Educational Mismatch: A Retrospective Study of Choice of Field and Institutions in Engineering Education in India

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DECLARATION

I, Sneha Bhasin, declare that the thesis titled **"Educational Mismatch: A retrospective study of Choice of Field and Institutions in Engineering Education in India"**, submitted to Jawaharlal Nehru University in partial fulfillment for the award of the degree of Doctor of Philosophy is my original work and has not been previously submitted for the award of any degree of this or any other university.

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CERTIFICATE

We, hereby recommend that the thesis be placed before the examiner(s) for the award of the degree of Doctor of Philosophy of Jawaharlal Nehru University.

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Sneha Bhasin

CONTENTS

LIST OF ABBREVIATIONS

AICTE	-	All India Council for Technical Education
AIEEE	-	All India Engineering Entrance Examination
AISHE	-	All India Survey of Higher Education
ANOVA	-	Analysis of Variance
B. Ed	-	Bachelor of Education
B.Tech	-	Bachelor of Technology
B.E	-	Bachelor of Engineering
BITS	-	Birla Institute of Technology and Science
BITSAT	-	Birla Institute of Science and Technology Admission Test
CABE	-	Central Advisory Board of Education
CSR	-	Corporate Social Responsibility
CTC	-	Cost to Company
FMCG	-	Fast Moving Consumer Goods
FYP	-	Five-Year Plan
GER	-	Gross Enrolment Ratio
GoI	-	Government of India
GNP	-	Gross National Product
HM	-	Horizontal Mismatch
ICT	-	Information and Communication Technology
IIT	-	Indian institute of Technology
IT	-	Information Technology
ITeS	-	Information Technology enabled Services
JEE	-	Joint Entrance Examination
M.Tech	-	Masters of Technology
MBA	-	Master of Business Administration

MCA	-	Master of Computer Application
MIT	-	Massachusetts Institute of Technology
MNC	-	Multinational Corporations
MS	-	Master of Science
MSC	-	Master of science
NAAC	-	National Assessment and Accreditation Council
NASSCOM	-	National Association of Software and Service Companies
NBA	-	National Board of Accreditation
NCR	-	National Capital Region
NCTE	-	National Council for Teacher Education
NEP	-	National Education Policy
NIRF	-	National Institutional Ranking Framework
NIT	-	National Institute of Technology
NKC	-	National Knowledge Commission
NSS	-	National Sample Survey
NTPC	-	National Thermal Power Corporation
OBC	-	Other Backward Classes
OECD	-	Organisation for Economic Co-operation and Development
ONGC	-	Oil and Natural Gas Corporation
GATE	-	General Aptitude Test in Engineering
PG	-	Post Graduate
PPP	-	Public-Private Partnership
REC	-	Regional Engineering Colleges
SC	-	Scheduled Castes
ST	-	Scheduled Tribes
PET	-	Pre-Engineering Test
UG	-	Undergraduate

UGC	-	University Grants Commission
UK	-	United Kingdom
USA	-	United States of America
VM	-	Vertical Mismatch

Million represents 10 lakh

Rs. represents Indian rupee

CHAPTER 1: INTRODUCTION

1.1 Background to the Study

With knowledge identified as the critical element in economic development, the work which was rooted in industrial production shifted to information and knowledge related work streams. This fundamental shift has changed and upgraded the skillset required in the economy. With a vast appreciation in the economic activities around knowledge industry, there is an expansion of the knowledge economy. Further, directly proportional to advancement in technology and human capital, knowledge is recognized as a key to economic growth (OECD, 1996). This, in turn, has accentuated the ‘economic value of institutions’ involved in knowledge generation (Varghese, 2013).

Earlier Universities were perceived as building a set of skills and values for participation in the larger society; however, there has been a shift in the way universities are perceived today. The discourse of universities has shifted towards marketization and corporatization (Leslie and Fretwell, 1996). In the 21st century, with immediate changes in global knowledge production, there is incessant pressure on higher education to churn out qualified and skilled human resources for the economy (Tilak and Choudhury, 2021). A consensus seems to be prevalent that though primary and secondary education is essential, predominantly, it is the quality of higher education that will prove to be a differentiating factor between a dynamic and a marginalized economy. With post-industrial economies argued to be knowledge-driven and with human capital investment representing the backdrop, there has been an emphasis on enhancing skills and qualifications to increase the growth of the economy. Thus, the role of preparing a qualified workforce is a more pragmatic concern for higher education among the various roles it plays in society.

Accordingly, the global education debate has led to a new thought process of associating education to work, this association results from various factors such as needs of emerging labour market, higher salaries (income elasticity of higher education is higher than all other levels of education), and improvement in job quality with a rise in ‘skill hierarchy’ (World Bank, 2002; Chadha, 2004; Varghese, 2012; Khare, 2012). However, with the changing work environment in today’s dynamic economy, employability skills are not restricted to just the ones required for gainful employment but to the ones who are constantly upgrading and improving themselves to compete in the job market. Technical skills are argued to be industry-specific, but there is a growing acceptance of giving more weightage to generic employability skills in the case of measuring comparative employability. Likewise, more weightage to generic skills is attributed to fast-changing technological needs (Berman *et al*., 1998). Drawing from Indian employers' perspective, employability is mainly assumed as a function of two factors: (*a*) academic qualification (*b*) the learning environment that aid in developing generic skills (Shrivastava and Khare, 2012). Thus, employability skills are recognized as those required by everyone- "skills that make specific knowledge and technical skills fully productive" (Conference Board of Canada, 2000; Watts, 2006).

With an increase in enrolment in higher education[1], there has been an increase in the demand for jobs. Growth in the economy also led to a demand for jobs. Economic growth recorded an unprecedented 8.4% growth between 2003-04 and 2011-12, driven chiefly by manufacturing, infrastructure, and services. Also, with the world experiencing the rising capital intensity and skill intensity in the manufacturing sector, a similar issue in India constrained the labour absorption in the manufacturing industry. The labour to capital ratio reduced from 0.179 to 0.0789 during the period 2001-02 to 2011-12, along with an increase in capital to output ratio in the organized manufacturing sector (Mehrotra *et al*., 2014). A Lewisian shift was observed in the Indian economy from 2004-05 onwards. Resultantly, there was a decline in the share of agricultural workers, and workers were moving towards construction, manufacturing, and services. Even though manufacturing could not record high employment elasticity, non-agricultural employment grew with faster gross domestic product (*ibid*). The services sector accounted for 25% of total employment compared to manufacturing which accounted for 11% of employment in the Indian economy. Also, the service sector comprised a majority of those with technical education. Manufacturing and non-manufacturing constituted less than 1/3rd of technical education graduates. It is often found that IIT graduates more often end up in finance and other services (Mehrotra, 2015). However, the IT service sector reported the lack of skills as the biggest obstacle for growth, and as a result salaries rose 15% annually

[1] According to the All India Survey of Higher Education (AISHE, 2019-20) report, the GER is 27.1%.

from 2003 to 2006 because of a dearth of qualified workforce (World Bank, 2009). Thus, it can be contemplated that all these factors jointly contributed to the demand for qualified labour in the economy.

The extent to which individuals invest in education and training also depends on the demand and supply[2] in the economy. Becker (1964) argues on the assumption of labour scarcity and emphasizes skill competition whereby individuals compete on differential investment in education and training. Brown *et al*. (2020) argue that on the demand side of the labour, there is a change in the occupation structure in the economy. Technological change is a driver for the demand for high-skilled workers. This is reverberated in the discussion on the 4th Industrial Revolution, which foresees demand for high skilled workers, emphasizing Artificial Intelligence and automation of lower-level jobs. New types of jobs have emerged in sales, marketing, and finance with an upsurge in installment payments. More opportunities in personnel departments are created to overlook the day-to-day functioning of the corporations and the employees. A transformation in the service sector is better referred to as ‘financial services factory’ and ‘industrialization of services.’ These middle-class occupations have chiefly contributed to the change in occupational structure. Hence, in the present times, this occupational change affects the demand for labour in the economy. Nonetheless, the expansion of higher education and increase in enrolment has not matched the rise in demand for labour in the economy.

The fact that higher education does not necessarily equip students with the requisite skillset for the job market creates issues of unemployment and skill shortage. This calls for a deeper understanding of the linkages between higher education and the world of work in the context of rapid changes in the globalized world. There are four possibilities of skill imbalances, a) Skill shortages:- when employers face difficulty in filling vacancies for an occupation, b) Skill gap/deficit:- when existing employees’ skills[3] is not up to the requirements of the job or employers’ expectations c) Recruitment difficulties:- these may be prevalent due to low remuneration, location, unsatisfactory working hours, etc. (Agarwal, 2007; Blom and Saeki, 2011), and d) Skill underutilization:- when the level of education and skill exceeds those required by the job (Allen and Velden, 2001; Green and McIntosh, 2007; Green and Zhu,

[2] Composition of the workforce churned out from institutions.
[3] Qualification, experience and specialized skill.

2010; Tilak and Choudhury, 2021). India faces all four types of skill imbalances. Employability in India is an issue not only related to poor quality but also with the problem of mismatch in supply and demand for specific skills, which acts as an impediment to the growth of the economy. Therefore, the challenge for India lies in harnessing the 'demographic dividend'[4] and providing individuals with gainful employment. The higher education has a very critical role to play in its response.

With the withdrawal of the public sector, increasing privatization, and globalization, there has been a change in the labour market demand. With the 'knowledge society', and technological changes, there has been an emergence of new job roles, new vocational and job-hopping, and the Indian education system has come under pressure for graduates' want of skills and competencies. It is now not just about the uneducated lacking skills but also graduates lacking core competencies who often find themselves below the requisite standards. Nevertheless, the advantage of a demographic dividend may soon turn into a demographic disaster if most graduates face issues in the job market (Khare, 2015). In the globalized world, just obtaining a degree does not suffice for employment and higher earnings. Notwithstanding, initial entry to the labour market has a more considerable dependency on academic credentials as employers have only academic credentials to understand the potential employability, given information asymmetry. However, with the massification of education, degrees are no longer considered as differentiating. Additionally, employers evaluate candidates based on additional criteria, such as field of study and their institution type (Triventi, 2013).

1.2 Higher Education in India

When a country's Gross enrolment ratio (GER) is less than 15%, it is in the elite stage of higher education; when the GER is between 15% and 50%, it is in the massification stage; and when the GER surpasses 50%, it is in the universalization stage of higher education. This is Martin Trow's taxonomy of higher education's stages of growth (Trow, 2006). Therefore, as per this categorization, India's higher education sector is in its initial stages of massification (GER of 27.1%[5]). India has a massive higher education system with more than 1043 Universities, 42343 Colleges, and 11779

[4] Growing proportion of working age population.
[5] As reported by AISHE 2019-20.

stand-alone institutions with 37.4 million students' intake, the third-largest after China and the USA. However, a large part of this expansion is attributed to the growth of private engineering and technical education.

Nonetheless, India's policy response to the privatization of higher education shows an alteration from a state-dominated model to endorsing privatization of private higher education institutions to expand the existing system. In this regard, the All India Council for Technical Education (AICTE) appointed the Swaminathan Panel (1992), which suggested cost recovery from students and introduced education cess to be collected from industries. Similarly, the Punnayya Committee (1992-93) set up by the UGC recommended cost recovery to 15-25% of the annual recurrent expenditure of the university. Simultaneously, some of the state governments came forward to offer self-financing courses in public institutions. To meet the growing demand for technical education and stop students' migration to other states, the Government of Kerala decided to open institutions on cost recovery mode (Varghese, 2006). The 1980s and 90's witnessed an unlimited growth of self-financing institutions, mainly in engineering, management, and medicine (Agarwal, 2007). However, there were regional disparities, and large numbers of institutions were primarily concentrated in the southern and western parts of India in Andhra Pradesh, Tamil Nadu, Karnataka, and Maharashtra.

Furthermore, the Birla Ambani study (GoI, 2000) proposed that the private sector be given access to higher education, that costs be recovered from students, that loans and grants for the economically disadvantaged be strengthened, and that private university bills be promulgated. Later, the 10th Five-Year Plan (2002-07) placed a greater emphasis on generating internal sources of finance and resorted to various methods like donations, alumni contributions, CSR, and so on. After that, in 2002, many state governments passed the Private Universities Act. Chhattisgarh was the first to enact the bill and officially established the first private university in India in 2002. In the same year, the state of Chhattisgarh founded 97 private universities. Private universities, on the other hand, were formed in accordance with the UGC's regulations (1993).

Similarly, the CABE Committee (2004-05) recommended resorting to self-financed and job-oriented courses, and universities were encouraged to introduce entrepreneurial education. It was also directed towards charging high and differentiated fees from the students. In the 11th Five-Year Plan, the public investment in education did go up. And it proposed a more prominent role of public funding in higher education. However, the public institutions were not able to cater to the required expansion. On the other hand, the National Knowledge Commission (2009a) suggested the promotion of quality higher education to increase competitiveness and output in the economy. It recommended funding through public and private modes. It also highlighted looking for alternative sources of financing and emphasized mainly private funding. Correspondingly, during the 11th Plan, National Skill Development Mission was envisaged to address the deficiency in skill supply. It was proposed by the State to integrate Skill development with conventional education. The primary purpose was to make the graduate employable by confining him to getting trained in a specific skill set (Chattopadhyay and Sharma, 2019). According to the estimations in the 12th Five-Year Plan's vision document (Planning Commission, 2013a), private higher education accounted for 4/5th of professional higher education enrolment. The role of the private sector was primarily envisaged in professional and technical education. Narayan Murthy Committee report (GoI, 2012b) also reiterated private participation and strengthening the industry-academia linkages to ensure the relevance of education and value for money approach and explore the corporate sector participation in higher education and research in India.

As a result of the exceptional growth of self-financing private colleges in response to policy recommendations, institutions of doubtful quality emerged. According to NAAC, 90% of Indian Universities and 70% of colleges are mediocre or low quality (Agarwal, 2009). The approval granted to such institutions in the engineering area by the AICTE has been questioned. It was also brought to light that the procedure of obtaining authorization was not transparent, and the former Chairman of the AICTE was found guilty of the practice, along with other officials. In 2009, even the chairman was apparently suspended for receiving bribes in the process of establishing private institutions (Mishra, 2011). Such an unanticipated increase in private participation in the education system has raised considerable concerns. Examples of fraudulent practices include grade inflation, teacher absenteeism, subversion of recruitment and promotion, and outdated curriculum.

Simultaneously, deterioration in the share of students enrolled in arts discipline from 46% (2005-06) to 38.63% in 2018-19 was witnessed. The drop in enrolment is explained by an increase in the share of engineering students besides the lack of a labour market information system. Engineering students' enrolment rose to 17% of total tertiary level enrolment in 2015-16 from 7.21% in 2005-06 and has declined to 12.6% in 2019-20. Additionally, 16% were enrolled in sciences, 14.9% in commerce and management (AISHE; GoI, 2019-20). These were more potentially employable than their arts counterparts. In 1960, the private sector accounted for 15% of enrolments, and by 2019 the private sector accounts for 86% of enrolment in the country (AICTE, 2019). In 1990, while 5% of enrolment in higher education was in engineering education, the enrolment went up to 7.2% in 2005 and 16% in 2015-16, and around 13% in 2018-19 (GoI, 2018). The Post-liberalisation era has attracted large private initiatives in technical education. As a result, enrolment in engineering increased about seven times, and in higher education about three times increase was witnessed (GoI, 2011). The intake in engineering has risen from 66,000 in 1992 to 6.59 lakh in 2007 to 16.42 lakh in 2015-16. The institutions rose from 1511 in 2006-07 to 6431 in 2015-16 (AICTE, 2015). Although professional courses such as medicine, engineering, management, law, and other vocational courses have seen quicker growth in recent years, it has resulted in 'disciplinary distortions' (Anandakrishnan, 2010). There has been a massive expansion in enrolment in higher education institutions. It can be contemplated that this expansion is mainly attributed to the skill needs for the growing economy, with a more considerable emphasis on operational knowledge than academic/scientific knowledge.

Liberalization and the growth of the service sector (IT Services) and expansion of the knowledge economy have chiefly contributed to the upsurge of engineering graduates in the country. Furthermore, in today's knowledge economy, the importance of specialised human capital in achieving rapid economic growth is being emphasised. As a result, the need for engineering education has risen over the world (Dubey *et al*., 2019). India's expanding aspirations to consolidate its status as a prominent contender in the global knowledge economy are being fueled by engineering and technical education (Blom and Cheong, 2010). As a result, professionalisation in India is severely lopsided. Engineering and management are confirmed to make up a considerable portion of professional education in the country (Khare, 2014). While higher education as a whole rose at a rate of 6.4% each year between 1960 and 2018, enrolments in engineering education climbed at an annual rate of 8.4% (GoI, 2018). Also, there is an emphasis on skills, numeracy, and literacy and raising GNP through strengthening technical graduates. The progress of institutions has shifted to quantitative measures more so indicated by affiliation of marks and economic returns that accrue to graduates over a while. Markets in education emphasize outputs produced from education which are quantifiable (Thomas, 2012 cited in Chattopadhyay, 2012b).

Therefore, in India's case, the challenge that an individual faces after passing class $XII^{th}$is regarding the choice of field of study. Various studies have shown that there has been a sudden offshoot in demand for professional courses and that too engineering. Thus, India's challenge lies in converting this embryonic talent into a productive resource that would boost India's growth and transform India into a developed economy. Students' entry into engineering colleges is based upon entrance examinations: Joint Entrance Examination (JEE-Main), Joint Entrance Examination (JEE-Advanced) for the IIT's, and institutes, such as BITS, Pilani, conduct their examinations. Since 2014, few states have discarded Common Entrance Tests and have started using JEE (Main) scores for admission. Top students who clear the entrance examinations prefer the IIT or NIT or a few top private engineering institutions. The examination is a nationwide, multiple-choice examination administered within a time-bound manner. It is a ranking rather than a qualifying exam, presumably assumed to seal students' fate for entrance to premier institutes and prestigious jobs later in life. The entry to these institutions constitutes less than 1% of the total students enrolled in engineering education. Individuals thus have to perform outstandingly to get admitted to these premier institutes (Sohoni, 2016).

1.3 Engineering Education in India

In 1842 the first formal school came into Guindy, Madras, and was linked to a gun carriage factory. The first engineering college, titled Thomson engineering college, was established at Roorkee in 1847 with the purpose of training civil engineers (AICTE, 2016). The colleges established during the pre-independence period include Poona Civil Engineering College at Pune (1854), Bengal Engineering College at Shibpur (1856), Banaras Hindu University (1916), Visvesvarayya College of

Engineering (1917), and Harcourt Butler Technological Institute, Kanpur (1920) (Bhatt, 2010). However, in the third quarter of the eighteenth century, the desire for engineering education was primarily to solve a technological gap in local capabilities and to fulfil the demands of the Industrial Revolution. At the end of the 19th century, there were four engineering colleges at the degree level, 50 industrial schools, and 20 survey and technical institutes (AICTE, 2016).

In addition, British Nobel winner Sir Archibald Vivian Hill commissioned a report to describe the state of scientific and industrial research in India as part of the postwar reconstruction. According to the report (1944), the war had severely shut off India's scientists from intellectual contacts with the rest of the globe, and as a result, India's technical resources "had not been harnessed" or developed to par with those of other developing countries (Arnold, 2004). Hence, the report pushed the development of the IIT on MIT's lines to fulfill the requirement of an adequate technical workforce for post-war India. Following that, in 1946, the Sarkar Committee delivered its interim report (published in 1949), in which it suggested the construction of four higher technical institutions encompassing India's East, West, North, and South. As a result, the Indian government created five IITs in the cities of Kharagpur (1950), Bombay (1958), Kanpur (1959), Madras (1960), and Delhi (1963). The Committee also stated that instructors should have access to consultation, research, and sufficient time off to visit the industry to stay up to date on the latest requirements.

At that juncture, these recommendations were taken well by Prime Minister Jawaharlal Nehru, whose idea of industrialization was based on investment in heavy industries, public sector investment, and infrastructure nationalization. In 1948, the Roorkee University Act was passed, and in 1949 it was granted the status of the first Technical University of India. After completion of 150 years, the institute was facilitated the status of the IIT in 2003. In 1995, the IIT Guwahati was established. Later, an Act of the Parliament declared the IIT as institute of national importance and an autonomous institution.

a) The Growth Story

REC were formed between 1956 and 1960 to not only meet the predicted increase of technical human resources in various states but also to meet the aspirations and manpower demands of those states. A high power committee was formed under Dr. Mashelkar to review REC's progress and suggest REC's future roles to improve the country's technical education base. As a result of the Mashelkar Committee's suggestion, 17 REC's became the NIT. Today, there are 31 National Institutes of Technology, all of which have been designated as institutes of national importance and operate with a high degree of autonomy and central support, similar to the IIT's but operating under a distinct Act. Eight new IIT's were established to handle the mounting difficulties, signalling a crucial expansion era for the IIT's. The expansion of the Indian Institute of Management (IIMs), the establishment of the Indian Institute of Science Education and Research (IISER), proposals to upgrade some of the older reputed technical institutions (such as the Bengal College of Engineering, Sibpur) into Indian Institute of Engineering Science and Technology or a public-private collaboration to extend the network of Indian Institutes of Information Technology – all speak to the necessity for a diverse set of institutions to support technical education (Saha and Ghosh, 2011).

In November 1945, the AICTE was established as an apex advisory body to promote technical education growth in an integrated way, and examine the activities as a regulatory body. Under the AICTE Act 1987, it became a statutory body. The council's mission is to plan, define and maintain norms and standards, as well as quality assurance through accreditation, funding, monitoring, evaluation, maintaining parity of certificates and awards, and maintaining integrated development and technical education management (Chopra and Sharma, 2010). National Board of Accreditation (NBA, 2009), an autonomous agency under the supervision of the AICTE, is in charge of accreditation.

However, by the late 1980s, India became a manufacturing laggard, with East Asia having seized the chance. Simultaneously, two independent events occurred. One was the liberalization of the economy, and the other was the IT boom. India seized the opportunity presented by East Asia's commitment to manufacturing. The underutilized human capital met the booming IT demand without alternative suppliers (Kapur, 2002). This booming demand for IT led to an increased demand for engineering education in the country.

Nonetheless, the demand for courses is fueled by parents' belief that their children will have a better life with a degree-BA acquisition used to be one such thing. However, from the mid-1990s, a professional degree occupied that share. This excess demand for engineering could be met either through i) financing the expansion in accessibility without compromising on quality ii) curbing demand through seat rationing via a policy of selective admission, which was recommended by the Sargent Committee and the Kothari Commission, or iii) enhancement in fees at market-clearing levels which would create a demand-supply equilibrium (Ayyar, 2015). The states were not in a position to either expand access or reduce the demand for engineering education. Even the central government could not develop its institutions to meet the excess demand nor support the states to expand access from 1970 to 2004. With no alternative at hand, the states responded to the demand for establishing institutions, resulting in self-financing colleges. The institutions were financed by recovering capital and recurring costs from students without any aid from the government. Interestingly, since independence and till 1975, 127 engineering colleges were set up. Another 178 colleges came up during 1975-1985, and another 190 colleges were added from 1987-88 to 1997-98 (Kumar, 2011:190), and most of these colleges were on self-financing mode.

b) Private enterprise

The private sector has chiefly contributed to educational institutions' growth in the last two decades. The decision to open the doors to private players was unavoidable, given the constant rise in demand for engineering education and the incapacity to invest in technical colleges. Many state governments encouraged private actors to enter the realm of self-financing professional courses by offering land and other infrastructure support at reduced costs in 1980, despite the lack of financial approval (Blom and Cheong, 2010). However, the private entrance had started with establishing the Indian Institute of Science, Bangalore in 1906, Birla Institute of Technology (Ranchi) in 1955, and BIT's (Pilani) in 1964. Further, the market's opening up in 1991 gave impetus to the private players (Chopra and Sharma, 2010). Private engineering institutes grew at a 13% annual rate from 1997 to 2007, with a 19% increase in student intake, owing largely to the new private institutes that opened in 1991 (Banerjee and Muley, 2008).

Likewise, philanthropy and charity got replaced by commercial motives in privatization (Tilak, 2006; Agarwal, 2009; Varghese, 2015; Kapur and Mehta, 2017). Many private institutions that claim to be non-profit in name are profit-making in practise (Tilak, 2012). Anandakrishnan (2006) discusses the change in private players' character in engineering education, particularly after the reforms of 1991. It brought forward their malpractices to charge exorbitant capitation fees, manipulate admission processes, and tamper with the entrance examination results. Simultaneously, the share of public expenditure did not increase at par with the enrolment in these institutes resulting in a decline of per-student public spending (Tilak, 2006; Varghese, 2015). These developments, however, were the outcome of the report submitted by the Justice K Punnayya Committee of Funding of Institutions of Higher Education[6] (1992) and D Swaminathan Report on Mobilisation of Additional Resources for Technical Education[7] (1992) pointed by Varghese (2015), which led to privatization of public institutions through a reduction in subsidies and opting for cost recovery measures. The haphazard rise of private colleges has resulted in a number of inconsistencies:- (1) poor standards make for un-employability and mismatches. As a result, in a market where trained manpower is in limited supply, the unemployment problem is exacerbated (2) little effort had been made to assess the industry's labour demands and to provide tailored courses to meet those needs (Subramaniam, 2015).

Previously, the two provinces of Karnataka and Maharashtra authorised the creation of engineering and medical education institutes under the direct political sponsorship of state legislators in the 1980s. Engineers and doctors were in high demand as a result of these colleges, and students from all over India flocked to them. They were also linked with the region's universities and governed by their statutes at the same time. They were tarnished for asking a hefty cost for entrance, which was frequently set in addition to the tuition fees levied by universities/state governments and was popularly referred to as the "capitation fee." However, they were few in number and had little impact on the system as a whole, especially in comparison to recent advancements. Private institutions charge exorbitant tuition costs with or without state government authorisation. In the matter of fee fixing, state governments and the

[6] This was appointed under the aegis of the UGC.
[7] This was led by the AICTE.

judiciary have had to step in. In order to be autonomous in curriculum and examination/evaluation matters, these institutions have increasingly pursued the status of deemed universities. Along with the students' financial exploitation, the quality of their education and motivations are also questioned (Anandakrishnan, 2004).

Engineering education, on the other hand, has occupied a significant position as a booster of economic growth and technical advancement in independent India. Various commissions and committees have discussed the importance of the country's socioeconomic development. Central committees (Saha and Ghosh, 2011) in the light of engineering education are discussed below:-

i) Sarkar Committee:- The Committee submitted its report in 1946 wherein they had recommended setting up four higher technical institutions on the lines of MIT across the length and breadth of the country to meet the post-war reconstruction plan.

ii) S.S Bhatnagar Committee:- The Sarkar Committee was followed by the Bhatnagar committee, which came into existence to meet the development prerequisites in the country post-independence. Simultaneously, in order to predict the demand for technical manpower in the government sector over the next decade, a 4:1 ratio of demand to supply of technical people was suggested.

iii) Thacker Committee (1959-1961) and Chandrakant Committee (1971):- The Committee had made a recommendation for the development of post-graduate engineering and research in the country. It recommended that the Post-graduate studies be concentrated in few institutions due to the limited availability of qualified staff. It also promoted technological growth and emphasized that the relationship between academia and industry be developed. It was directed towards developing more employment opportunities for post-graduate engineers. After a decade, an appraisal of existing post-graduate and research programs came under the Chandrakant committee's purview. The Thacker committee's recommendation of a one-year post-graduate diploma degree was unsuccessful, and the system was abolished.

iv) Kothari Commission:- It recommended encouraging deserving students to take up branches such as electronics and instrumentation. The Committee recommended that practical hands-on training be part of the student's curriculum from the third year onwards. It also proposed a fair salary to highly qualified engineers to retain them for teaching and research purposes. It argued that the success of engineering education depends upon the ability and skill of the workers. It recommended that 50% of students after completing class X^{th} and 20% of students after completion of secondary education must opt for professional and technical education by 1986. It also recommended the appointment of an eminent educationist as president of the Board of Governors of REC. It emphasized practical training to be imparted to third-year degree course students. Curriculum to be designed keeping the changing needs of the economy.

v) Nayudama Committee (1978-80):- The current condition of engineering education and research left the Committee profoundly dissatisfied. The dissatisfaction demanded that post-graduate courses be restructured, faculty be improved, and new/emerging topics be identified. It recommended making post-graduate courses for two years having three semesters (with two-course work in 1^{st} year followed by dissertation and Viva in 2^{nd} year) and the AICTE will be established as a legal entity through an Act of the Parliament. The Committee also felt that the Regional engineering institute (now known as the NIT) should have funds at their disposal and be upgraded. It was the first time that all the IIT were reviewed together under one Committee. It recommended that there should be greater flexibility in the curriculum for those doing B.tech at the IIT. UG and graduate programs were to be examined and changed on a regular basis to meet the needs of the country. Thacker, Chandrakant, and Nayudamma recommended that Post-graduate education be encouraged through a government scholarship. Likewise, the Graduate Aptitude Test in Engineering (GATE) began for entrance to Post-graduate courses in engineering. However, the Ph.D. criteria for post-graduate teaching are yet to be followed in most institutions.

vi) National Policy on Education (1986):- It recommended developing a technical manpower information system to cater to its information. For promoting efficiency, the curriculum was prepared to meet the industry requirements. The suggestions were enacted into law in 1987, making the AICTE a statutory entity with the responsibility to plan, formulate standards and regulations, ensure quality through accreditation, and further promote technical education. It was also suggested that for the overall expansion of higher education institutions, the focus should be on increasing facilities in existing institutions. It also attempted to devise steps to protect the system from degradation. When the National Policy on Education was created, private educational institutions were on the rise; however, it missed the opportunity to critically analyse the factors responsible for the rise in demand for higher education.

vii) Mashelkar Committee:- With the establishment of REC in various states, the Committee was set up to review their progress and recommended issues concerning funding, faculty, governance, and academic matters. The existing 17 REC were converted into the NIT as a result of the recommendation, which changed the funding and governance structure of the institutes and shifted control from the states to the centre.

viii) U R Rao Committee (2003):- The Committee proposed that the AICTE be reviewed, noting that approximately 20% of engineering graduates were unemployed, and addressing issues of faculty shortages. It also recommended discontinuing UG technical institutions' expansion in states where intake exceeded the national average of 350 per million population. The Committee expressed worry about the state of technical education in the country constituting poor quality assurance structures, accreditation procedures, shortages of qualified faculty, and low Ph.D.'s. The Committee also raised concern over the uncontrolled expansion of technical education. To meet the growing demand for technical education and have quality engineering education, the government decided to raise a few REC to the IIT's level and simultaneously open more IIT's to cater to the demand. The Committee stated that there is a need for stronger industry-academic ties so that institutions can assess the market's human resource needs and modify their programs accordingly. Despite the fact that accreditation is required, only about 10% of institutions were accredited. According to the committee assessment, there is a significant gap between the recognition and accreditation systems of the AICTE. In May 2003, there were around 14,000 programs at 3,589 approved degree-granting institutions and 1,608 approved diploma institutions. However, under the purview of the AICTE, only 985 programs from 202 institutions had been accredited. At the time, the data appeared to show widespread scepticism of the accreditation process. The report recommends tightening regulatory standards to weed out substandard institutions and increase the accredited institutions proportionately. Institutions that failed to meet the minimum accrediting requirements were given a probationary period to correct deficiencies or face a reduction in enrolment or closure. It also noted excessive cost charged by the private engineering institutions as well as capitation fees as one of the most crucial commercial exploitation instruments of the students.

ix) Parliamentary Standing Committee (2003):- The Committee emphasized establishing engineering institutions in the North-Eastern region through government and private initiative. For admission in engineering education, it recommended uniformity in eligibility criteria at all India levels. Accordingly, a Common Entrance Test for admission in engineering colleges was initiated in 2002-03. It also framed regulation for fees to be charged and took steps for modification in pay scales of faculties appointed to engineering colleges. It also suggested granting autonomy to engineering institutions possessing adequate infrastructure and competent faculty etc. It recommended that the lack of funds be met through strengthening the industry-academia linkages.

x) Knowledge commission report on technical education (2005-08):- The NKC was established to provide advice to the government on how to develop India into a knowledge economy. It proposed creating an independent regulating authority[8] for higher education that would cover a wide range of streams. It also suggested that industry practitioners and professionals from research laboratories be part of the teaching process. It called for flexibility in the curriculum and adopting interdisciplinary at the same time. It contemplated that higher education should look for alternative sources of funding. It suggested that public-private partnership be looked upon as an option. The policy framework is directed towards making more institutions elite. It also suggested increasing the faculty number by relaxing the Ph.D. criterion for a UG degree. The NKC proposed an increase in university fees to recoup 20% of their costs (cost recovery). To address the demand for professional skill-based education, it was also suggested that 1500 universities be established in the form of specialized research institutes.

xi) Kakodkar Committee:- During the 11th Plan period, the IIT grew from the existing 7 to 15. The Committee came into existence to suggest measures concerning expansion, inclusion, and excellence.

[8] To minimize bureaucratic interferences in higher education.

xii) The Yash Pal Committee:- While the 11th Plan called for government support to meet higher education goals, the NKC underlined the need of private funding. To resolve the tussle between the two goals, the Yash Pal Committee was constituted (Chattopadhyay and Sharma, 2019). After critically assessing the functioning of the UGC and the AICTE, the Committee recommended creating a new regulatory body called the National Council of Higher Education Research (NCHER) to replace different regulatory bodies like the UGC, the AICTE, the NCTE, etc. Further, the curriculum reform was to be of prime priority for the newly created Higher Education Commission. It also laid the groundwork for all universities to have a diverse range of knowledge areas and was against making single or specialized universities.

Also, the recent discussion of the Kasturirangan report (GoI, 2020) on National Education Policy with specific reference to engineering education is detailed here.

xiii) National Education Policy:- In 2017, it was again proposed to merge the UGC and the AICTE, and a new body called Higher Education Empowerment Regulation Agency (HEERA) was to be created. In 2018, a proposal repealing the UGC Act and establishing a Higher Education Commission in India (HECI) was prepared (Chattopadhyay and Sharma, 2019). Thus, with the ongoing debates on regulation, the National Education Policy 2020 proposed a standard uniform approach for regulation. It emphasizes 'light but tight' regulation. This was indeed proposed by NKC[9] and Yash Pal Committee earlier. However, the experience of the AICTE to regulate on its own and leaving aside the State and universities may be a pointer to the establishment of an overarching body. A parliamentary standing committee concluded that an overarching body like the National Council of Higher Education Research (NCHER) would not regulate the country's entire education system alone and would need the participation of the state governments (Ayyar, 2015). Contrariwise, the existing regulatory authorities have failed to deliver quality and perform its function diligently. Many criticisms leveled against the AICTE questioning its functioning are dealt with in the subsequent chapter.

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[9] It wanted to provide a *single-window clearance* to entrepreneurs who wanted to establish new institutions while Yash Pal Committee wanted to fulfill academician's desire of University Grants Commission to represent the broad range of higher education.

Nonetheless, over recent years, engineering education has transformed from sellers to the buyer's market, with seats remaining unfilled. As a proportion of sanctioned intake, the admission rate had declined from 62.4% in 2012-13 to 51.1% in 2018-19. The decline is mainly in private engineering institutions. During 2012-13 to 2019-20, the AICTE has approved progressive closures of 778 engineering colleges in the country. Of the 14.1 lakh intake capacity at the UG level, the total enrolment in 2018-19 was 7.2 lakh which is approximately 51% of enrolment. Accordingly, 6.9 lakh approved seats have remained vacant in 2018-19 across the engineering institutes in the country (AICTE, 2019).

With the decline in enrolment in private institutions, it implies that quality eventually would determine quantity in private institutions, and stringent and transparent regulatory body and a commitment by private institutions for improving the quality of engineering education delivered is the necessity of the hour. This is not to deny that there isn't a credible and quality private higher education institution and quality public institutions, but the majorities in operation are under poor conditions. Varghese (2015) argues that many private technical and professional colleges are witnessing a decline in enrolment partly due to the questionable quality imparted in these institutes. The quality attributes of graduates coming out of engineering institutes in terms of their skills and knowledge determine their employability. Thus, low employability and a significant decline in job placements testify to the poor quality engineers churned out by the institutes. The training that these engineers would receive is based on a minimum level of understanding at the UG level, which is largely lacking among India's pass-out engineers.

1.4 Engineers and Employment: The Facts

A detailed look at the engineering profession in India depicts that it is riddled with paradoxes. The paradox is that employers face a shortage of highly skilled engineers, yet there is no lack of engineering graduates in the job market. Nonetheless, there appears to be no difficulty with graduate demand and supply in terms of quantity, but in reality, all engineers are unable to find jobs in accordance with their training. India produces more engineers than China and the USA combined. Despite this mammoth increase, industries complain about the absence of quality engineers (Banerjee and Muley, 2008). This may allude to the fact that training provided to engineering students is far below industry standards. Simultaneously, the industry struggles to get relevant candidates. Several reports have brought forth the discrepancies associated with engineers and their education system during the past few years. The NASSCOM-McKinsey Report (2005) states that while more than 3 million students graduate from Indian colleges, the industry directly employs only a minute percentage. In the offshore IT and BPO industries, only about 25% of technical graduates are expected to be fit for employment.

Further, a NASSCOM survey (2011) pointed out that only 17% of engineering graduates in the country are employable. Later, a National Employability Report (2016) revealed that more than 80% of students who passed out of engineering colleges in 2015 failed to meet the competencies required by the industry standards. According to Purple Leap research, even with interventional training, one-third of graduates from Tier II, III, and IV engineering colleges were unemployed. Further, the number of graduates who are immediately employable from Tier II, III, and IV colleges is equivalent to that of Tier I engineering colleges (Khare, 2014). Similarly, the disparity in employment of technical graduates across Tier I and Tier II cities is concerning (Aspiring Minds, 2015). Employability varies by institution; a major share of the total number of employable graduates comes from the top 30% of colleges (Aspiring Minds, 2013). Despite the fact that the World Bank supported programmes in the last two decades aimed at making technical education more industry relevant as a follow-up to the National Policy of Education, this has remained the situation.

Further, the Aspiring Minds 2015-16 stated that of the 6 lakh engineers who graduate each year, 18.43% find themselves employable in software engineer IT service roles. As far as core jobs in mechanical, electronics/electrical, and civil jobs are concerned, a mere 7.49% are employable. Simultaneously, 53% of engineers prefer software, and 44% have core engineering jobs as their preferred role. Although a subject like mechanical engineering remains very high on the list of engineering aspirants, it becomes secondary for employment. Contrariwise, money recovery is argued to be the fastest in IT. Concurrently, the rise of the IT sector has had an impact on the quality of core engineering graduates. Correspondingly, the traditional branches such as electrical and electronics, civil and mechanical, have declined in popularity. Their space has been occupied by electronics and communication, computer science and engineering, and IT. As far as possible, students often from other disciplines take IT-related courses due to the easy availability of jobs and high salary and neglect their core discipline.

Interestingly, most graduating students, irrespective of the branch, have been finding jobs in the IT service space where their previous training becomes irrelevant. As a result, half-baked engineers emerge who aren't well-versed in their fields or in IT. Furthermore, in core academic courses, an over-reliance on software products rather than concepts has resulted in a lack of knowledge of the subjects (Sarkar and Choudhury, 2014). This, in turn, accounts for a mismatch in graduating engineer aspirations and their job readiness leading to dissatisfaction amongst them. However, the problem concerning core engineering jobs is that students do not have their basic concepts right. There is a need for insistence on the basics of electrical, mechanical, etc. Thus, the majority are forced to take up jobs in non-engineering fields or remain underemployed. Simultaneously, there is a mismatch between the skill sets that are imparted and the ones that are needed in the workplace. However, nearly half of the graduates are unemployable in any sector based on the industry standards of employability. Many Indian universities and colleges are performing poorly in preparing students for employment. The engineering job market is, therefore, affected by low graduate employment and an over-saturated market (Aspiring Minds, 2015; 2016).

India has a glut of engineers, still, engineers remain underemployed in the fastest-growing economy. Additionally, the skill training imparted appears to fall short of the resilience needed to cope with technological change. In the same way, there is an emphasis on soft skills rather than developing subject knowledge in their discipline. Further, the India Skill Report (2018) published by Wheebox demonstrates a lack of programming skills among newly graduated engineers. This skill gap points towards institutional bottlenecks, viz. out- dated curriculum, poor faculty, flawed learning, and teaching pedagogy. What needs to be implicit is that the possession of academic knowledge is of no use unless this can be subject to resolving real-world problems; unfortunately, the crop of engineers today falls short of such skills. The paradox is that commensurate with this increase in intake and growth in several engineering institutions, quality faculty, and infrastructure development has not been taken care of, resulting in unrestrained growth of quantity without assured quality and industry relevance. Besides, the masters in engineering amounts to approximately 8%, which is a concern for India. The advanced nations are looking to outsource their highly skilled and knowledgeable manpower for their industries and Research and Development centers. It is pressing for India to simultaneously enhance its post-graduate and research manpower output (Chopra and Sharma, 2010).

In the survey conducted by Aspiring Minds (2016), it is reported that over 60% of engineers cannot find employment in design engineering courses as it requires the understanding of the complete domain exquisitely. Simultaneously, they are faced with outdated courses, which are often cited as a reason for not being employed in design engineer courses. The curriculum seems to have been the same throughout the years, but the primary and clear understanding of the fundamentals' concepts is lacking in large numbers. Moreover, the study found a significant gap in skills in computer programming compared to logical reasoning and command over the English language. Also, there is a gap in employability across different roles except for ITeS roles. The maximum drop in employability for the top 100 versus the rest is in the following sectors:- IT product, Design engineer, business analyst, technical content developer, and least is for Associate ITeS/Business Process Outsourcing (BPO). In IT product role employability, one would expect a steeper trend as its employment is more strongly influenced by educational quality than IT services employment.

Additionally, through the latest survey of an Ed-tech startup, Scaler- it was estimated that out of 15 lakh graduates passing out every year, only 2.5 lakh could land in technical domain jobs. And most of them broadly fall in the income category of less than Rs. 8 lakh. These engineers are mainly in IT services, earning in the range of Rs. 3-5 lakh annually (Nigam, 2020). Among the fresher's, only about 3% of the 15 lakh graduating every year can land in Rs. 8-10 lakh income per annum. It is also reported that this 3% reporting earnings in the higher range are from tier 1 colleges, thereby hinting at quality concerns in other colleges. One needs to consider what happens to those remaining 12.5 lakh engineers churned out from institutes every year. They are then on the path of rerouting their career options to pursue jobs in non-technical areas. The report claims a lack of relevant skills amongst engineers is a more significant issue concerning the problem.

In 2017-18, 1.89 million students graduated from engineering and management schools, and hardly a little over 1/3rd of them were placed (Nanda, 2018; AICTE, 2019). Based on National Sample Survey (NSS) data, the highest rate of unemployment was faced by technical graduates, which was reported around 37.3% in 2018 compared to 18.8% in 2012 (Mehrotra and Parida, 2019). According to a survey published by Aspiring Minds (2019), 80% of Indian engineers are unsuited for any job in the information economy.

Between 2014 and 2018, the engineer's employment has remained somewhat static, around 50%, with negligible fluctuations reported by the India Skills Report (Wheebox, 2020). A study by Tilak and Choudhury (2021) depicts that, in fact, in the past nine years, there has not been a substantial change in the employability prospects of engineering graduates in the country. However, in 2019 it improved to 57%, but in 2020 the employment prospects experienced a steep fall to below 50%. With the changing technology and changing requirements in the labour market, it is reported that hardly 2.5% of engineers possess skills required in artificial intelligence, and 1.5% to 4.5% possess data engineering skills. It noted that roughly 2.8% to 5.3% of engineers were qualified in wireless technology that the industry demands (Aspiring Minds, 2019).

Vivekananda International Foundation (2019) reported that just around 5% of engineering graduates pass the GATE examination, and barely 5% of engineering programs are fully certified by the NBA. As a result, it is believed that private institutions primarily exploit the system's existing flaws, such as the State's inefficient administration and regulation, the market, and the attitudes of information-deprived parents' (Kirp, 2003; Levy, 2006).

To sum, the labour market and job roles are continuously modified, redefined, and changed. Simultaneously, certain types of work become obsolete, while new vocations with new roles emerge. Engineering, a technical sector that generates unique human capital, is being impacted by rapid technology advancements.

1.5 Pre-existing Disease in the job market

Fast enrolment in engineering education and the broader expansion of the private sector were responsible for existing problems in quality and employability. Still, there were pre-existing problems in the system.

a) Diploma Disease:- There was a slow growth in government jobs in the 1990s, and it declined in absolute terms in the 2000s (Mehrotra *et al*., 2012). Also, with limited seat availability in government institutes, there remains an issue with quality and a reason for compromising employability. Diploma disease[10] (Dore, 1976) appeared to be a reason for the rise in enrolment in engineering education as students continued in academic courses for want of an alternative. The minimum requirement for white-collar jobs is university education, even though these jobs were not growing (Mehrotra *et al*., 2012).

b) Credentialism:- The drive to increase formal educational criteria for entry into and promotion through labour markets is known as credentialism (Davis, 1981). The standard human capital theory argues that the link between education and employment is the outcome of productivity augmenting effects, i.e., an increase in human capital/education increases productivity and, simultaneously, earnings increase. However, in the case of asymmetries of information, employers seek prospective employees' educational qualifications. The alleged problem is that education just gives a 'sheepskin' to the individual in the form of a degree and conveys minimal/nothing about individual productivity (Psacharopoulos, 1980). Furthermore, the selection mechanism of top-tier institutions, the affordability of the middle class, and a larger emphasis on cultural fit appear to be important driving forces of 'credentialism' in India (Collins, 1979). As a result of the selective process, an examination system has emerged that admits only a small number of students while excluding the vast majority. Affordability in the middle class can be understood as the ability to pay for their children's education in order to offer them a competitive advantage in the credential race. Therefore, the fierce competition for professional qualification, the 'middle classes' have turned to professional education in order to

[10] Ronald Dore coined the term as part of a critique of the over-reliance on formal educational institutions' selection processes (and thus educational qualifications) as evidence of competence, training, and merit for admittance into certain jobs, careers, or internal labour markets.

gain a positional advantage in high-status jobs. The educational institution from which the certification is obtained has become more important than the educational experience at that institute in terms of cultural fit (Punjabi, 2019). The students' procedure is to enrol in the best institutions as the leading institutions are like "brands" and command prestige in the job market.

1.6 The Problem of the Study

It is clear that obtaining a higher degree is seen as a passport to good work chances. Higher education has become a norm for the middle class. Since within a sea of mediocrity, a handful of excellent institutions exist, the insecurities of the middle class have created intense competition for limited seats. Thus, the fundamental problem with the engineers churned out from the institutions is that with a meager 2% coming out from Tier I institutions, the rest mainly are from the private institution where quality becomes questionable. The emergence of middle-class parents' aspirations of an increased expectation from engineering education ended up as pressure in fulfilling the parent's desire. Further, the allegiance with marks has led to rote learning. It is the fallout of the deficiency of generic skills among individuals' viz. communication skills, problem-solving skills, etc., which are critical in jobs. In the process, it also ended a child's creativity, if any. Rote learning, in turn, instils in students a sort of complacency throughout the course of more than 12 years of education, and they are unable to transition from un-questioning learners to job market innovators.

Furthermore, the Indian economy has grown at an annual rate of more than 8% in recent years, notwithstanding the financial crisis of 2009. However, with entry and admission to certain private institutes being loose, the quality could be easily tampered (Gupta, 2008). The studies have argued that poor quality intake eventually leads to bad outcomes (Natarajan, 2000; Noaman *et al.*, 2017). The skill shortage is still a significant constraint in most Indian industries (World Bank, 2009b). In addition, one of the biggest hurdles to improving economic growth is a lack of high-quality skills.The most striking factor behind this is the mismatch of what is being demanded by the employers and what is being supplied by the higher educational institutes. For decades, according to Altbach (2005), India has had a subpar higher and technical education system. The rise in the number of institutions and the subsequent shortages of teaching faculty is another cause of worry which adds to the low-quality education. Even the premium institutes suffer from faculty shortages for want of good quality teachers'. Simultaneously, there is a lack of a robust accreditation system. The accreditation bodies have limited capacity to accredit the growing number of institutions. The lack of a firm regulatory framework resulted in the formation of a weak technical institution. The reputation of institutions is dependent more on their selectivity in the intake of students than on their curriculum and pedagogy. Thus, the linkage between education and work is quite loose, and concurrently the transition between education and the world of work is very complex (Gibbons, 1998).

Simultaneously, the skill dimension that has not received due attention is that skill mismatch is leading to the underutilization of education and skills in the economy. Following rejection for jobs, engineers are more often taking up jobs neither in their field or applying for openings requiring a lower educational level. There is a widespread frenzy in India about becoming engineers, and then even many from reputed institutes end up working in the finance and FMCG sectors. Overqualified engineers then displace those who are aptly qualified for these jobs. Since employers are hiring highly skilled candidates or who appear ideal for these jobs or whose qualification is adequate to perform the job, this trend leads to crowding out of others with low employability skills. In this context, it is necessary to dissect the issue in India's setting, assess it objectively, and determine whether or not workers are willing to accept mismatches. Thus, this labour market needs to be critically discussed in detail.

However, to fulfill the broad objectives of equity and accessibility, the regulatory authorities have undermined the third objective of excellence. Consequently, the graduating engineers churned out are misfits for the economy. Thus, raising the problem of employability thereby, quality becomes questionable. While the demand for highly skilled and technologically efficient is rising, the public funding per student has been declining (Glakas, 2003). Therefore, markets in education become problematic because students earn degrees and do not buy them. Invocation of market principles will treat them as customers, and the consumerist approach will hamper the quality of both students and teachers' as they are the co-producers of knowledge. It will lead to distortion of engineering education and consequently a devaluation of the degree.

1.7 Conclusion

To summarise, changes in policies linked to public funding, private participation in higher education, globalisation, and the creation of knowledge-based economies may all be ascribed to the growth of higher education institutions and their enrolment. Many government policy documents (12th Five-Year Plan; National Skill Development Corporation reports; Economic Surveys; Rashtriya Uchchatar Shiksha Abhiyan, 2014, etc.) reports and studies (Federation of Indian Chambers of Commerce and Industry, 2012; Team Lease India Labour Report, 2009; India Labour and Employment Reports, etc.) have stressed the need to make the supply side of education/skills responsive to the demand side, in order to reap the benefits of *demographic dividend.* However, in the Indian context, the word skill development implies equipping trainees with some expertise to fetch them temporary employment. It is often regarded as a remedial and a resort for the dropouts, the long-term benefits of skilling such activities are relatively low.

Initially, the proliferation of engineering institutes and the increase in manpower availability fuelled the IT boom. From the mid-1990s, the IT industry led to increased demand for engineering education, leading to a dominance of self-financing institutions. This demand for engineering education got a boost from the late 1990s because of the economy moving to high growth, the escape for the Hindu rate of growth of 3.5%, economic reforms that were undertaken from 1991, the benefits of development accruing to the middle class, and the rise in expectations from higher education. Resultantly, the unparalleled growth of professional education led to the unsystematic growth of institutes, jeopardizing quality concerns in education. The institutes couldn’t keep pace with the latest developments. Outdated curriculum, poor governance, faculty shortage, resistance to change, and infrastructural bottlenecks impeded the deteriorating quality of education in the country. Simultaneously, the AICTE looks to be straining to keep up with the high standards set by India’s best institutes. Of late, it is evidenced that there was a transformation in the market of engineers from that of a seller to a buyer’s market, and with a more significant number of seats remaining unfilled; many self-financing institutes offer incentives to join. Middlemen are working to lure students to join engineering colleges, often paid by the institutes, in return for a commission. Thus, the middle-class affordability and the preference shift need to be simultaneously understood as to why these well-trained engineers have chosen not to contribute their skills to India's burgeoning manufacturing sector and are lost to the services sector.

CHAPTER 2: LITERATURE REVIEW: EMPIRICAL AND THEORETICAL

2.1 Introduction

Middle-class aspirations and opening of the economic opportunities through globalization and increased emphasis on the knowledge economy led to ongoing demand for engineering education in the country. However, institutions failed to keep pace with the emerging technology as well as with human resources required with the requisite skills and knowledge. Out-dated curriculum, shortages of qualified faculty, and infrastructural challenges were mainly responsible for the country's deterioration of the engineering education system. Memorizing and rote learning to produce in examination has severely affected the basic understanding of concepts and practical applicability among engineers when faced with real-world problems. Engineers are identified as gaining degrees for its symbolic value. Acquisition of engineering education is viewed as fulfilling instrumental credentialism. There is an emphasis on the end outcome of studies rather than a holistic development of the individual. Such attitudes are reinforced by higher education's expanding marketization and shifting financial landscape (Naidoo, 2003), which is driven by cost-cutting initiatives as well as increasing competitive pressures in the graduate market for employability.

Given the backdrop, students at a relatively younger age and unstable phase of their life make important educational (investment) decisions. There are numerous career options, and every year, many students decide on college and field of study. There are, however, influencers in the decision-making process of choosing which college and course to opt for. In this connection, this chapter encompasses three broad sections. The first section deals with the choice of field of study. How the choice of major is affected through different constraints is deliberated upon. Following this, the second section incorporates existing literature on the choice-making process of institutions. How the information one gathers for taking admission and the factors that influence the choice of the institutions are detailed. Lastly, the third broad section deals with the concept of educational mismatches, what it further encompasses, and the factors determining such mismatches. The literature also talks about the impact these mismatches have on educational outcomes. Individuals' decision-making is argued to be situated within a multi-layered context that includes school, peer groups, family, and culture. Thus, an assortment of factors that determine choices is analysed within the continuities' understanding.

2.2 Influencers in the field of study

Higher education candidates are part of a complex web of influences, which is best depicted by overlapping circles of persons, families, friends, and institutions. There is an inevitable degree of blurring boundaries between peer groups, families, and institutions. Within this messy confusion, the study tries to locate these factors' roles and explore how they shape one's choice of field of study. Many factors have influenced this decision, viz. candidate's interest, offer of higher education institution, the distance between home and academic institution, candidate's abilities, secondary education qualification, family educational background, gender, entry marks, subjective relevance attached to diverse life goals and the like. The study discusses these in detail here.

i) Socio-Economic Background

Hansen (1997 cited in Vila *et al*., 2007) found an association between social background and the chosen field of study. In defining the educational field selection process, Werfhorst, Kraaykamp, and de Graaf (2000 cited in *ibid*) stressed the relevance of family background in terms of resources accessible at home and the responsibilities of father and mother as figures of reference. Fathers played an important role in the decision-making process, instructing and leading the decision. Mothers, on the other hand, are perceived as emotionally engaging in their children's future rather than being personally involved in decision-making (Reay *et al*., 2005). Parents' even played an essential role as definers of career expectations (Garcia *et al*., 2007). Having a highly educated father increases electing medical sciences, law, natural sciences, or engineering. In contrast, having a mother with a degree influences the selection of humanities, education, and mathematics. Thus, it is viewed that family educational background influences the choice of field of study. They provide the necessary assistance in determining a child's schooling capacity at an early age. Simultaneously, they facilitate access to high-quality universities. The cultural background becomes hugely pertinent in this process because better-educated parents' respect their children's education more than others (Ordine and Rose, 2009).

Besides, institutional habitus makes it challenging to break out of the narrowly defined acceptable choice parameters. It is depicted in a study by Reay *et al*. (2009) that how the class differences affect the choice-making process. The study discovers evidence of behaviour that approximates objective rationalism. The privileged students only need to pursue their inclinations to achieve their goals (Bourdieu, 1990a cited in *ibid*). For others, it is about negotiating the choices they are ill-equipped with. For them, it's a process of determining what you can't have, what isn't negotiable, and then selecting from the few possibilities that remain (Reay *et al*., 2002 cited in *ibid*).

Furthermore, Bourdieu and Passeron (1977; 1979 cited in *ibid*) present a theoretical explanation for the existence of this link and attempt a comparative empirical example based on the studies of French university students. In their homes, students from affluent families develop high levels of cultural capital in verbal ability, general cultural awareness, and competency in a society's high-status culture. As a result, students' accumulation of cultural capital aids their academic competence, particularly abstract and theoretical thinking. Academic fields were ranked by Bourdieu between the poles of cultural power (science and the humanities) and economic and political power (law and medicine). This rank reflects the order in which students enrol in such disciplines. His findings also revealed that students from lower socioeconomic origins were more inclined to pursue technical and vocational degrees (Bourdieu, 1984). He argues that the accumulation of cultural capital acquired by elite students through the educational system then maintained their privileged position in the social structure (Bourdieu and Passeron, 1977 cited in Reay *et al*., 2009). A liberal arts education has long been promoted as the necessary instruction for elite students in order to successfully imbue them with the traits required to govern. As a result, the most prestigious and competitive postsecondary institutions have long been those that provide a strong liberal arts curriculum (i.e., private liberal arts colleges, Ivy League universities).

Davis (1965 cited in Goyette and Mullen, 2006) conducted a large research on UG career choices, based on a sample of over 30,000 students gathered by the National

Opinion Research Centre. His studies revealed that socioeconomic status influenced job choices in the humanities, medical, legal, physical, biological, and social sciences, but it had a negative impact on engineering, education, and business. These trends imply that in the 1960s, students from a higher socioeconomic background were more likely to enrol in Arts and Science UG programmes in order to prepare for their desired vocations.

ii) Gender

The gendered patterns of major selection have been well documented. Regarding gender, Whitehead (1996 cited in Aracil, 2008) evidenced that people associate specific fields of study with males (science) or females (languages and arts). Men have traditionally concentrated in business, engineering, chemistry, and physics, while women have focused on education, humanities, nursing, and psychology (Chanana, 2007). Males have stronger mathematical aptitude than girls, according to Polacheck (1978 cited in Aracil, 2008), and are more oriented to quantitative subjects. Females, who are less committed to the labour market, prefer occupations that require less continuous human capital investment. This gender-based categorization has a big impact on subject selection.

Also, girls opt for subjects that are necessarily not of their choice. While the seat shortages and entry marks are identified as a reason for the same but more often for girls, they are deprived of the school level options because of the socio-cultural hierarchies prevalent in the society (Chanana, 2007). In some circumstances, sons' aspirations and hopes for further education take precedence over daughters' (Mukhopadhyay and Seymour, 1994:08).

iii) School

Schools play an important part in deciding on a stream because it establishes the institutional boundaries within which choice can be exercised. However, a major choice is a personal one encompassing personal interests and preferences as well as numerous academic constraints (Werfhorst *et al*., 2000 cited in Vila *et al*., 2007). In the context of the United States, Boyle's (1996 cited in Reay *et al*., 2009) study reported that college aspirations are influenced by high school practices, particularly the imposition of academic standards. A study by Aracil (2008) represents that the lower the grades, the higher the chances of choosing education and social sciences, and the lower the possibilities of selecting natural sciences, medical sciences, and computer sciences. Another statistically significant variable was entry qualification requirements: Natural sciences, mathematics, medical sciences, law, and engineering are more likely to be chosen when the entry requirements are greater. In contrast, the lower the entry criteria, the more likely it is that Education and Social Sciences will be chosen. The teaching-learning process also influenced the decision. In science and mathematics classes, the process encouraged much of boys' participation and restricted that of girls' (Becker, 1981).

iv) Career aspirations

The career aspirations among individuals shape one's route to higher education choices. According to one's values, the relevance placed on diverse career aspirations is likely to influence the choice of degree field, as reported by Tokar, Fischer, and Subich (1998 cited in Vila *et al*., 2007) Windolf (1992 cited in *ibid*), among others. A different personal profile is related with the possibility of choosing each field of study when it comes to a graduate's interest in various career ambitions. Career aspirations can be related to various life goals; social prestige, personal development, varied social life, home/family life, making money, academic inquiry, and the job itself (Aracil, 2008).

For the male category, career orientation is more important while making decisions and was far more pragmatic (Sojkin *et al*., 2012). There is a higher polarization between men's and women's values in India, with men being career-oriented and females being more social and family-oriented. Studies have also depicted that women are much affected by unemployment. The social perception of women being considered secondary workers cannot commit themselves to their jobs because of the dual role of family and work that confronts them (World Bank Report, 2002:09).

v) Rationality

Individuals select the major that gives the most significant expected utility (Freeman, 1971 cited in Montmarquette *et al*., 2002). It is not the initial earnings associated with different occupations that determine the choice of major but is more influenced by the stream of payments that these occupations expect to yield (Berger, 1988 cited in *ibid*).

Researchers have also looked at the labour market returns to UG courses of study, finding that wage disparities between disciplines have a significant effect in students' decisions. Because of the increased economic demands for such occupations, engineering, business, and math graduates typically earn the highest annual wages. At the same time, Education, Psychology, Arts, or the Humanities students earn significantly less (Hansen, 1993; Rumberger and Thomas 1993; Lightbody and Durndell 1996; National Centre for Education Statistics, 1999 cited in Goyette and Mullen, 2006; Whitehead, 1996 cited in Aracil, 2008). Male students also distinguish between fields that promise considerable future wages and those that offer the highest entrance earnings, favouring the former (Berger, 1988 cited in Montmarquette *et al*., 2002). Davies and Guppy's (1997 cited in Goyette and Mullen, 2006) study revealed that men are more likely to choose fields with high economic payoffs than women. And that the difference in income between fields of study increases over time (Berger, 1988 cited in Montmarquette *et al*., 2002).

One of the crucial reasons for the choice of a stream is to obtain decent employment. Financial concerns become important while weighing varied options. Sometimes expectations move beyond a simple obviousness to become pressure. Belonging to a good school makes it evident that the child will opt for science specialization in the future, barring their interests. Reay *et al.* (2005) illustrate how scoring a low grade in science, a student opted for arts and finds that it is something that he enjoys simultaneously.

Nonetheless, one can recollect that the choice of study field is a personal decision that encompasses personal inclinations, preferences, work prospects, as well as financial and academic constraints. Almost all students make their choice of higher education within constraints – but the type of constraints varies from individual to individual. Thus, the studies illustrate how these micro-processes inform decision-making and influence one's choice of field of study. It points to structural limits of choice in higher education, given the institutionalization of subject choice at a very early stage.

2.3 Choice of Institutions

This section relates to the existing literature on how students choose institutions or colleges. Most college choice studies (Lewis and Morrison, 1975; Chapman, 1981;

Jackson, 1982) have examined how individuals' socio-economic background interacts with college expectations. The review on college choice will give an overview of the characteristics of college choice behaviour.

The proliferation of universities and the enormous demand for education had a negative consequence on educational quality. In this context, many newly founded institutions concentrated on earning money, and quality took a backseat. Many of these institutions have closed, leaving graduate students with questions about the worth of their degrees. Although degrees were granted, employers started differentiating amongst employees being from different institutions. Therefore, reputation and tradition started to play a role in choosing a university (Sojkin *et al*., 2012). Graduating from an elite university gives one an advantage in the labour market. There is, however, a paucity of data to support the claim that benefits arise from university prestige or a graduate's social background, their ability, or various sorts of social capital (Lee and Brinton, 1996).

In terms of university selection, Whitehead, Rafan, and Deaney (2006) assessed 1019 high-achieving students and discovered that the prestige associated with Cambridge University was the driving factor in their decision. In another study by Briggs (2006) in Australian universities, he surveyed first-year science and engineering students and found academic reputation significant in the choice-making process. Hagel and Shaw (2010) and Dunnett *et al*. (2012) also reverberated similar findings. Various other studies argued that the university's reputation and the course were the two essential characteristics in institutions' choice. A survey by Hooley and Lynch (1981) and Soutar and Turner (2002) reported course suitability to be more critical, although academic reputation was significant. Another study in the UK by Lawton and Moore (2011) supported the importance of reputation and fees being an essential criterion for lower socio-economic groups. Likewise, the importance of job prospects is also identified as a significant factor in universities' choice. Callender and Jackson's (2008) study used multivariate analysis to see if fee levels influenced characteristics like proximity to home and job prospects, and echoed similar results. Through a large-scale survey and factor analysis, Wilkins, Shams, and Huisman's (2013) study reported fees as a critical decision-making factor, though it was not different amongst the various socio-economic groups.

Murphy (1981) discovered that friends, family, and cost all had an impact on a university's decision. In Indonesian UG study five most essential factors were:-cost, reputation, proximity, job prospects, and parents' (Hossler and Gallagher, 1987). A study in the UK by Kaye and Bates (2016) reported that after introducing fees, there had been a shift in the focus from significance given to cultural factors to graduate career opportunities. This is highlighted in Tomlinson's (2016) study, where the students' focus was on value for money and their position as a user of the services, as revealed through a series of in-depth interviews.

Information dissemination also plays a vital role in the choice of a university. Information is accessible through current students and staff (Wasmer *et al*., 1997). In some instances, it becomes essential for the individual to visit the institution to be sure about their decision (Heap, 2001). Prospectus as a source of information and its designing becomes highly crucial in the choice process (Briggs, 2006). Wherein it seemed colorful and exciting, it increases one's chances of being read. Brochure details aim at directing a clear message to the reader (Herr *et al*., 1991). However, studies have suggested that university websites are becoming the most important sources of information in the age of the internet. Other sources of information include - opinions by friends, families, teachers', etc.

An increasing corpus of research shows how selective institutions affect incomes (Karabel and McClelland, 1987, cited in Goyette and Mullen, 2006; Bowen and Bok, 1998). Aside from the prestige, a degree from a selective college or university provides a tangible resource that allows students not only to enrol in graduate school and obtain prestigious jobs, but also to comfortably navigate difficult situations, join exclusive social networks, and feel empowered to confront social issues and problems. Thus, the research backs up the distinction between educational credentials' '*use-value'* and '*exchange value*' (Labaree, 1997 cited in *ibid*). Vocational students acquire degrees that have a strong practical value: tangible abilities that can lead to "excellent jobs" (stable income). Students in the arts and sciences, on the other hand, have high trade value credentials: a cache of cultural capital accompanied with the name of a prominent university. Because it provides admission into higher social and occupational strata, this certificate is worth significantly more than just a "good job" (Goyette and Mullen, 2006).

Zemsky and Oedel (1983) reported that with the decrease in entrance scores and parental income, the prospective student's geographical range of applying to institutions and the quality of institutions under consideration faces a fall. Also, during the search, due to information asymmetry, many limit the type of institutions they desire to attend. In the study conducted among Black students in search of institutions, it is reported that students from low-income families, with low educational backgrounds of parents', take a longer duration of the inquiry, and the search activity is less efficient (Litten, 1982). Similarly, in certain circumstances, students apply elsewhere, failing to achieve the grades required by traditional universities. More so, for some, there prevails what Bourdieu (1990a cited in Reay, *et al*., 2009) describes as 'not for the like of us'[11] where any sense of entitlement is difficult to sustain within an institution, even by the high achieving students.

2.4 Theoretical Understanding

There are two distinct phases: the first relates to the choice-making of streams and institutions which is followed by choices in the job market. The second phase deals with the mismatches in the job market which will be taken up for discussion in the later sections. With regard to the first, the choice of institutions may get the priority of quality and the brand value of the institutions. Human capital theory helps in the choice-making process. Thus, we begin with a basic structure of human capital theory as suggested by Becker (1964). A critical evaluation of the human capital theory can lead to the analysis of the factors responsible for choice making.

The foundation of the human capital theory (Becker, 1964) is based upon neo-classical economics. Fred Block (1990 cited in Chattopadhyay, 2012a) argues that the two building blocks of neoclassical are based upon the following, i) they assume economy to be a separate entity from that of society, and ii) the individual is *homo-economicus* and acts rationally. This rationality approach depicts human beings as utility-maximizing individuals who allocate money to purchase products that will give them maximum satisfaction given budget constraints, preferences, and product prices. This approach to individual behaviour is extended to the analysis of students' decision making in case of education. The theory argues that expenditure on education made

[11] Where working class students consider elite institutions as not a place for people like them.

by individual is to be regarded as investment expenditure. Individuals invest in themselves to enhance their productivity, which calls for a sacrifice with the current consumption instead of future benefits. The theory follows methodological individualism, where the individual is at the centre of analysis.

Neo-classical economists assume that there is a relation between preferences and choices. They believe that preference is measurable through utility and is subject to the law of diminishing marginal utility. It assumes that preferences are before choices. And choices are a direct function of preferences (Samuelson, 1938), i.e., choices are 'revealed preferences.' Also, the choices are exogenous to the market and are independent of income as well as prices. Simultaneously, choices are made when constraints are given, and it does not assume social interdependencies, i.e., choices are parametric and not strategic. The neo-classical theory of choice is a stipulation of a set of rational choice conditions under full information. The rational economic man preferences are complete, transitive, monotonic, and self-interested, and that preference lies outside the realm of the market (exogenous).

The human capital theory perceives the decision of education and training as an individualist one, based on the postulates of rational choice. The theory contends that weighing the benefits against the cost, individuals make deliberate choices. Thus, underpinning the model, it brings forth the linear relationship between credential expansion and educational outcomes. It shapes our understanding of education and work and simultaneously focuses upon employment aspects of education. It highlights the productivity augmenting role of higher education, enhancing skills and leading to higher future returns in the market. It sees education as a long-term investment with both social and private benefits. Social benefit is reflected in terms of the highly skilled workforce required for the economy. Higher pay, job advancement, and a greater scope in the labour market are all indicators of private returns. The theory assumes a smooth transition (with certainty) to the job market. It does not talk about the possibility of unemployment, expectations, and jobs not being in accordance with the courses. It does not talk about problems at the entry-level in the job market and is not even concerned with the problem thereafter too (no vertical/horizontal mismatches)[12]. As a result, according to the theory, an individual's decision to invest

[12] These terms are elaborated later.

in education is made at a micro and highly individual level, is founded on the rational choice principle (Abell, 1991), and is motivated by the utilitarian and self-optimizing pursuit of one's labour market potential.

However, in reality, expectations about future incomes serve as a building block for education decision-making processes. Simon (1955) disagrees with the neoclassical emphasis on objective rationality and emphasizes the distinction between objective and procedural rationality to emphasize the idea of rationality as a technique employed in decision making which is not always related to the outcome. Expectation and perception form the basis of decision-making. Thus, it can be argued that expectations about the future guide investment decisions. The valuation of the outcome may be subjective and hence vary across individuals. Some may value status, prestige, satisfaction over money, while others may value money above all. Thus, it is difficult to assess these different valuations of individuals. He (Simon, 1955) argues that preferences differ from individual to individual, and choices depend on human aspirations. Thus, assigning a common value to human aspirations is not feasible. Accordingly, expectations being subjective, there are differences in the expectation of the benefits that are realized over time. This implies that there is a difference between expected benefits and those achieved in reality. Further, individual expectations and probability may not align with the expectations of the job market. This thereby may lead to mismatches in the job. Therefore, the variables determining actual benefits vary. There is not a direct association between education and work, i.e., education may not lead to higher productivity and higher earnings for all.

The objective is to explain and relate the various factors at stage 1 and stage 2 (mismatches) and put them within a framework. Though human capital does not deal with stage 2, it has been criticized for ignoring the possible factors which can influence/interfere/impede the institution to the job market transition.

2.4.1 Limitations of Human Capital Theory

i) Endogenous choices:- In reality, preferences are not exogenous but produced endogenously within and by the market (Gintis, 1974). Social structures structure individual understandings, preferences, aspirations, expectations, and these resultantly shape the choices individuals make from amongst the set of choices they face. It is not that individuals seek to satisfy existing preferences as 'that the individual is socially constituted so that preferences and actions are mutually determining'. Hence, preferences are formed through choices (Bowles and Gintis, 1986:20-1). Preferences are socially constructed choices and are not determined exogenously. In other words, recognizing that preferences are endogenously determined choices, it cannot be revealed preferences. Given the recursive[13] nature of social action, the formation of one's preferences may not represent a Pareto optimality situation, but rather a suboptimal situation (inefficient) may accrue over time. This may render distorted choices and reflect consumers' inability to rationally choose their long-term welfare.

Further, the endowment that is of significance in a competitive economy is what Giddens refers to as "market capacities." These may take several forms varying from educational credentials to social and cultural capital[14], 'habitus'[15] (Giddens, 1974; Coleman, 1990). Thus, individuals enter the market with existing market capacities derived from their families, schools, and neighbourhood. Therefore, the outcome of their choices made will depend on the market capacities that they own and have access to.

The rationality assumption of the human capital theory is not tenable, and it is argued that, in reality, an individual may not act in rational terms. Individuals often choose from amongst the different choices based on the incomplete information at their disposal. Likewise, their preferences are affected by their socio-cultural environment. As put forward by Hogan (1997), choices are endogenous. Their choices have long-term and substantial multiplier effects that have consequences for their economic and social well-being. This is because the market value of the credentials they will graduate with will affect the kind of occupation they will take up, the income level they will secure, the type of work satisfaction they will experience, etc. In effect, their choice involves creating and generating particular sets of market capacities that will affect their economic welfare when they enter the labour market. Thus, educational

[13] The choice that individuals make shape not only the preferences but who and what they will become, the resources they will have access to, the choice they will be able to make and the kind of live they will lead.

[14] To sensitise the child to cultural distinctions, it takes pedagogical activity, time investment by parents, other family members, or hired professionals.

[15] The notion of habitus emphasises the permanent influence of a variety of contexts, such as familial, peer group, institutional, and class culture, on choices, and their subtle, often indirect, but still pervasive influence.

choices can be viewed as investments in human capital and cultural property, social capital, and competitive advantage (Hogan, 1997). Accordingly, the rate of return approach fails to capture the complex nature within which individuals make choices.

ii) Screening:- The institution plays a crucial role in developing the requisite skills in an individual and simultaneously giving them exposure. In reality, the quality of institutions varies, and so does the quality of students churned out by these institutions. The information flows or market signals offered to employers by amassing educational degrees are emphasised in Spence's concept (Spence, 1974). While education serves in his model only to signal ability and that it does not enhance productivity. Arrow (1973) looked at screening in the context of higher education. He, too, believed that education does not improve peoples' productive skills, but rather serves to separate people into groups based on their different abilities. Stiglitz (1975) made a contribution to the understanding of the screening mechanism by proposing a theory. He demonstrated that screening benefited high-ability individuals. He also argued that some people have less incentive to go through screening, particularly those who plan to be self-employed and do not need to signal productivity to an employer, as well as those who are confident in their abilities and are willing to enter into contracts in which the employer rewards productivity. He expanded on the topic of screening to include on-the-job screening.

Further, rational behaviour is assumed to function in full information and complete preferences in decision making. However, the existence of information asymmetries in the market brings human capital theory flaws to the forefront. Individuals may not be aware of institutions' true quality before taking admission, as education is argued to be 'experience good' (Teixeria *et al*., 2004). Likewise, human capital's homogeneity assumption may not hold because individuals differ in their cognitive capacity and possess different learning abilities, thereby reflecting heterogeneity. Education acts as a screening device for employers. Therefore, screening signals the employers about individual productivity and distinguishes between high and low productive workers. This is because employers cannot gauge job applicants' true quality without complete information and might fail to perceive the applicants' motivation and productivity.

iii) Domain Distinction:- The '*homo economicus*' assumed by human capital theorists does not hold because the structure of investment in education is heterogeneous. This is because the two domains of investment: individual and government, call for complementarity in the two domains because of interdependencies. Likewise, the time horizon for the two domains also varies. This aspect of heterogeneity is called the domain distinction argument put forward by Majumdar (1983). Estimating the rate of return based on the human capital approach at a particular point of time for different levels of education may not be significant. Unlike other investments, investment in education is a one-shot investment. It is sequential, wherein a sequence has to be followed to reach the desired goals and which at the same time is irreversible.

Individual investment in the choice of stream within a broader field might be interpreted as the domain distinction argument. There is a massive investment in IT fields in India on the part of the students. However, with the emphasis on the part of the government on "Make in India" and "Skill India" initiatives, there is an effort to create demand for hardware engineers. Unless these two domains' (individual and institutional) objectives do not align, there are bound to be mismatch issues. Simultaneously, with the '*Atmanirbhar Bharat*,' there is a demand from the manufacturing sector. Hence, a complementarity in the two domains will avoid mismatches.

Mismatches are not entirely independent of choice-making as the individual level attributes do matter in the choice of jobs/change of jobs at a point of time as well as over a period of time. Literature on the discussion of mismatches is detailed in the next section.

2.5 Mismatches in Education

Undertaking higher education is one of the reasons for improving one's chance of employment opportunities. A degree improves one's expectation of securing better employment (Harvey, 2000). Also, most individuals calculate the rates of return from higher education. However, even when graduates obtain employment, in some instances, their salary levels are deficient. Individuals may be overqualified, and their knowledge and skills may not be up to date with changing market demands, adding to the problem. This is a common occurrence in Asia and other parts of the world when graduates face uncertain futures (Jonbekova, 2015). Hence, there is a mismatch between labour market demands and university-learned knowledge sets. One of the other problems in the mismatch issue is concerning specialization between demand and supply, implying difficulty in finding employment in one's field (Jones and Urasawa, 2014). Despite a positive outlook from higher education, there has been a growing debate over the mismatch between higher education and the labour market (Allen and Velden, 2001).

McKinsey Center for Government (2012) study has offered four reasons for the explanation of educational mismatches. As technology advances, so does the demand for skills, and the educational system has failed to produce graduates with the necessary adapting skills. Secondly, mismatches are also caused by a lack of coordination between educational institutions and the labour market. Thirdly, students are more inclined towards attaining a degree than skill acquisition. Lastly, there is insufficient information to help students form their future career decision and are not aware of the implications of their occupational preferences. Studies have been in consonance that due to information asymmetry, labour market mismatches take place (Jovanovic, 1979; Wolbers, 2003). Some may not seek proper education guidance resulting in a misinformed decision about the field of study relevance in the market. Moreover, as depicted in some cases, field choice is a choice amongst influencers varying from family to social values, salary considerations, and the like.

However, with higher education becoming competitive, institutions simultaneously are competing for students in the recruitment drive. Consequently, for understanding the working of the recruitment market, it becomes imperative to understand the intended customers' choice making. There is an insufficient research basis upon which one can develop an understanding. Therefore, the study focuses on the factors influencing the job that one intends to opt for.

2.5.1 Educational Mismatch

The concept of educational mismatch has a long history dating back in the 1870s (Gladwell, 2008). Jarvis initially introduced this hypothesis in a report titled "relation of education to insanity" by the United States Commissioner of Education. Over-study was responsible for 205 of the 1741 cases of insanity he investigated. However, educational mismatch did not receive much attention back then. However, since the 1970s, when this concept received a lot of attention, the supply of educated people in the market began to outrun the demand for them (Freeman, 1976). In his book "The Overeducated Americans," Freeman (1976) accurately forecast the scenario of an excess supply of college graduates, which is likely to persist for a long time. Indeed, as supply began to outgrow demand in the American market, over-investment in education resulted in poorer rates of return. Smith and Welch (1978), on the other hand, looked at the major findings of Freeman's study using a larger sample period. They came to the conclusion that the loss in returns to higher education was less than Freeman claimed. Their finding was that returns were lower because of the increase in higher educated workers' supply than over education.

Nonetheless, Betti *et al.* (2006) and Farooq (2011) define education mismatch as a lack of coherence between the acquired education levels with that required in the current job. It is defined by Mahuteau *et al.* (2014) as a circumstance in which an employee's qualifications do not match the qualifications of the job they are performing. It is defined by Graham and Graham (2013) as a situation in which a worker's level of education, experience, skill, or interest does not correspond to the job, and the mismatch is the result of a combination of peoples' needs, values, and expectations, as well as the characteristics and rewards associated with their jobs. It is defined by Chan and Lin (2016) as a mismatch between graduates' qualifications or abilities and work requirements. It is usually measured by comparing an employee's prior education to the job's educational requirements. There are two forms of education mismatch: vertical and horizontal mismatch (European Centre for the Development of Vocational Training (Cedefop) 2010; McGuinness and Sloane, 2011; Kim *et al*., 2012; Chan and Lin, 2016).

The mismatch between the level of education and the employment is referred to as vertical mismatch. The literature further classifies vertical mismatch into two categories:- over-education and under-education. Over-education occurs when acquired education is more than that required in performing the job. When workers have a lesser level of education than is required for the job, this is known as under-education (Cedefop, 2010). Vertical mismatch results in either over-educated/qualified people bringing skills above those required for the job or under-educated/qualified workers bringing abilities below those required for the job. Both of these situations have negative consequences.

The horizontal mismatch, on the other hand, is frequently described by contrasting an employee's field of study with the field prescribed for the position the employee holds (Somers *et al*., 2016). A 'horizontal mismatch' occurs when there is a lack of correlation in the knowledge group of the field degree and occupation. A horizontal mismatch occurs when employees have received education in a field that is unrelated to the field necessary for the job (Robst, 2007a). Furthermore, demand and supply factors may have a role in accepting horizontal mismatch (Robst, 2007b). When a matching job is not accessible, the source of mismatch is thought to be demand-related. Given that students choose a subject of study with the hope of finding work in field-related occupations, the horizontal mismatch can be defined as an unfavourable phenomenon in this situation. The welfare losses produced by horizontal mismatch are more confusing when the mismatch source is supply-related. Pay and advancement chances, as well as a change in career interests, are all supply-related reasons for accepting horizontal mismatch (Robst, 2007a; 2007b; Bender and Heywood, 2011 cited in Somers *et al*., 2016). In some fields, high rates of mismatch indicate weaker labour market demand. As a result, graduates from these disciplines are forced to hunt for work elsewhere, or they may have improved career opportunities due to their skill transferability to other fields. They could also indicate improved skill transferability from these professions, allowing graduates to work in a variety of occupations (Montt, 2015). Thus, education-job mismatch is mainly understood as when jobs secured by graduates' do not match either their level of education or field of study or both.

2.5.2 Determinants of Mismatch

The classification of determinants of mismatch is understood as- education-related, job-related, and individual-related determinants. Education-related determinants are further classified at the individual and the country level. The discussion of determinants is elaborated in the following paragraphs.

a) Education Related Determinants

i) Individual Level

The individual-level determinants of mismatch are understood in terms of a) demand-supply discrepancy in the labour market, b) pace of human capital depreciation associated with the field of study, c) individual's level (B.Tech/M.Tech) of education, and d) fields of study.

There is a relationship between the supply of graduates in specific disciplines and the job market's demand for them. Mismatch, on the other hand, can be attributed to a mismatch in supply and demand for these graduates. The demand for graduates being a derived demand, derived from the industry's demand, affects graduates' supply from some fields. Thus, at the individual level, the choice of one's field of study affects graduates' supply in that field. This, in turn, may cause a mismatch if the supply of graduates is in an area that is different from the one demanded in the market. Cosser (2010 cited in Somers *et al.,* 2016) reveals that graduates' demand is primarily in science, engineering, and technology, and that the majority of graduates have a humanities degree. The trade-off between mismatch and career stage interacts with the individuals' choice of field. This is linked to the rate at which human capital depreciates in relation to the field of study. Science and engineering occupations, for example, are more prone to mismatching due to the high frequency of technological advances, which result in constantly changing skill needs (Bender and Heywood, 2001 cited in *ibid*).

Individuals' level of education, in addition to their field of choice, presupposes the possibility of being horizontally mismatched. Employees who are unable to find a job that matches their degree level may be forced to compete with less-educated individuals for a job that is below their level but in a related field. Given that the less educated face fewer jobs, accepting a job in a different field is more likely to be an alternate solution when a suitable job is not accessible. At the individual level, the liberal arts cohort has the biggest mismatch degrees in terms of field degrees. In contrast, the mismatch rates are lowest for graduates from health-related fields (Robst, 2007a). Health-related areas are distinguished by the provision of occupation-specific skills to students, lowering the possibility of graduates seeking employment outside of their sector. According to the literature, broad skills enable people to work in a wider range of jobs, increasing their chances of landing a job that isn't immediately relevant to their field degree.

Furthermore, Kucel and Vilalta-Bufi (2012 cited in Somers *et al*., 2016) show that those who attended an intellectually excellent study programme have a lower likelihood of being horizontally mismatched. The more familiar companies are with one's attended study program; the lower is the risk of a graduate being horizontally mismatched.

ii) Country Level

At the country level, two factors are identified. One is regarding timing, and the second is the orientation of the country. When it comes to timing, later specialization allows students to gain crucial knowledge about their aptitude in several professions. As a result, it gives them a better understanding of the chances of landing a field-related job after earning a field degree. Malamud (2011 cited in Somers *et al*., 2016) strongly evidenced this hypothesis in the Scottish education system. However, in India's case, specialization in major choice in later years constitutes a tiny proportion. This is true for engineering education. Therefore, the question concerning India needs examination. If later specialization is not taking place in engineering education, then horizontal mismatch is more porous?

Countries are defined as vocationally oriented by Wolbers (2003) when the share in vocational type education is larger. Graduates in vocationally oriented countries are more likely to be mismatched. However, the findings are insignificant. Levels *et al*. (2014 cited in Somers *et al*., 2016) found that countries with more extensive vocational orientations face a high incidence of horizontal mismatch. According to Levels *et al*. (2014), there is a positive relationship between vocation orientation and horizontal mismatch, which is stronger in nations with strong institutional ties.

Concerning vertical mismatches, studies have emphasized over-education being a prominent mismatch issue. The studies have mainly been directed in the context of the UK and the United States. When the data was analysed again after a period of time, it found that over-education had increased in the same country (McGuiness, 2006). Allen and Weert (2007) describe disparities in educational mismatch categories across nations in a cross-country research study. The study depicted that in Japan, over-education was evident, and under-education was a problem in the UK. However, Spain faced both the problem of over and under-education. The study reveals that graduates from Japan and Britain were likely to work in fields different from which they had acquired education. Contrariwise, graduates from Germany and the Netherlands were the most likely to choose jobs with matches in both the level and education field.

The UK literature on over-education has been reported based on the self-assessment method and stated that 30% of the graduates were over-educated. However, in the UK, over-education did not increase in the early Nineties (Battu *et al*., 1999). This is reverberated by other studies (Groot and Brink, 1996), whose meta-analysis of 25 studies reported no worldwide increase in over-education. Although the study highlighted that it was concentrated amongst low-ability workers, it was not due to workers' mismatch and the job. The work of Freeman (1976) on over-education contradicts evidence from the UK, which claimed that over-education was a transient condition. In the UK, Dolton and Vignoles (2000) found that 38% of graduates reported over-education in their first employment and that 30% remained overeducated even after six years. Furthermore, over a longer length of time, over-education is identified as a permanent problem in some graduate's careers (Dolton and Siles, 2003).

b) Job-Related Determinants

As far as job-related determinants are concerned, the factors discussed are tenure of employment, and the type of contract which individuals experience. The employee's duration of employment provides an answer to the question of how long he has been in his current position. The tenure appears to have a negative relation with the mismatch (Wolbers, 2003). An explanation for this stems from the fact that once an employee finds a job that matches their level or field of education, he will not be incentivized to change jobs. In addition, as one's tenure increases, the likelihood of gaining firm-specific abilities/skills increases thereby making one's skills less appealing to other companies.

Furthermore, the type of contract determines mismatch. A temporary job, unlike a permanent one, provides limited opportunity to gain work experience and productive skills. Given that temporary employees are expected to leave early, because of the shorter payback periods of such investments, firms are hesitant to provide on-the-job training (Becker, 1964). The occurrence of mismatch varies according to the different occupational setups. Bender and Roche (2013 cited in Somers *et al.*, 2016) find self-employed workers more mismatched than salaried workers. Self-employed men accept mismatch due to working conditions, and women accept due to family-related reasons. Employees in specialist occupations, such as managers, professionals, and associate professionals, are less likely than those in basic occupations to be horizontally mismatched. As far as firm characteristics are concerned, a larger firm gives a lot of options to find a matching job (Wolbers, 2003). Contrariwise, Witte and Kalleberg (1995 cited in Somers *et al.*, 2016) find that the likelihood of men's horizontal mismatch is positively related to the firm's size. Large-firm employees may be more motivated to mismatch in exchange for greater compensation, job security, and other benefits that come with working for a larger company. According to Green and McIntosh's (2007) research, job qualities are linked to being overeducated. People who work in small businesses, the private sector, or part-time occupations are more likely to be overeducated.

Thus, the factors discussed in the following section pose many questions relevant to the present study. How mismatch varies according to firm size and the type of contract? How do the job-related determinants play their role in understanding the acceptance of mismatches amongst individuals?

c) Individual Related Determinants

Individual related determinants are related to one's gender, age, ability. How these factors affect one's probability of being mismatched is discussed in this section. Bender and Heywood (2011 cited in Somers *et al.*, 2016) found men more horizontally mismatched than women. Other studies find females' to be more horizontally mismatched than their male counterparts. There are varied reasons for their mismatches. Men are motivated by profession-related factors such as money, promotion, and changing career interests. It is a barrier for women, due to factors such as family obligations, employment location, or workplace circumstances (Robst, 2007b). Another study by Groot and Brink (1996) stated that those with high interruptions in their careers and low mobility, women or women with children, face a higher probability of being over-educated. Marital statuses are also determinants of mismatch. Individuals who are not married or have never been married are more likely than their married counterparts to be horizontally mismatched (Robst, 2007a; Bender and Roche, 2013 cited in Somers *et al*., 2016).

Also, the probability of being mismatched is dependent on employees' age (Wolbers, 2003). Employees at the start of their career can make a transition from mismatch to a state of the match. This aligns with the belief that mismatch is more a career evolution outcome and not an indicator of an inefficient labour market. The skill acquired depreciates over time due to technological changes (Somers *et al*., 2016). Both the young and the old are over-educated than prime-aged workers (Green and McIntosh, 2007). Hensen *et al*. (2011 cited in *ibid*) find that age is positively related to employees holding a job that matches the field of education.

An individual factor that affects the labour market outcome is individual ability. Boudarbat and Chernoff (2012) investigated if an individual's ability influences their odds of getting a job that matches their skills. Grades are identified as a proxy for ability. Their research discovered that graduates in lower grade categories had a lower chance of finding a job that matches their qualifications than their higher-grade counterparts. Overeducation was unavoidable due to unobserved heterogeneity of skills and aptitude, even after correcting for disparities in socioeconomic and institutional characteristics in some studies. Some studies argue that overeducated possess skills, not in demand in the labour market (Allen and Velden, 2001; Green and McIntosh, 2007). Also, it was reported that there is a lower probability of being overeducated amongst search-intensive individuals.

2.5.3 Consequences of Mismatch

The study further delves into the consequences of mismatches. These are discussed in terms of wages, job satisfaction, choice of field regret, etc. Given that a field of education aims to prepare students for a range of occupations, matching in terms of level and job requirements with employees' field-specific skills is essential for the efficient functioning of the labour market. Furthermore, students are expected to make schooling decisions based on their educational interests and they anticipate future employment in field-related occupations. Consequently, this mismatch may result in skills not being fully utilized (Robst, 2007a).

It also has no guarantee that a graduate will find a fit; as a result, they may confront lower-than-expected income, worse job satisfaction, and a higher likelihood of changing professions (Wolbers, 2003; Robst, 2007a; Aracil and Velden, 2007; Somers *et al*., 2016). Horizontal mismatch has little influence on job satisfaction, according to Allen and Velden (2001). However, underutilization of skills has a detrimental impact on job satisfaction. Over-education has also been linked to a decrease in job satisfaction (Allen and Velden, 2001; Green and McIntosh, 2007). Malamud (2000 cited in Somers *et al*., 2016) discovered that mismatched employees are much less likely to find a job that they enjoy.

Horizontal mismatch also raises the likelihood of program regret. It indicates that skill formation and skill allocation in the labour market are both inefficient. Mismatched employees may be less productive than those who work in jobs that fully utilise their abilities. Suboptimal productivity might lead to wage penalties, reducing the return to investments in educational provision. When the mismatch source is supply-related, however, the welfare losses are more ambiguous. Pay and advancement chances, as well as a change in career goals, are all examples of supply-related motivations for accepting mismatch (Robst, 2007a; 2007b).

Wage penalties are reported to be higher in horizontal than vertical mismatch (Robst, 2007a). However, some studies do not find a negative effect of horizontal mismatch on earnings, or minimal effects are reported (Witte and Kalleberg, 1995 cited in Domadenik *et al*., 2013). Also, the impact of wage is more pertinent when workers accept jobs due to demand-related reasons, unlike the supply[16] side (Robst, 2007b; Nordin *et al*., 2010). In some instances, the studies have reported that the impact due to vertical mismatch tends to have lower wages (over-education) than their counterparts (matched) (Lin and Wang, 2005).

Mincer and Polachek (1974), on account of human capital depreciation theory, argue that human capital attributes not in use would depreciate in the course of one's

[16] Change in career interests and working conditions, as well as pay and advancement opportunities.

employment. Thus, in an overeducated worker, human capital depreciation would impact one's productivity and affect wages. Resultantly, due to the applicability of human capital depreciation, an overeducated worker's experience may be rewarded at a lower rate than their competitors. Studies using data from the United States and Hong Kong have reported that overeducated with experience might receive lower wages (Cohn *et al*., 2000). Undereducated, on the contrary, is said to earn higher than average wage from experience. These findings were corroborated in the context of studies conducted in Hong Kong and the UK (Groot and Brink, 1996). Similarly, Smoorenburg and Velden (2000) reported lower participation in job training by overeducated workers.

Economists and sociologists see education-job mismatch as a serious matter with significant socio-economic costs at the individual, firm, and national levels. At the individual level, it would reduce the marginal product of the individual. The lower rate of return to education may result in lower job satisfaction, frustration, and high turnover rates. At the firm level, it would result in decreased productivity and job involvement, and in the case of high turnover rates, the firm would have to cover the additional cost of screening, hiring, and training new personnel (Smoorenburg and Velden, 2000). The cost to society would be a loss of monetary and non-monetary benefit, which would be mitigated by skill underutilization (McGuinness, 2003). It's also likely that well-matched grads will be "bumped down" in the labour market when overeducated graduates shift into lower-paying jobs, raising educational requirements in these jobs (Battu *et al*., 1999).

To measure educational mismatches, the empirical work has focused on two primary methodologies. The first pertains to the Job Analysts method (objective approach) and the Self-Assessment method (subjective approach). Professional job analysts rate positions and recommend the minimum educational qualification for the job using the 'Job Analyst technique' (Battu *et al*., 1999; Hartog, 2000). In the case of the 'Self-assessment method,' individuals are asked directly to give information on their current job's minimum educational requirements (Sicherman, 1991).

2.6 Employability Discourse

In recent years, there has been an international interest in the issue of skill shortages in India. The skills gap, according to the New York Times (October 17, 2006), could jeopardise India's technology boom. The Financial Times, London (July 20, 2006) expressed concern about India's educational shortcomings, citing a chronic shortage of qualified manpower (Agarwal, 2007). Nonetheless, there has been an increased emphasis on higher education institutions to focus on skill development. For employers, degrees are considered more of a 'threshold to requirement in addition to evidence of suitability' (Purcell, 2002:10), also reiterated by Brown and Hesketh (2004). Studies by Purcell depict the importance placed by employers on generic skills as well as personal attributes. However, this transition away from credentials and toward abilities/skills and personality must be approached with caution. In comparison to general management and service occupations, Purcell *et al.* (2002) found a restricted development of this skill emphasis for specialist professionals. The concept of skills, on the other hand, has sparked a lot of debate. In higher education, the skill agenda has been criticised for representing a narrow set of educational goals. Likewise, skills are argued to be socially constructed. Employers value and reward them in various ways, based on the worker's identity makers as well as the educational path and type of institution/university chosen (Coffield, 1999). Studies by Blackmore (1997) and Burton (1987) demonstrate how abilities/skills are gendered, and how this affects women in the workplace. According to Moreau and Leathwood (2006), with a level playing field, it is the skills and personal traits that define their success in the labour market; nevertheless, social class, gender, age, and university attended all play a part in the opportunities open to them. The study depicts that older graduates were far more likely to develop generic and personal skills than younger ones. The reason stated was that skills are socially constructed, and the work and life experiences have a role to play in its development. Worker's experience is viewed as significant in developing appropriate skills among individuals. Employers also emphasize its importance, and there is a testimony that graduates see as allowing them to differentiate between graduates with similar credentials (Tomlinson, 2004). Thus, the increasing importance of knowledge and skills of employees is a policy emphasis partly reflecting the need for innovation, efficiency, and productivity. According to the findings, Indian employers value higher-order thinking abilities. It further specifies that graduates fulfil the demand for lower-order thinking skills[17], but that they fall short of meeting the demand for higher-order thinking skills[18] (skill gap). These high-order thinking skills are identified as the most critical professional skills. Increased global competition, the pervasiveness of technology in today's society, and the focus on higher-quality products and innovation are all grounds for requiring higher-order thinking skills (Blom and Saeki, 2011). Higher-order thinking skills and the ability to learn new and more complicated skills are becoming increasingly important in the globalisation era as skills learned in school and the workplace become obsolete more quickly (Riboud and Tan, 2009).

Credentials' value as a screening device is diminishing as more graduates enter the labour market. As a result, personal attributes and skill acquisition are stressed to legitimize inequalities rather than improve productivity. Thus, employability not only represents the fulfillment of requirements in the job market but how one is positioned in comparison to other job seekers (Brown and Hesketh, 2004). Hence, the positional perspective of employability gains dominance. The rapid expansion of higher education, on the other hand, fails to detect the demand for high-skilled positions, and instead represents credential inflation as graduates strive to further their education in order to obtain better job possibilities. Thus, the discourse of employability does not necessarily confirm human capital and rational choice framework in the globalized knowledge economy. The idea of higher education as an investment good may fail to capture graduates' motivation of why they are participating in higher education. Their decision is more based upon what is referred to as instrumental credentialism. Brown (2003) suggested that the institution's effect persists even when personal traits and the subject of study are controlled for. Once characteristics known to affect graduates' employment are controlled for, Elias *et al.* (1999) claim that the impact of the type of institution remains. Educational credentials are sought largely for their perceived positional value and advantages in gaining work. This discussion reflects the widespread notion that graduates are under pressure from outside forces to invest in further education in order to improve their chances of landing a job.

This rhetoric, employability, in particular, represents 'a critical shift on the fulcrum of responsibility for individuals' futures from objective opportunities in education and

[17] Remembering and understanding.
[18] Such as analyzing and solving engineering problems including creativity.

labour markets to subjective aspiration and managing the project of the self' (Mok *et al*., 2016:03). Thus, the idea of confronting graduate employability is shifted from the massification of access to credentials' valorization. The emphasis is on individual abilities or employability, suggesting that skill-based employment and performance have replaced neo traditionalism (Walder, 1986). In the globalized world, obtaining a degree does not suffice for employment and higher earnings. Simultaneously, there is evidence of severe market congestion, which leads to people ending up in employment that pay less than they expected (Mason, 2002). As a result, the goal is to determine whether the engineers consider their job to be a graduate-level post in the field they desired. This implies that the study tries to understand the extent to which engineers' expectations of employment have been met or not. Since there is an increase in income and occupational expectation from education, a positive relationship cannot be presumed, as expectations may not be realized. With a limited number of jobs (Bairagya, 2018), it can lead to graduates' oversupply leading to downward pressure on wages and a rise in unemployment as wages fall below reservation wage. Hence, a negative relationship is also conceivable. This is one of the performance metrics for higher education institutions that is based on graduates' employment-related outcomes, showing the rising effort to build ties between higher education and the labour market. Individuals' employability quotient is thus both an outcome and a determinant of the quality of their higher education. The demand for higher education is a derived demand, meaning it is based on criteria such as employment and employability (Khare, 2014). Hence, in the present times, it is evidenced that the evolution of the economic purpose of education has gained dominance.

The problem ensues when employability becomes the only objective and education gets relegated to that of imparting skills (Patnaik, 2013) and an entry to new jobs and the purpose of education for acquiring knowledge and enlightenment is sidelined. The education system should have prepared students for changing careers and flexibility and not employability. Concerns for employability point to the deficiency in enabling students with the foundational knowledge needed to compete in the global economy where newer demand for skills is increasing at astronomical rates that require broad-based knowledge. Hence, Patnaik (2013) argues that education is viewed as a commodity when it is the exchange value of the individual that is dominated in the job market, i.e., the skill embodied in an individual and not for the *use-value,* i.e., students are not a transformed individual through the transaction of education.

Thus, the choices of engineering as a stream and the transition to the job market have not necessarily followed from the human capital theory. There is no unifying framework to deal with the entire gamut of issues that i) influence choice-making ii) and the possible factors behind mismatch. However, the following section will throw some light on the mismatches concern and will put it in a framework that would help understand the problem the study is attempting at.

i) Signalling:- The argument put forward by Hirsch and Collins is that credentials add little to no value to one's human capital. An upsurge in the credential fails to indicate an increase in skills and knowledge needed to do the job but reflects the increase in stakes required for getting a job (Hirsch, 1977; Collins, 1979). These conflict theorists argue that the economy is not moving towards a highly-skilled economy; instead, skills are polarised. Credential inflation, whereby students prolong their education to improve their employment prospects, is driving the expansion of education, not the demand for high-skilled jobs. These theorists argue that the development of employability skills reflects the mismatch between credentialism and market requirements. Credentials' value as a screening tool is diminishing as a result of massification. Those who adopt the credential approach to participation in higher education see the worth and benefits of offering employment access from a positioning standpoint. The rise in formal qualifications associated with mass higher education lowers one's exchange value in the job market. In this context, one becomes keen to capitalize upon the university's institutional profile and status in order to acquire a positional advantage in the labour market. When entering the employment market, the institutional capital (Bourdieu, 1998) associated with graduating from an exceptional university would place one more favorably.

Educational institutions convey information to employers through certificates and degrees (Arrow, 1973; Stiglitz, 1975). In the process, degrees are seen as screening devices, and the institution's brand value gains prominence in the job market. The signaling theory accentuates the positional good argument of education as the student derives prestige and gets a position in the existing social hierarchy based on the university he graduated from. Those not coming from the reputed colleges are left behind in the hierarchy, and their positional advantage gets worn away. The education market is a zero-sum game due to the uniqueness of human capital contained in people (Marginson, 2004). These best colleges are intrinsically different due to the cultural capital of these colleges. In the case of information asymmetry, these certificates act as a signal to reveal students' qualities and skills embodied, such as trustworthiness and smartness of the employees. However, in the case of government-funded institutions, subversion of the teaching and learning process and poor governance, as well as commercialization in privately funded institutions, signaling losses its credibility and becomes less applicable in the job market. This adds to the employability problem amongst graduates as they think that degrees are available for sale, thereby bypassing the rigorous learning process. The fallout is amongst graduates suffering poor employability in the job market (Chattopadhyay and Mukhopadhyay, 2013). Interestingly, university degrees fail to signal students' competencies as they are subjected to further exam in order to be considered for a job. This is evidenced by the replacement of university grades and certificates with competitive tests for further study and careers (Kapur and Mehta, 2004). Thus, the degrees fail to reflect the actual quality of students if the providers of education resort to fraudulent practices. The concept of competition, quality, and efficiency fails to retain their true sense in a privately funded institution. Because of these practices, accreditation has become compulsory.

ii) Micro-Macro argument:- Majumdar (1983) argues that investments in education can be on an individual as well as on a societal level; decisions that are taken at the individual level depend primarily on the prevailing macro conditions. Suppose an individual considers investing in IT training in lieu of the higher future earnings in the present period. As individuals decide to join this course in large numbers lured by higher salaries, institutions also respond by opening many institutes for IT professionals. However, suppose the demand does not grow sufficiently. In that case, the pay packages suffer a downfall, thereby dislocating the expected rate of return, which now would make the decision of the individual regrettable. There arises a mismatch between micro and macro aspects of investment decision-making. Decisions based on micro considerations may not materialize at the macro level as the parameters for an individual vary when many individuals act together at the macro level. There thus may arise a conflict with the emergence of unemployment among IT graduates. At the same time, there may be specific sectors where pay packages would have been high. So the labour market gets characterized by such mismatches, and the problem of horizontal mismatch may accentuate. Students construct their preferences based on predicted future income profiles, which may or may not materialise as the macro, which will eventually emerge as the result of millions of individuals' aggregate decisions, may turn out to be fundamentally different.

Likewise, the social choice problem may also emerge over time, a dilemma the government faces on the investment front. A choice is to be made concerning the different areas of investment. There are numerous engineering colleges in the country. The expansion is still occurring when there is a constant complaint regarding engineers churned out from low-ranked institutions. Those churned out from low-quality institutes add to the existing problem of mismatches. And on the contrary, there are specific sectors where they are paid lucrative packages. This thereby leads to mismatches in the job market. Failure to discriminate between social and private demand is a failure of markets in education. With markets in education, there is an existence of a social choice problem (Majumdar, 1983) with students pursuing a course of their choices, and those who do not have market choices will face extinction. In such a scenario, both micro and macro aspects may not be in accord with one another.

The micro-macro argument may well explain the paradox that engineering education faces. This can be explained through the institutional (micro) and industrial (macro) divide. On the one hand, there is no shortage of engineers (enrolled and outturn) in the economy. At the macro level, when it is viewed, these engineers are not employable, and there is a constant complaint about the quality of engineers churned out by institutes. The micro decision-making at the individual level is not in compliance with the macro. At the macro level, this excess supply of engineers is not being absorbed because of technological changes in the economy and a lack of skilled engineers. Also, the industry, on its part, tries to minimize the cost of employing engineers. This is why they are primarily on the lookout for trained engineers, which will reduce their in-house training cost. Thus, the paradox is that there is no shortage at the micro-level, but there is a shortage of skilled engineers in the economy at the macro level. However, the industry-academia linkages can be strengthened if academia produces trainable engineers employable by the industry. This also can be understood as an offshoot of low-quality engineering institutes churning out low employable engineers in the economy. The micro-macro issue can also be explained by the difference in individual and aggregate private rates of return. Private rates of return may be rising at the individual level, but they may not be rising to the predicted levels in aggregate.

iii) Non-ergodicity:- Individuals, according to behavioural economists, do not make rational decisions. However, the future would be important if it could be predicted with absolute certainty, but in reality, it can only be predicted with uncertainty, if at all. This complicates its portrayal even more. In this sense, Keynes was one of the first economists to stress the importance of the uncertain nature of the future. In his defence of The General Theory in a 1937 essay in the Quarterly Journal of Economics, uncertainty about the future had a key impact. When the future was unknown, Keynes emphasised making decisions rather than relying on existing probability distributions. As a result, future decisions are based on a convention. "The essence of this convention—though it does not, of course, work out quite so simply—lies in assuming that the existing state of affairs will continue indefinitely, except in so far as we have specific reasons to expect a change" (Keynes,1936:152). Keynes noted that the market's "conventional valuation…is established as the outcome of the mass psychology of a large number of ignorant individuals [and] is liable to change violently as the sudden fluctuation of opinion….since there will be no strong roots of conviction to hold it steady" (*ibid.*,154).

Post Keynesians, on the other hand, have demonstrated that Keynes' uncertainty idea necessitates the abolition of the ergodic assumption. If the system is governed by non-ergodic processes, the future is unclear and cannot be predicted using a probability distribution. Davidson (1982; 1991), the major proponent of the Post Keynesian position, highlights the importance of limitless uncertainty by distinguishing between ergodic and non-ergodic processes. The ergodic process is a risky one that moves over time and has uncertainty that can be measured using standard probability theory criteria. To put it another way, knowing about the future in an ergodic setting entails projecting statistical averages based on past and/or current realisations to future events (Davidson, 1989:477-478).

Non-ergodic processes, on the other hand, are processes that move through time with immeasurable uncertainty, and probability statements do not apply. When non-ergodicity dominates, statistical information derived from data will be insufficient as a source of proof for future events. In such instances, Davidson (1982-83:190), "calculable probability statements... have no relation to future events," or, to put it another way, "the evidence is insufficient to establish a probability" concerning future events (Hicks, 1980:113). Davidson (1996:491-493) argues that, in a non-ergodic environment, the information encoded in past and current market outcomes is an inaccurate pointer to the future, and rational actors will reject such data as the empirical basis for their expectations. For Davidson (199la:136), "whenever decision-makers. . . face non-ergodic conditions. . . [they] are ignorant regarding the future" in the sense that "they just don't have a clue" (p. 133) what the consequences of their actions will be: The decision-maker believes that no information regarding future prospects exists today and therefore the future is not calculable. This is uncertainty (or ignorance about future consequences) in the sense of Keynes, where he wrote that by uncertainty, he [meant] that "[w]e simply do not know." (Davidson, 1991a:131; Davidson, 1993:431).

As a result, Davidson's (1991) approach to decision making under uncertainty, which emphasises the non-ergodicity of real-world processes, dismisses any probabilistic-based decision-making strategy. In this case, to the extent that decision-makers resort to the outward appearance of expected value maximization approaches to decision making. The reality, on the other hand, is not the ritual of predicted value maximisation that underpins actual judgments. Instead, it is the "gut feeling" or "animal spirits" of the investing individual. It is not necessary to be familiar with probabilistic ideas in order to create expectations at any point. What matters is the view (model) of the economy that decision-makers hold, and it is this view that structures their expectations.

iv) Heterogeneous domain:- According to Marginson (2017), the human capital theory is based on a single lens that sees the phenomenon through only one potential truth. It relies on independent variables and blocks the possibility of realistic explanations. He claims that the human capital theory's main flaw is its lack of realism. It is closer to realism only when the economy is working under full employment but fails under the condition of unemployment prevailing in the economy. Further, he argues that social realities are complex, and to get a holistic view, reliability on mathematical treatment may be inappropriate. He emphasizes that organic facts in the form of contextual issues affect the returns from education. Variations in the sort of secondary school attended, family and social networks at the time of entry to higher education, employment and careers, workplace hierarchization, and the wage determination system all have an impact on economic volatility and one's earnings. He identifies education and employment as heterogeneous domains, but the human capital theorists treat it as a unified domain. Further, the transition from education to work is not always smooth, as assumed by human capital proponents.

v) Human capital theory revisited:- Brown *et al.* (2020) on the basis of mounting research evidence refutes the notion that 'learning is earning.' The revisited theory argues that humans are not capital rather is a reason for the existence of wealth. The orthodox theory emphasises investment in human capital and minimizes it to rates of return and self-interest. This has created an individual with a monolithic destiny based on the presumption that learning is earning and that life constitutes a better-paid job and social mobility and making one employable. With the emphasis on labour scarcity, investment in human capital in the orthodox theory implies a private/individual concern for investment to meet the growing demand. It ignores the social realities that individuals confront in their life. The revisited theory contends that the conventional view is founded on the incorrect premise that the economy's workforce will be upgraded in terms of skills and productivity, and that the labour market will absorb all available talent. Contrary to the orthodox human capital, the revisited human capital does not reduce human behaviour to an economic one. But it differentiates between ownership of capital and capitalization on human labour. It is not just based on capitalizing on knowledge and skills but also supporting initiatives that would constitute basic income for all. The revisited human capital confronts job scarcity. The creation of employment opportunities is subjugated by the restructuring of the occupation and the global demand for labour. It also denies that learning is not earning, and it does not necessarily indicate a quality concern with the education system. Based on the different political economies, the revisited theory is an imagination of the renewed effort and renewed individual[19] bargain. The revisited theory identifies systemic issues which are beyond individuals' efforts to resolve. It distinguishes between the individual 'growth' model of life-long learning and the 'banking' model of education. It presents a balanced approach to social and economic concerns in life (*ibid*).

However, choice making can still be explained by human capital theory more so, explained by the demand for professional education and the expectations from the job market. It also explains the payment of capitation fees by students in certain instances. And the human capital theory revisited depicts a weaker linkage between the degrees and its culmination in the job market. Nonetheless, by drawing from the imperfections in the market, the critique likely generates an understanding of mismatches in the job market. Through the micro-macro argument, human capital as revisited, etc., the framework seeks to explain the mismatch phenomenon. It is likely to define the mismatch among engineers in the job market by recognizing imperfections that influence employability. The study now deliberates upon the concerns with reference to engineering education by giving a glimpse of the existing literature.

2.7 Engineering Education in India: An Appraisal

Raviparkasha's (1991) study describes that Indian engineering institutions are facing quality issues. Additionally, there are shortages of qualified faculty. Fund crunch has led to deterioration in quality. A study by Sonda (1998) depicts that the advent of IT ushered in changes in engineering education. It led to an enormous increase in the number of IT colleges and a mammoth increase in student admissions. Sharma (2001) pointed out that engineering education faces many problems ranging from lack of practical experience, outmoded curriculum, and administrative issues to unemployment. A study by Karuppayal (2003) reported that barring a few excellent institutes majority fail to offer programs worth the fees they are charging. Many lack infrastructure and qualified faculty. Most often, the courses are taught by hired faculty on contractual terms. It further explains that since 1980 there has been a boom in the development of engineering education. Not only the increase in institutions is experienced, but new courses have been added from time to time. However, he stated

[19] This requires policy prioritization to address job scarcity issues rather than labour scarcity.

that there is a variation in employment opportunities among engineers from different states. Hariharan (2003) opines that decline in engineering education standards is mainly due to inadequate financial input into the education system. The study emphasized that center and state governments should be responsible for addressing this issue of financial inadequacy into the engineering education.

Karuppayal (2003) study argues that in different states, facilities for technical education should be concerned with parameters like population, enrolment in class X^{th} science stream, emergent technologies, etc. Nonetheless, it was observed that these parameters are not taken into consideration, and rather engineering education development policies have more relied upon infrastructure norms and standards. A study by Ahuja (2004) depicted that there are jobless engineers on the one hand and vacant seats in colleges on the other. The vacant seats pose financial viability threat to private engineering institutes. The problem, however, is two-fold. The degrees awarded hardly carried any positional value. On the other hand, parents' were devastated seeing the plight of unemployed and underemployed wards with worthless degrees on whom they had spent lakhs of rupees. A study by Gupta (2008) reported the reasons for the deterioration in the education standards, ranging from easy entry modes to admission criteria being lax or non-existent. The AICTE (2006) report depicts that it was financially willing to assist those engineering institutions situated in backward areas. It also emphasized the need to establish engineering education for the underprivileged section of society comprising female, rural, and backward classes.

In light of national and global changes, a study by Biswas *et al*. (2010) made an assessment of the state of engineering education in India. India has taken the lead and is one of the biggest exporters of labour skilled in IT to the world. Consequently, unregulated and unbalanced growth of the private sector appears to be one of the reasons for the deterioration in the engineering education quality along with the issues of shortages of qualified faculty, weak industry-academia linkages, poor teaching-learning outcome, outdated curriculum, lack of autonomy, poor employability of students, low level of research and innovation and lack of robust quality checks in quality of technical and engineering institutes in India. Loyalka *et al*. (2016) study reported that higher percentages of faculty with Ph.D. are found in elite than average institutions in the privately funded institutes. Availability of qualified faculty is associated with industry-academia linkages, entrepreneurial innovation, and pedagogical developments, and these, in turn, are linked to the employability of graduates. It is viewed that without interaction with the industry, students lack the knowhow of solving real-world problems. This is primarily a drawback amongst those institutes that were opened by private players in the early 2000s where the majority of engineers churned out but faced employability issues because of loose linkages of the industry with the academia. Choudhury (2016) argues that there has been an expansion in enrolment and engineering education institutions during the post-liberalization period. However, the addition in the institution is primarily in the private sector. As far as enrolment is concerned, the enrolment in engineering has increased faster than other disciplines. But this massive expansion is not able to give access to the disenfranchised sections of the community. The study has also evidenced that public expenditure has not shown increment with respect to the enrolment in engineering education, which subsequently resulted in a decline in student public expenditure.

Nevertheless, it is believed that economic liberalization gave an impetus to the Indian software industry. It grew faster from the mid-1990 until it got affected during the global meltdown in 2008 (Mani and Arun, 2012). The trained human resource of the country was utilized to provide software services to other countries. With the growth in industries, the supply of engineers became a challenge. It became accepted in industry and policy that the Indian technical education system failed to supply enough human resources to the labour market's needs (Banerjee and Muley, 2008). The shortage of employable engineers and a significant disparity in quality among engineering graduates are severe issues and need a resolution.

The concern also lies in the fact that churning out sound quality engineers in the economy is a function of the availability of funds. IIT and some central institutes are often prioritized by the Centre over other institutes. Every year the IIT is funded to the extent of Rs. 500 cr. to outturn roughly 1000-odd engineers. The vast majority of these then go abroad because of a lack of better opportunities in the country. At the state level, an institute hardly gets funding to the tune of Rs. 20-25 crores per year. Barring a few private institutes that invest primarily is nowhere near what the IIT's get. Thus, it can be argued that competency-based skills can be built to fit any industry's needs, but it comes at a cost that has been subject to neglect (Nigam, 2020).

Further, a shrinking economy bears the brunt of the problem, with job losses rising across different sectors of the economy— from textile to capital goods, banking to IT, and start-ups; the economy is identified as being in a stationary mode. Industries are not making any investments, so there aren't enough engineering jobs in the market. Simultaneously, an engineering degree is argued to offer a low return on investments in the case of a more significant number of low-quality engineers. Thus, in this whole process, the student stands to lose but they continue to endure this struggle in the hope of a satisfying job.

Engineering is vastly beyond computer science and IT, and this fact has still not dawned upon the Indian employment market for engineers. Resultantly, this has led to mismatch requirements in the economy. To match the 100% placement guarantee, institutes often herd up their students from all domains to appear for software industry opportunities. However, of late, a study by Chopra (2018) revealed that IT, which was the most sought-after stream, has now become the least preferred one, with many institutes discontinuing its IT courses. Industry simultaneously is engaged in up-skilling the cream of the lot from premier institutes while the average employability in many institutes has declined due to quality concerns. There is a clear-cut separation between those that impart skills and the educational institutions, in the case of government initiatives such as Skill India (Sadgopal, 2016:36). This, therefore, calls for a deeper understanding of the choices made by engineers during their nurturing stage. For the Indian industry's success, the issue lay in the growth of engineering education in India. Globally, however, with the change in technology, new demands on skills are emerging for graduating engineers. The review portrays that studies on engineering education have primarily been assessed on the information obtained from the stakeholders other than the graduating engineers themselves. Hence, the engineer's perspective and understanding of the realities need greater attention.

2.7.1 The regulatory body: A criticism

National policy on education 1986 was to vest the AICTE with the statutory powers to license technical education institutions' establishment and expansion and curb commercialization. However, the policy process preceding the vesting failed to address how the demand for technical education could be met if the central Government shuddered from expanding access. Simultaneously, the state government could not handle the expansion issue because of the resource crunch. The licensing policy by the AICTE was no better than industrial licensing; it appeared rigid but, in reality, was flexible. The AICTE presided over the most considerable proliferation of substandard engineering in the country. With the statutory powers vested to the AICTE, it was no longer concerned with restoring technical education facilities; it had even started viewing state government and universities as supplicants instead of partners. Sometimes even tension arose between the UGC and the AICTE regarding who was responsible for regulating engineering institutions. These overriding powers changed the dynamics of engineering education. The states had lost the monopoly to sanction new institutions, and universities resented the erosion of affiliating powers and the power to begin new courses. Private players started manipulating the AICTE. The tampering with the pre-entry conditions and the quality of instructions was not being assessed; with the continuous demand the private institution's establishment became a low-cost, high-profit business. During the approval granting phase the AICTE failed to monitor the fulfillment of stipulated conditions. It failed to continually assess the quality of education imparted as well as the functioning of the institutions. There emerged a need to enlist the universities and the state government to monitor and establish mandatory accreditation, which would have closed substandard institutions. However, within the formulation of the AICTE Act, the AICTE had set up National Accreditation Board. But the accreditation was voluntary and was not enforced upon. This resulted in adverse selection while better institutions opted for assessment. The others easily slipped out (Ayyar, 2015).

The AICTE experience when it tried to self-regulate without enlisting state and universities is a pointer to the fact that a single regulatory authority would break down under the organizational overload, and the education system is too large and wide to be viably regulated by a centralized body. What is necessary is closely associate the state and state bodies and universities in as many functions as possible. The Kothari Commission had also recommended that expansion of access should not be at the expense of quality. One size fits all is undesirable for regulation (*ibid*). The transformation from elite to democratic education system was accompanied by differentiation of programs and institutions. Also, the defining aspect of the Indian higher education system had been its fragmentation (Agarwal, 2006:05). The enrolment in institutions may be high in China and the USA; India has five times the number of institutions. Fragmentation has implications on improving the quality as well as designing a new regulatory system. High grading in accreditation should be free to innovate, and those with low ratings should be kept under scrutiny and shut if necessary (Ayyar, 2015).

Also, to review the performance of the AICTE, the U R Rao committee was set up. The report's findings claimed that expansion in private institutions was more speculative than meeting the actual demand. To alleviate the "*serious situation*" of the rising number of private institutes in the country, the Rao committee recommended a five-year ban on all sanctions for technical institutions in states where students' admission rate exceeded the national average of 150 seats per million population. However, Rao's recommendation was never acted upon. Its effect was experienced during the global economic crisis of 2008, where growth was affected in the United States and Europe, which was the hub of IT companies. This, in turn, led to a drastic fall in campus placement in India. The associated problem in technical education has been the absence of a proper plan for the manpower. A probe into the reasons for the proliferation of institutions despite the lack of demand, several inadequacies have come to light. For instance, when there was a psychological mindset that IT was the in thing, the Government at one stage decided to quadruple the capacity of existing institutions in respect of IT courses (AICTE, 2015). In 2015-16, 8 lakh BE/B.tech students graduated, yet there were no takers for more than 50% of seats in the country's engineering colleges. The AICTE further reveals that 51% of the 15.5 lakh seats in over 3000 engineering colleges were vacant in 2016-17.

In some instances, the AICTE is alleged in corruption of granting the opening of many engineering colleges. With the growth in the demand, qualifying criteria were relaxed, which led to increased enrolment in institutions. In private institutions, they were allowed to open premises in rental grounds contrary to the existing regulations of shifting in a regular building within three years. The AICTE was, however, notorious in this regard (2018). In 2018-19, the AICTE had announced its decision to reduce the intake in courses with poor admissions by half. This decision was aimed at addressing the mismatch faced by existing engineers in the economy. Following this, the total number of B.tech and M.tech seats in 2018-19, across all the AICTE-approved institutes, had witnessed a fall by 1.67 lakh – the sharpest fall in five years, almost double of what was seen in 2017-18. Further, through the Mohan Reddy committee, recommendations have been made for not opening any new colleges from 2020-2021. It has requested existing institutions to start programs or convert current capacity to new technologies. The AICTE has control over the institutes it regulates, but the quality of regulation is questionable (AICTE, 2018).

2.7.2 Issues in Court

A discriminatory pricing policy was followed in the self-financing colleges in Karnataka, where higher fees were charged from those enrolled in these colleges from other states than those from within the state. This was challenged in the court (*Mohini Jain v. State of Karnataka, 1992*). The Supreme Court disagreed with the prejudiced fee structure, and banned the capitation fee, declaring the state notification to be null and void (Gupta, 2005). But allowed 'paid' seats up-to 50% in private professional colleges.

In the case of *Unnikrishnan J.P. v. State of Andhra Pradesh (1993)*, the Supreme Court noted that For-profit institutions are 'poisonous weeds in the fields of education and are financial adventures without morals and scruples and characterized them as pirates in high seas of education' (Gupta, 2008:250). The Supreme Court stated that education is a fundamental right, its commercialization was not acceptable, and it was opposed to public policy and traditions of the country, and it was illegal to charge capitation fees (Chattopadhyay, 2009). Later in 2002, in the case of *Inamdar v. State of Maharashtra,* the Supreme Court opined that professional colleges would enjoy autonomy in the matter of students' admission. Also, in the case of T M A *Pai v. State of Karnataka (2002),* the Supreme Court granted the right to establish private higher education institutions to all its citizens. The Supreme Court refused to regard education imparting as 'businesses' where profit was the sole purpose. However, it granted approval to financially independent institutions to establish institutions of their choice, and it banned profiteering. In P.A. *Inamdar and Others v. State of Maharshtra and Others (2005),* the right to occupation guaranteed under Article 19(1)(g) of the Constitution includes the right to establish an educational institution, whether for charity or for profit. The Court authorised surplus to be used to cover the costs of private higher education institutions' expansion and augmentation of facilities (Varghese, 2013).

The impetus to establish private deemed universities got a boost through a Supreme Court judgment in *Bharathidasan University v. AICTE and Others (2001)* which declared that universities were not required to seek prior approval of the AICTE to establish a technical institution or start a new course. Many professional colleges saw an opportunity not to be missed to acquire a deemed university status and free themselves from the regulation of the AICTE and affiliating universities. The availability of a deemed university route which few private entities were keen to establish private universities via State legislation and the states of Uttar Pradesh, Gujarat, Chhattisgarh, Himachal Pradesh, Uttaranchal, were willing to oblige excluding Chhattisgarh, seven private universities came into existence in 2003 (GoI, 2003a).

Even though the Private Universities Bill was not passed[20], the elements of the legal framework proposed in it still apply to the formation of private institutions as they were incorporated in state legislations relating to private universities and the UGC (Establishment of and Maintenance of Standards in Private Universities) Regulation 2003. The failure to enact the Private Universities (Establishment and Regulation) Bill, 1995 had the consequence of letting the State Government of Chhattisgarh pass legislation that gave a rein to set up teaching shops going by the name of universities and bring discredit to the idea of a private university. Ministry of education[21] responded to bizarre developments in Chhattisgarh by getting the UGC to issue the UGC Regulations 2003. However, the road to the 2003 regulation was marked by detours. The rules for granting deemed university status were revised, and even new higher educational institutions came under its purview and could acquire a deemed university status. This revision led to an alternate route for the formation of private

[20] Some of the states succeeded in establishing private universities at an unprecedented rate.
[21] Erstwhile Ministry of Human Resource Development.

educational institutions. The move, however, was totally uncalled for (Varghese, 2013).

In the Judgement, *Yashpal Sharma and Others v. State of Chhattisgarh (2005),* the Supreme Court ruled all private colleges in the state under the Private Universities Act 2002 as null and void as they failed to comply with the regulations prescribed by the UGC (Establishment and Maintenance of Standards in Private Universities) Regulation 2003. This led to the closure of 117 private universities established between 2002 and 2005 by the state of Chhattisgarh. Supreme Court clarified that a university cannot come into existence based on a mere project report but that it required an infrastructure to exist. It also stated that failure to comply with the UGC regulations would confer the degrees/diploma awarded by the private university as unspecified (GoI, 2003). This was mainly to prevent the unscrupulous practices of awarding 'fake degrees.' However, the petitioner was not against the private universities but against the way they were established 'without having any regard to the availability of infrastructure, teaching facility or financial resource.' Some were found operating from one-room tenets (Gupta, 2008c:247). The Court stated that private universities could be established within the jurisdiction of the State legislature only after ensuring that infrastructure and academic conditions are fully met. From the passing of the Private Universities Act in 2002, 97 private universities came up in the state of Chhattisgarh within a span of two years (Varghese, 2013).

The AICTE (Ayyar, 2015) is purported to behave differently in judicial review of its power. Its power was supported by the landmark Supreme Court judgment – *the State of Tamil Nadu and Another v. Adhiyaman Education and Research Institute and Others (1995).* In this case, the Supreme Court stated that the university and state government illegally acted when they derecognized/disaffiliated a technical education institution for not satisfying the criteria set by them but satisfied the requirements of the AICTE. Further, in the case of M. Samabasiva Rao *alias Sambaiah v. Osmania University (1997),* a full bench of the Andhra Pradesh (AP) High Court stated that universities ought to seek approval from the AICTE for offering technical new courses. However, this judgment was consequent upon the decision of Madras High Court in a writ filed by the AICTE against the Bharathidasan University in case of not taking approval of the Council for starting technical courses. The Supreme Court went by interpretation of the provision and concluded that the AICTE had powers to regulate only technical institutions. However, the judicial philosophy adopted varied in the Yashpal Case, where the court went ahead to correct a public wrong committed by Chhattisgarh Government.

Nonetheless, a judgment by the Supreme Court in *Bharathidasan University v. AICTE and Others (2001)*, the Supreme Court had found misinterpretation of the AICTE Act by Andhra Pradesh and Madras High Court. It stated that the AICTE was not authorized to control a university for offering technical education courses. This implied that universities no longer had to seek approval of the AICTE either in establishing a new institution or starting new technical courses. Many self-financing professional colleges banked upon the opportunity to free themselves from the AICTE regulation as well as affiliating universities. Slowly, the Supreme Court realized the menace of charging substantial capitation fees and the regulatory mechanism’s failure to take strict action against erring institutes. The Supreme Court in 2013 deliberated that the AICTE would be a mere advisory body removing from its purview the capacity to grant approval of technical institutes and vested regulatory powers to the UGC, which was already burdened with managing the growing number of central and state universities in the country. However, the Supreme Court restored the approval powers to the AICTE in 2014, wherein its prior approval was mandatory for a technical course (Ayyar, 2015).

Such incidents indicate how credibility and regulation play a role in providing quality engineering education in the country. Studies (Hallak and Poisson, 2007) in international context have shown that fraudulent practices like tampering with admission criteria, inaccurate assessment, and faked results and degrees are persistent in the sector. Since students are not well-informed many of them, who are desperate to attain a degree, end up enroling themselves in such institutions. A corrupt and inefficient regulatory system aggravates quality concerns and leads to the subversion of duties and maximizing their profit with a compromise on quality. Thus, it is necessary to have a regulatory structure that does not obstruct merit and innovation in the name of restricting mal-practices. There is a need for a Regulatory body for higher education to substitute the existing regulatory framework comprising of the UGC and the AICTE. Simultaneously, decentralization and governance reforms and autonomy for institutions are much needed (Varghese, 2013).

2.8 Research Gaps

Having dealt with the literature extensively and delving into choice-making in higher education and mismatches in the job market with specific reference to engineering education, and through deliberations on theoretical underpinnings, the following research gaps are identified.

1. Regarding field choice, there are reasons to believe that social background and major choice are linked. However, the link between socio-economic factors identified in the literature and the selection of engineering per se and further the option of a different stream within engineering is a scarcely explored empirical question in the context of changing educational preferences as well as changing demand for skills in India; as GER alone cannot capture the challenges, given the constraints faced by individuals. Primarily the studies have not dealt with choices of major even within a broader discipline. Likewise, the study needs to explore the factors behind the difference in choice amongst those who desired different engineering streams and studied another stream that may have given rise to mismatches in stream choices. Similarly, with the change in financial conditions in education, it becomes imperative to understand the difference in the attitude of engineers towards their employability and which simultaneously affects the choice of Masters to cater to the market demand is wanting given the emphasis in policy circles.

2. The literature shows varying information sources that one gathers while choosing institutions, but there is a disconnect between the variation in the information collected by students while making institution choices amongst those from varying socio-economic backgrounds which has not been deliberated upon. Besides, the literature in the present study’s context is inadequate and focuses on accessibility issues per se. It links socioeconomic status to the choice of institution. Still, it fails to connect the dilemma of ‘choices in higher education,’ viz., choice of engineering as major and choice of institution, especially in times of the declining value of the degrees when the institution types (prestige) rise in importance. But in our research, we address this fissure in the literature by looking at the interplay of choice of

engineering or choice of institutions in terms of career objectives. The research also evaluates the chosen institute, which has primarily been subject to neglect in existing studies. This becomes particularly significant in engineering education because the opening up of private institutions in large numbers becomes a source of suppliers of engineers in the economy who have mainly been at the accusation end.

3. Further, educational mismatch being a recent discussion fails to find its place in Indian literature and, more particularly, among engineering graduates. Having realized the economic loss from its association with the underutilization of skills, the mismatch in some instances may be an undesirable phenomenon from the human capital theory perspective. The degree to which welfare losses accompany mismatch is not uniform across individuals and depends on various factors. Thus, with more significant complaints levied against engineers in terms of lacking requisite skills, it is imperative to understand the relationship between educational mismatch and skill utilization. More so, the study tries to locate the pecuniary and non-pecuniary benefits from their career choices made at varying stages. And how the decisions made at the micro-level at a particular point of time materialize when affected due to prevailing macro conditions is not primarily undertaken. Furthermore, how individual and institutional factors influence the expected outcomes is attempted to get a complete picture of the prevailing mismatches and their expectations from the job market. Simultaneously, there is a shortage of studies of educational choices and the chosen life path in the changing context of the markets' approach to education.

2.9 Objectives and Research Questions

1. To examine the factors that account for the choice of engineering as a field of study.

1.1 How do engineering applicants vary in their socio-economic participation while deciding to enrol in the engineering discipline?

1.2 Is there a mismatch between the actual and desired stream of study? What could be the possible factors for mismatch in the choice of a stream?

1.3 Does the addition of an extra credential amongst those from lower-tier universities reflect a change in attitude and orientation towards their employability?

2. To study the choice making decision regarding institutions.

2.1 What are the different sources of information used while making university choices? Can sources of information collected be a reflection of one's situational characteristics?

2.2 What are the factors that determine the decision of choice of institutions?

2.3 What are the factors that affect the satisfaction/dissatisfaction amongst institutes of different ranking?

3. To study the problem of educational mismatch among engineers.

3.1 Is there an educational mismatch among engineering graduates, and what are the determinants of educational mismatch among Indian engineers?

3.2 Is there any relation between skill utilization and educational mismatch (whether the mismatch is a real or a formal one), and which is more prominent among engineers?

3.3 What are the effects of educational mismatch on wages and job satisfaction?

2.10 Conclusion

Therefore, gaining an insight into how the individual behaves in the choice-making process is essential for managers, policymakers, etc. With engineering graduates argued to be the largest employee, more investigation is required. The study, therefore, adds to the relatively limited study on choices of students in several important aspects. It reveals a significant divide between the quality and quantity of information supplied to students. Higher education institutions can design a relevant information supply plan if they properly grasp the decision-making process of students and the information needs that drive it.

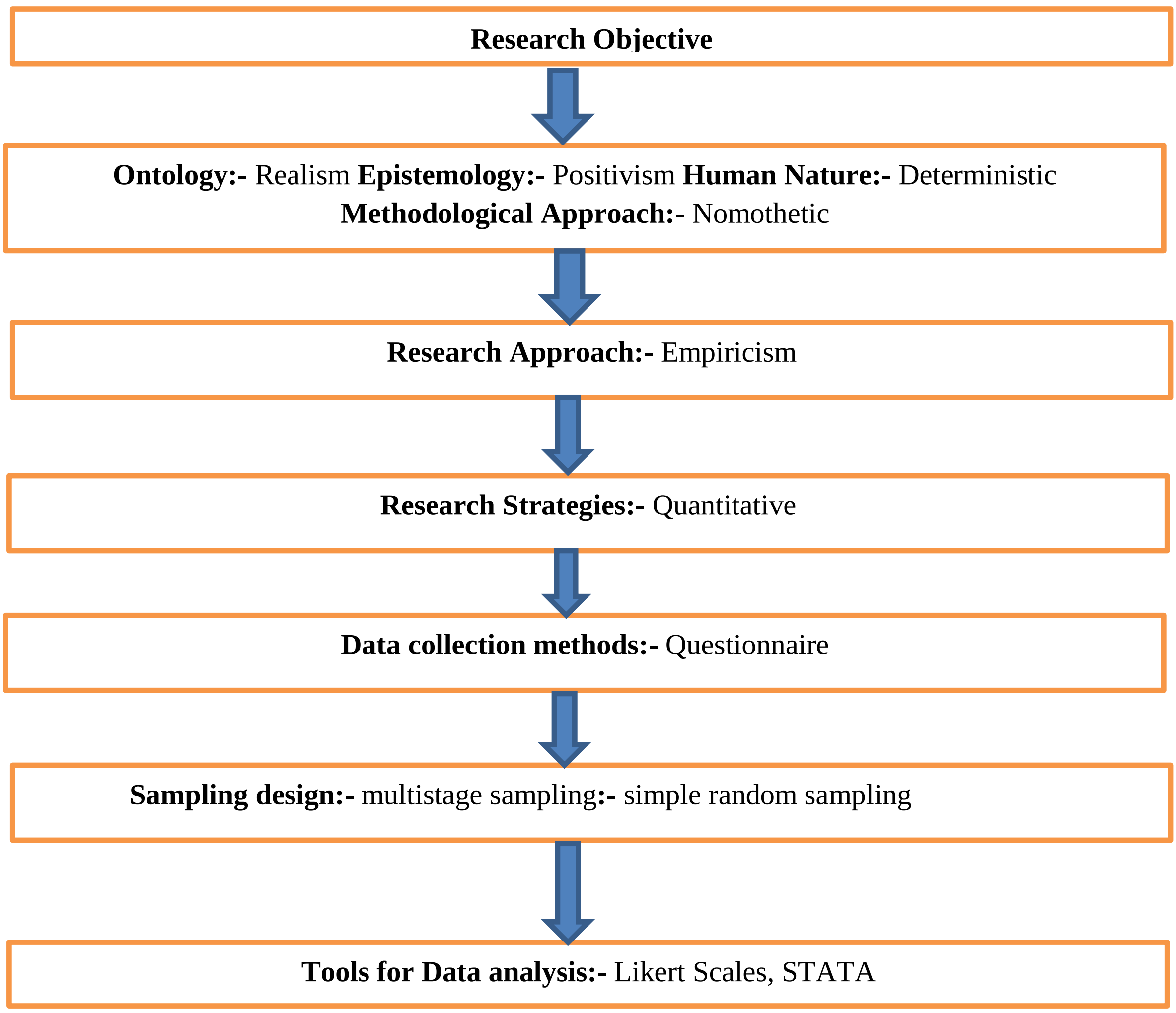
Hence, this choice-making phenomenon can be understood as a sequential factor beginning from engineering education to work in the labour market. The study illustrates how a series of events from admission to employment can lead to coherent or distorted skill formation, as well as hinder or construct the relationship between education and employment. A holistic analysis from choice in higher education to selection in the job market is presented in the subsequent chapters. The factors undertaken speak of the relationship between the education system and the labour market and how employees assess their educational credentials. The study would thus explore a set of mechanisms through which various factors affect college major choice, i.e., engineering, including choice of institutions and occupational expectations. Therefore, a complete picture of the decision-making process can help higher education institutions better understand their clientele.

CHAPTER 3: RESEARCH METHODOLOGY AND METHODS

3.1 Introduction

Research methodology refers to the approaches to, kinds, and paradigms of research (Kaplan, 1973 cited in Cohen *et al*., 2007). Kaplan argues that the sole purpose of the methodology is to understand not the product of the investigation of the matter but rather the whole investigation process. Methods thereby refer to the skills that allow one to conduct research rather than the techniques, tools, and procedures utilized in carrying out the research. It provides an understanding of how research is done. It could also refer to a variety of data collection methods that will be utilised as a foundation for inference, interpretation, explanation, and prediction (Cohen *et al*., 2007). Thus, the following figure gives an overview of the methodology and the requisite methods adopted for the present study.

Figure 3.1: Methods adopted for the study



3.2 Placing the study in various research paradigms

There are conflicting paradigmatic perspectives on what reality or ontology entails, as well as what knowledge or epistemological content entails. Given how the proponents of different paradigms have chosen to respond to the four questions, paradigm refers to the beliefs representing the most informed view within the advocacy of their respective paradigms (Guba and Lincoln, 1994). According to Denzin and Lincoln (2000:19), "the net that contains the researcher's epistemological, ontological, and methodological premises may be termed a paradigm or an interpretive framework."

a) Ontology:- It is the assumptions about the nature of reality (phenomenon) subject to investigation (Guba and Lincoln, 1994). One can determine "the way things are" and the cause-and-effect relationship that underpins social reality. At the very least, relevant signs of what is "really" happening can be found. Since the study is situated in a '*realist*' view, the ontology (nature of reality) is that the reality is tangible, exists outside the researcher, is *objective*, has a universal meaning attached to it; the researcher and the subject of the investigation are separate entities. The investigator is free to investigate the topic without being influenced by it (Cohen *et al.*, 2007). Truth exists and can be captured and measured. In the process, the social phenomenon confronts one as an external fact beyond one's control. For example, the study assumes that educational mismatch has a specific and universal meaning and is not constructed by the researcher's mind as in nominalism. Instead it has an independent existence indicated by the reports in the context of engineers. Also, the social, cultural, and economic capital has an inert objective reality acting as a constraint in the decision-making process amongst some engineers.

b) Epistemology (nature of knowledge):- It is a discipline of philosophy concerned with knowledge's origins, nature, techniques, and boundaries. It has to do with how the researcher learns about reality (Guba and Lincoln, 1994). It's the study of how we know what we know. The questions "what kind of research is this?" or "what kind of knowledge does this research produce?" direct an investigation into the state of knowledge or epistemology in general for the research (Taylor *et al.*, 2002:11).

One of the most pressing issues in epistemology is whether the social world can and should be researched using the same principles, methodologies, and ethos as the natural sciences (Bryman, 2012). *Positivism* is an epistemological position based in the natural sciences, that is, the composition of reality from detectable material objects. The researcher is assumed to be a distant and neutral observer (Guba and Lincoln, 1994). In contrast to post-positivist approaches, which aim to describe and explore in-depth phenomena where the researcher gets involved with the subjects to understand the reality from a qualitative perspective, positivism takes a quantitative approach to investigating a phenomenon, taking an epistemological position that supports the use of natural science methods to the study of social reality (Cohen *et al*., 2007).

A positivist philosophy assumes that the investigator's position should be objective detachment or value freedom to discover how things are (Guba and Lincoln, 1994). It is an approach to studying society that explicitly uses science like experiments and statistics to explain how society functions and operates. Knowledge consists of proved hypotheses that can be accepted as facts/laws. The study believes that the positivist philosophy is appropriate to this research. This approach explains that the analysis carried out with respect to engineers in the form of decision-making in terms of streams or institutions or choice of work can be expressed in some generalizations. Here are some of the features of positivism. These features help explain why this particular philosophy is guiding the study.

Table 3.2.a: Positivism and Research

Factors	**Approach**
The researcher	Independent, objective
Human interest	Detached
Research goal	demonstrate causality
Research process	progress made through hypothesis and deductions
Concepts and variables	must be operationalized in order to be measured and analysed quantitatively
Unit of analysis	recognisable and reduced to the most basic terms
Generalization patterns	statistical probability

c) Assumptions about human nature:- As human beings are the object and subject of investigation, the residuum of assumptions about human nature is far-reaching. The investigator portrays them as responding mechanically and *deterministically* to their environment (Cohen *et al*., 2007). The occurrence of events leads to causes. In turn, the events are determined by other circumstances, and science believes that these established links can be well understood and uncovered (Guba and Lincoln, 1994).

d) Methodological Assumptions:- This delves into the question of "How can inquirer go about finding out whatever he or she believes can be known?" (*ibid*). Unlike the constructivist and subjectivist approaches, those who assume a positivist and objectivist approach towards social reality adopt methodologies that help them search for universal laws explaining the phenomenon. The investigation is concerned with the analysis of the relationship between selected factors. Researchers, thus guided through this approach, generally choose quantitative research methods. The process characterized by procedure and methods for discovering general laws is *nomothetic* (Cohen *et al*., 2007). Since the research questions are directed towards generalization, quantitative research methods are utilized in the study.

Thus, the assumptions about the nature of social sciences and the requisite methodological assumptions cannot be reduced to a question of methods; methods have to be suited to a predetermined methodology. Hence, the various approaches and strategies adopted have directed the data collection method, which is discussed further.

3.3 Research Approach

The present study's research approach is empiricism, which implies that reliable knowledge can be gained only through experience. The tenability of the hypothesis or the theory depends on empirical evidence's nature (Cohen *et al*., 2007). This suggests that ideas must be subjected to testing/verifiable by observation and experience (Barratt, 1971 cited in Cohen *et al*., 2007) and evidence, data resulting in confirmation of the theory/hypothesis framed for research before it can be identified as knowledge. It further entails that fact accumulation is it's another far-reaching goal.

3.4 Research Strategies and Data Collection Method

Research Strategies, in simple terms, imply orientation to the conduct of social research. The present study employs a *quantitative* strategy to study the phenomenon. The quantitative approach incorporates natural sciences' practices, particularly the epistemological position of positivism, and simultaneously embodies an objective and external view of social reality (Bryman, 2012). It emphasises the quantification of the collected data that entails a deductive approach[22]. The present research argues that it is not only the various factors affecting the choice of different streams of engineering but also the role of institutions that would determine the job that one would land into. These reflections would then constitute the theory, guiding further research and providing a framework within which social reality can be comprehended, and findings can be interpreted accordingly.

Further, the method employed for data collection is the survey method, which involved a specific instrument called a questionnaire. The questionnaire was comprehensively designed to gauge the educational mismatch among Indian engineers, tap the mismatch in the choice of stream, and understand institutions' role in the job market. The objectives discussed in the previous chapter point towards studying the life path of engineers. Therefore, the study tries to establish a pattern that emerges from engineers' behaviour, for which the questionnaire was utilized. The questionnaire was divided into two parts: the first part comprised individuals' decisions regarding choice-making concerning different streams in engineering and institutions' choice-making. The second part was conclusively for the details and intricacies regarding the job that the individual ended in.

In Section I, the respondents were asked to give details regarding their socio-economic background, the stream of engineering they chose, institutions they attended, the reasons behind the choice of engineering leading to selecting the different branches in engineering, and the factors responsible for such decisions. Also, in the case of institutions, the factors behind the choice of institutions were probed. Additionally, the different sources of information utilized to select the final institution

[22] The nature of relationship between theory and research.

were addressed. In a retrospective manner, they were asked to evaluate engineering education in a more comprehensive manner.

In Section II, the details regarding the individual's job structure are looked at. This section enquires about their job profile, satisfaction, and relevance of engineering education in the job market. It delves into the job characteristics, viz. the number of employees and contractual or permanent job, etc. It also enquires about their work experience. It further tries to capture mismatches concerning engineering education and skill utilization of respondents in their respective jobs. It also gathers information on the job satisfaction variable.

3.5 Research Design and Sampling

The *cross-sectional* research design comprises data collection on a series of variables at a single point, subject to finding patterns of association amongst different variables. The primary purpose of employing cross-sectional design is to identify the variation amongst the variable of interest. With the completion of the questionnaire, the answers arrive at the same time instead of in phases as in the time-series data (Bryman, 2012). Once the information is collected, it is made meaningful by transforming it into data to be quantified. Several techniques are then sorted to reduce the amount of data collected, test for association of variables, and further analysis. Since the study is based on working engineers, they were thus the universe of units from which the sampling followed. The study resorted to sampling since the population was not small. The current study, therefore, uses *multistage sampling* for research investigation. The sampling of working engineers was based on separate stages:-

Area: This involved grouping working engineers according to the standard region wherein Delhi NCR was selected.

Sectors in which engineers are employed: Amongst the different sectors, IT/ITeS and Services were the broad sectors where engineers were majorly employed and were thus selected for the study.

The domains they are in: Within these sectors, the different domains engineers were working in, viz., Software engineer IT services/IT Product, Finance, Consulting, etc., were selected randomly for the sample.

a) Target Population

The target population is inferred from the objectives of the research. The target population is engineers working in any of these two sectors and spread across any of these defined domains. Though the targeted population is defined well, their quantification is wanting. There are no unified records of engineers working in the IT/ITeS or service sector, making it difficult to estimate the population size.

b) Sampling Unit

The sampling unit was defined as an engineer working in either the IT/ITeS or Service sector and spread across either of these domains with at least six months experience in the job and a maximum of 8 years' experience.

c) Sample size

Based on these two premises, there had to be a proportionate representation of samples. The present study applied a probability sampling method.

Simple random sampling was used to select the target sector, i.e., IT/ITeS or Service sector, and the domains and the engineers with these domains.

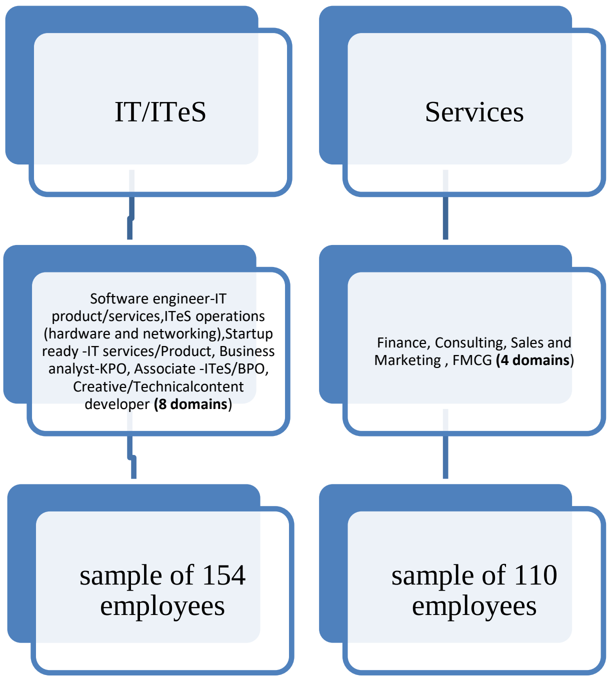
3.6 Research Framework

On a broad level, the universe that is being targeted in the survey of employed engineers (SEE) dataset is divided into two major sectors: - IT/ITeS and Services (finance, consulting, etc.), where majorly engineering graduates are employed[23]. After the initial categorization of sectors, different domains in different sectors were determined based on various studies (Banerjee and Muley, 2008; Sohoni, 2014; Aspiring Minds, 2014; 2016). Among these two sectors, 12 domains (discussed in

[23] As no other framework was feasible to approach the study the employees were approached through sectors. However, in analysis the 264 sample is taken in totality and not in isolation with the sectors they are employed in since the sample size was getting smaller and results were not significant.

figure3.6 below) are considered for the sample. These domains are considered as strata for the respective sectors. The engineering sector is not considered since the study focuses on mismatches related to the engineer's job market.

Fig 3.6: Sampling Framework



Although the service sector domains are less than the IT/ITeS sector, 41% of the sample of employees comprised of those workers in the service sector compared to 58% of the employees in the IT/ITeS sector. This is because, based on employability, IT/ITeS has the highest employability compared to the engineering sector (Aspiring Minds, 2014; 2016).

There is no classification in the National Employability Report (2014 and 2016) regarding the services sector. Thus, based on Banerjee and Muley (2008) and Sohoni (2014) studies, it is depicted that student employability is spread across different domains, viz. Engineering and Technology, Finance, IT, FMCG, Consulting, R and D, and Non-IT services. Based on the data available in these studies, the highest employability percentage is in Finance and Consulting combined, followed by IT (Sohoni, 2014). Thus, based on the first stage classification (i.e., sectors) of the present study, viz. IT/ITeS and Services, and on the assumption of transitivity[24],

[24] Highest employability in IT/ITeS as compared to engineering in case of National employability reports and studies by Sohoni (2014) the employability is highest in Services followed by IT. Thus

initially, it was decided to draw the largest sample of employable engineers from the service sector followed by the IT/ITeS sector. But, since the domains spread across these two sectors are not equal, eight domains are taken up in the IT/ITeS sector against four domains in the service sector. Therefore, larger numbers of employees were selected from IT/ITeS covering eight domains vis-à-vis the Service sector covering four domains. Across these 12 domains, an effort was directed to draw at least two engineers from each of these domains to complete the questionnaire. The study tried to cover a sample of 264 employees. The study is located in Delhi, NCR, and through simple random sampling, employees were identified.

Why Delhi?

Since the study is based on a mismatch of engineers who are already employed, Delhi shows the highest employability among the selected domains that engineers take up (the classification is in the framework above), followed by Bangalore and cities in the Western part of India, viz. Mumbai, Pune (Aspiring Minds, 2016). Hence, the study is based in Delhi. The analysis is based on primary data collection. Engineers between 6 months-8 years' work experience were surveyed. They were asked about the relationship between engineering education and employment via a written questionnaire. The respondents were enquired on their socio-biographic backgrounds, how they chose institutions, the degree to which employees thought their field degree and the job were a good match and whether skill and training they received are utilized in the job market and further insights concerning wages, job satisfaction and retrospective views on engineering education were gathered.

3.7 Field Visit

The survey began by reaching entrepreneurs, company executives, HR's through LinkedIn and social media, family connections and mutual contacts etc. Some were really helpful and forwarded the survey to their employees. Some allowed access to their office premises to gather the necessary information and helped in survey collection. In some cases, the researcher managed to talk to employees in restaurants/food courts/cafes, sometimes at the tea stalls near their offices and in their office premises, and occasionally had a telephonic conversation. Initially, there were

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following transitivity, services has highest employability followed by IT followed by engineering sectors.

suspicions about the researcher's intentions. After ensuring that their identity would be anonymous and showing them the university permission for conducting the research, some of them started furnishing the requisite information. At the same time, the researcher would be loitering around the hub to contact the employees. She generally preferred to visit the area around 2:30 to 7:30-8. She chose to 'loiter' between these time slots because many people were either in the transition (change of shifts) or was out because they took breaks. Then when it became a continuous process targeting the sample became easy and biasedness got reduced as random selection became easy with each passing day and employees started getting familiar with the researcher's presence. To convince them how data collection was entirely dependent on them, they started gauging their contribution to the study. Some agreed to fill the questionnaire survey with pen and pencil, and others requested an online link. The link to the questionnaires was sent to these engineers. The first reminder was given in fifteen days, followed by a series of a reminder to fill in the questionnaires.

Since the objective of the study is to comprehend the connections between education and the labour market and the decisions taken earlier in one's life that affects one's final outcome in the job market, the initial biasedness is reduced to a greater extent as the employees are very diverse in terms of the regions and the institutions that they came from. They are spread across the country's length and breadth. By virtue of the job that they are doing, they happen to be in Delhi, however the decision that drove the final outcome (landing into their present jobs) i.e. choice of engineering and the choice of institutions are varied in nature.

3.8 Tools for Data Analysis

Likert scales[25] have been utilized to address the concerns raised in the study. Further, to analyse the quantitative data, STATA version 12 was used. In this aspect, several quantitative statistical techniques were adopted across all the relevant questions used in this research by tabulating the data and modelling it. A detailed description of the methods used for data analysis is described here.

[25] It provides a range of response to a given statement.

Research Mapping of the objectives with the questions to link the method for data analysis

Having arrived at the objectives and the specific research questions earlier, the study try to map the variables that were then subject to examination and the relevant statistical techniques were applied to establish the variables' relationship.

The first objective relating to the factors affecting the choice of engineering is mapped in the following table. The variables for analysis are arrived at through the literature survey, and the existing gaps identified in the literature helped the inclusion of certain variables.

Table 3.8.a: Mapping Research objective 1 to the analysis method adopted

Research Objective	**Research Questions**	**Variables subject to examination**	**Statistical Method**
1. To examine the factors that account for the choice of engineering as a field of study.	1.1 How do engineering applicants vary in their socio-economic participation while deciding to enrol in the engineering discipline?	Gender, category father's education, family income, teacher's advice, friends/peer effect, sibling education, parental desire, social prestige, marks scored in class X^{th} and XII^{th}, personal interest, post-marriage family constraints, the subject is analytical and practical, early employability, institutional funding	Percentage and t-test
	1.2 Is there a mismatch between the actual and desired stream of study? What could be the possible factors for mismatch in the choice of a stream?	Gender, family income, father education, 1st choice of branch, actually studied, stream restricted due to qualifying rank, institutional ranking, social prestige, wider career choice, better income possibilities, going abroad, for further study and research, better employability, placement, ranking of the branch	Percentage and logistic regression to determine mismatch in the actual and desired stream of study
	1.3 Does the addition of an extra credential amongst those from lower-tier universities reflect a change in attitude and orientation towards their employability?	pursued Masters, gender, category, institute ranking, educational qualification father, 1st choice of branch, actually studied, personal interest, marks scored, parental desire, social prestige, the subject is analytical and practical, institutional funding, type of job, size of the firm, tenure of job, job satisfaction, suitability and updated curriculum, quality faculty, industry-academia linkages, student-professor relationship, quality of training, emphasis on exam culture	Logistic regression

The second broader objective of the study is related to choice-making of institutions. Herein, the questions are hinted at the determinants of institutional choice and the variation in the level of satisfaction/dissatisfaction that would accrue from studying in a chosen institute. Accordingly, the variables are subjected to examination to find a pattern of association amongst them.

Table 3.8.b: Mapping Research objective 2 to the analysis method adopted

Research Objective	Research Questions	Variables subject to examination	Statistical Method
2. To study the choice making decision regarding institutions.	2.1 What are the different sources of information used while making university choices? Can sources of information collected be a reflection of one's situational characteristics?	websites, ranking, campus visits, university brochures, educational fairs, friends' teachers' and parents' recommendation, educational qualification father, institutional funding	Percentage
	2.2 What are the factors that determine the decision of choice of institutions?	fees, distance from home, teachers' credential, campus placement, graduate's profile, campus accommodation, family members studied, media advertising, college facilities, living cost, the credibility of the institution, family income, early employability, category, institutional funding, parental desire, social prestige, educational qualification father, wider career choice, choice restricted due to qualifying rank, gender, institutional ranking	Percentage, T-test, One way ANOVA
	2.3 What are the factors that affect the satisfaction/dissatisfaction amongst institutes of different ranking?	quality of training, the possibility of using acquired knowledge, suitability and updated curriculum, quality faculty, industry-academia linkages, professors student relation, emphasis on passing exam rather than acquiring skills, developed engineering training and skills in meeting job requirements, engineering education equipped them enough for the job market, institutional ranking, over education, horizontal mismatch	Percentage, One way ANOVA

Further, the identification of variables in various studies and the requirements of the present study's research questions have been arrived at to analyse the study's third objective relating to the educational mismatch. Once the decision regarding incorporating variables was finalized, different statistical tools were employed to depict the relationship between the variables and analyse the problem of the study.

Table 3.8.c: Mapping Research objective 3 to analysis method adopted

Research Objective	**Research Questions**	**Variables subject to examination**	**Statistical Method**
3. To study the problem of educational mismatch among engineers.	3.1 Is there an educational mismatch among engineering graduates, and what are the determinants of educational mismatch among Indian engineers?	IT, Service sector, institutional ranking, interesting work, job location, suits in short-run, better than unemployment, career development, job benefits, improved job status, faster technological change, management decision, willingness to do a different job, salary level, status, size of the firm, type of job, job status, work experience, gender, age, marital status, institutional ranking, funding of the institute, satisfaction from engineering training and skills in meeting job requirements, engineering education equipped them enough for the job market, CTC, choice of stream restricted due to rank, Vertical (over education, under education) horizontal mismatch and over skilled or under skilled and matched	Percentage, Logistic regression
	3.2 Is there any relation between skill utilization and educational mismatch (whether the mismatch is a real or a formal one), and which is more prominent among engineers?	Vertical (over education, under education) horizontal mismatch and over skilled or under-skilled and matched, institutional funding, size of the firm, work experience, satisfaction from engineering training and skills in meeting job requirements, engineering education equipped them enough for the job market, wages	Percentage and chi-square to identify the relationship between educational mismatch and skill utilization
	3.3 What are the effects of educational mismatch on wages and job satisfaction?	wages, job satisfaction, gender, age, job status, type of job, job status, firm size, work experience, educational mismatch, skill utilization, institutional ranking	Multinomial logistic regression and linear regression

3.9 Sample Description

A description of the sample collected from the set of employed engineers is depicted below:

Table 3.9.a: Proportion of gender

Gender	**Frequency**	**Percentage**
Female	48	18.18
Male	216	81.82
Total	264	100
Source: Based on field survey		

The table above represents that the sample comprises 81.82% males and 18.18% females.

Table 3.9.b: Marital status proportion

Marital Status	**Frequency**	**Percentage**
Unmarried	189	71.59
Married	75	28.41
Total	264	100
Source: Based on field survey		

The table depicts that 71.59% belong to the married group in the sample, and 28.41% are unmarried.

Table 3.9.c: Proportion amongst different age group

Age	**Frequency**	**Percentage**
Less than and equal to 25	90	34.09
Above 25 -28	105	39.07
Above 28 -32	69	26.14
Total	264	100
Source: Based on field survey		

The table represents that engineers in the age group less than or equal to 25 are 34.09%, engineers in the age group of 25-28 are 39.07%, and engineers in the age group of 28-32 are 26.14% of the sample.

Table 3.9.d: Proportion amongst different categories

Category	Frequency	Percentage
OBC	26	9.85
SC	25	9.47
ST	3	1.14
Unreserved	210	79.55
Total	264	100
Source: Based on field survey		

The sample consists of 9.85% belonging to the OBC category, 9.47% belonging to SC, and 1.14% belonging to the ST category. Also, 79.55% represents people who are in the unreserved category.

Table 3.9.e: Proportion amongst institutes of different ranking

Classification of Institution	Frequency	Percentage
Lower-tier	228	86.36
20-40	23	8.71
1-20	13	4.92
Total	264	100
Source: Based on field survey		

It is to be pointed out that the higher education sector is strongly hierarchical (Winston, 1999). Higher education is characterized by selection-based efficiency in customer input technology, referred to as ‘S’-competition (Glennerster, 1991). As a result, top-ranked universities have been able to sustain their positions over time (Marginson, 2010). However, the ranking of institutions is not without flaws, but it has gained credibility to choose institutions among higher education students. Therefore, based on the above arguments, institutions have been classified according to the NIRF 2018 ranking of engineering institutes, and accordingly, the sample was classified.

Lower-tier represents engineers who belong to colleges below 40 ranking or may not have been featured in ranking and constitute 86.36% of the sample. Further, engineers who belong to colleges in NIRF 20-40 constitute 8.71% of the sample, and engineers who belong to colleges in NIRF 1-20 are 4.92% of the sample.

Table 3.9.f: Proportion amongst institutes of different funding

Type of funding	Frequency	Percentage
State University	50	18.94
Central University	54	20.45
Private aided	97	36.74
Private unaided	63	23.86
Total	264	100
Source: Based on field survey		

Engineers enrolled in a state university for pursuing engineering is 18.94%, and engineers in the central university are 20.45%. Those who studied in Private aided colleges are 36.74%, and engineers who studied in Private unaided colleges represent 23.86% of the sample.

Table 3.9.g: Distribution of engineers amongst different educational qualification of father

Educational Qualification of father	Frequency	Percentage
Up-to class XII^{th} or diploma/professional	83	31.44
Completed bachelors	115	43.56
Completed post-graduation and above	66	25.00
Total	264	100
Source: Based on field survey		

The sample comprises 31.44% who represent those whose fathers' educational qualification is up to class XII^{th}or diploma/professional within the sample. The category of people whose father has completed up-to bachelor's education is 43.56%. And 25% of the sample represents those whose fathers' have completed post-graduate and possess qualifications above that.

Table 3.9.h: Distribution of engineers amongst different educational qualification of mother

Educational Qualification of Mother	Frequency	Percentage
Class 8 and below	53	20.08
Class X^{th} pass	29	10.98
Completed High school	32	12.12
Completed bachelors	82	31.06
Completed postgraduate and above	59	22.35
Diploma/professional	9	3.41
Total	264	100
Source: Based on field survey		

Those engineers whose mothers' educational qualifications are class 8 and below represent 20% of the sample. Those whose mothers' qualification is class X^{th} pass represent 10.98% of the sample, and those whose mother has completed high school represent 12.12% of the sample. Further, 31.06% represent those whose mother has completed bachelor's education and those whose mother has completed post-graduate and above represent 22.35%. 3.41% represent those whose mothers have acquired a diploma/professional degree.

Table 3.9.i: Distribution amongst different family income

Annual Family Income	Frequency	Percentage
Rs. 2-5 lakh	102	38.64
Rs. 5.01-8 lakh	70	26.52
Rs. 8.01-12 lakh	45	17.05
Rs. 12.01-15 lakh	17	6.44
Rs. 15.01 and above	30	11.35
Total	264	100
Source: Based on field survey		

The sample constitutes 38.64% whose annual family income was in the range of Rs. 2-5 lakh. 26.52% represent those whose annual family income was Rs. 5.01-8 lakh. 17.05% represent those whose annual family income was in the range of Rs. 8.01-12 lakh. 6.44% comprise that sample of engineers whose annual income was Rs. 12-15 lakh when he chose to take up engineering as a broader discipline. Similarly, 11.35% represent those whose annual income was in the range of Rs. 15.01 lakh and above.

Table 3.9.j: Distribution amongst different preference of institution (provider) vs. stream choice (product)

Preference	Frequency	Percentage
Availability of preferred stream during counselling	163	61.74
Institution of your choice	101	38.26
Total	264	100
Source: Based on field survey		

Amongst the sample, 61% represent those engineers for whom the order of preference while taking admission in engineering was based upon the preferred stream during counselling. They represent those engineers who gave priority to the stream/branch of engineering over the institution, unlike thirty-eight percentage of the sample for whom the order of preference was based upon the institution of their choice. They represent those engineers who prioritized the institution over the choice of stream.

There could be various reasons for a smaller proportion giving preference to institution choice since entry to these institutions depends on multiple factors discussed later in the analysis.

Table 3.9.k: Proportion of engineers who studied in first preferred institution

Study in first preferred	Frequency	Percentage
No	168	63.64
Yes	96	36.36
Total	264	100
Source: Based on field survey		

The sample comprises 63.64% who represent those engineers who could not study in their first preferred institution, unlike 36.36% who could study in their first preferred institution. This denotes that for a more significant proportion of the engineers approached for data collection, their choice of the institution was not their first choice. There could be various reasons affecting the choice of institutions, which are taken up for analysis in the study.

Table 3.9.l: Proportion appeared for different qualifying exam

Qualifying exam in engineering entrance	Frequency	Percentage
JEE prelims, AIEEE	108	40.90
State PET	93	35.23
JEE Mains	37	14.02
BITSAT	26	9.85
Total	264	100
Source: Based on field survey		

JEE prelims, AIEEE, and State PET, account for most engineers competing for the qualifying exam in the sample survey, which stands at 76%. In comparison, JEE

Mains and BITSAT have a relatively low proportion in the sample at 14% and 10% respectively who appeared for such entrance examinations.

Table 3.9.m: Distribution of engineers amongst different Ctc's

Range of CTC	**Frequency**	**Percentage**
Rs.<3 lakh	21	7.95
Rs. 3.01-6 lakh	77	29.17
Rs. 6.01-10 lakh	98	37.12
Rs. 10.01-15 lakh	29	10.98
Rs. 15.01-20 lakh	21	7.96
Rs. 20.01 lakh and above	18	6.82
Total	264	100
Source: Based on field survey		

The sample constitutes 37% of respondents who earn between Rs. 6-10 lakhs, 29% make money between Rs. 3-6 lakhs, 11% earn in the range of Rs. 10 and 15 lakhs, about 15% make more than Rs. 15 lakh annually, and a minute 8% of respondents make less than Rs. 3 lakh.

Table 3.9.n: Proportion who thinks Masters degree opened more opportunities

Masters degree opened more opportunities	**Frequency**	**Percentage**
Yes	23	38.33
No	37	61.67
Total	60	100
Source: Based on field survey Note: Has your Masters degree opened equal or more opportunities for you as compared to a graduate from a premier engineering institution with a bachelor's degree		

Further, only 39% of respondents who pursued Masters believe that their masters degree has opened opportunities for them equivalent to a bachelor's graduate from a premium engineering institution. Seeking a Masters after engineering is prevalent amongst Indian engineers; hence, the study tries to find out how they differ in their orientation compared to their counterparts with only an engineering degree.

Nonetheless, the statistical analysis and the relevant objectives that the study attempts to answer are taken up in the coming chapters. The three goals that the study has framed are dealt with in the subsequent three chapters, which discuss the relevant research questions concerning each objective in detail.

3.10 Conclusion

This chapter discusses how the study was carried out, explaining the methodology within the different paradigmatic views. Further, the quantitative strategy adopted for conducting the research is advocated based on the study's objectives. A structure of the research framework has been arrived at to study as to how the sample was selected and the different tools adopted for conducting the research. The chapter thus deliberates the sampling techniques and methods employed for data collection and surveying of the engineers. The study is unique because engineers were asked to reflect upon their decisions retrospectively since they are better positioned to analyse their shortcomings and their problems in the course of a set of decision-making procedures. Further, mapping the research questions and identifying the relevant variables upon which various statistical techniques were applied to establish a pattern of association amongst the variable was contemplated. Accordingly, the following chapters will give a detailed analysis of the broader objectives that the study is trying to address.

CHAPTER 4: DISTORTIONS IN CHOICE

4.1 Introduction

In the present study, decision-making is a continuous process that recurs at different stages of an individual's career-making. More particularly, after completion of the Class XII^{th}, the choice of major becomes a crucial determinant for career trajectory for most students. Hence, at this stage, discipline choice becomes a critical decision. The chapter, therefore, discusses the pertinent three questions concerning the selection of engineering as a larger discipline. How do engineering applicants vary in their socio-economic participation while deciding to enrol in the engineering discipline? Is there a mismatch in stream choice, and what could be the possible reasons for the mismatch? Does adding an extra credential amongst those from lower-tier universities reflect a change in attitude and orientation towards their employability?

Since the study comprises engineers, this chapter probes into the factors affecting one's engineering choice as a broader discipline. The study identified factors based on the literature survey, and subsequently, through the data analysis, the results are analysed. The chapter presents a detailed description of the factors affecting the choice of engineering as a larger discipline and, further, based on *t*-tests, the study tries to report the differences between the various factors that affect the choice of engineering amongst the marginalized groups (viz. female, reserved category, and those with lower educational qualification of the father).

Once the factors affecting the choice of engineering are accounted for amongst different socio-economic groups, the study explores if there is a mismatch in the selection of different streams of engineering. Mismatch in terms of what an individual wanted to study but couldn't pursue is elaborated in the second section.

Lastly, the chapter seeks to find an answer to whether the addition of an extra credential amongst those from lower-tier universities reflects a change in attitude and orientation towards one's employability. Among those from lower-tier universities, who are opting for a Masters after engineering, what are their characteristics, and whether there are any advantages that accrue to them from pursuing Masters? These are the questions that this section seeks to probe at. The decision-making among graduates from lower-tier universities is to decide whether to go for a Masters or continue working with a Bachelors' degree.

Thus, throughout in this chapter, the survey-based study will shed insight on the complexities of the decision-making process. The prime focus is how the different factors at each stage assume importance and how different groups of individuals' choices are driven. Accordingly, through the questions compiled in the questionnaire and filled in by the engineers, the chapter finds out explicitly why the individuals chose engineering as a stream of study and the layers within which choices are made.

4.2 Factors affecting the choice of engineering as a discipline: An Analysis

In this section, the factors affecting the choice of field, i.e., engineering, in the case of the present study are given below. From the literature discussed in Chapter 2, various factors affecting the choice of discipline were identified. Factors like socio-economic background, gender, marks scored in Class X^{th} and XII^{th}, marks in the entrance exam, parental desire, social prestige, and personal interest are analysed to establish a relationship with the choice of engineering as a broader discipline. Through cross-tabulation, the study initially tries to find a relationship amongst these factors and makes an effort to gauge the importance of these factors individually and conjointly in deciding to take up engineering. Also, the study identifies the nuances of specific factors in the decision-making process by controlling for the marginalized groups. Table *4.2 a*[26] below depicts the relative importance of the factors that affect the decision to pursue engineering as a broader discipline.

[26] From the data collected in Likert scale those who answered very important and important for these factors their total proportion is calculated and hence ranked accordingly.

Table 4.2.a: The relative importance of the attributes that affect the choice of engineering

Rank in order of importance which was most influential within the decision-making process	Important
Early employability	230 (87.12%)
Personal interest	189 (71.59%)
Parental desire	178 (67.42%)
Marks	177 (67.04%)
Subject analytical and practical	170 (64.39%)
Peer effect	162 (61.36%)
Social prestige	154 (58.33%)
Sibling education	110 (41.66%)
Post marriage family constraints	35 (13.25%)
Source: Based on field survey	

Figure in parentheses indicate percentage components

The prospect of early employability (87.12%) is the most dominant factor for choosing engineering among the different factors that affect the choice of engineering as a field of study. Engineering in India is often projected as a discipline that entails an early outcome in terms of employability. This is followed by personal interest (71.59%) for choosing engineering. This points out that one is interested in the subject, or it is because of hierarchization amongst disciplines and existing information asymmetry; the most opted for discipline becomes engineering, which sometimes is represented as one's interest in the profession. Likewise, in some instances, parental desire (67.42%) plays a vital role in decision-making. This is because after completion of the Class XII^{th}, most students do not find themselves in a position to make career choices. This is true in India's context, where children are most often not allowed to explore choices independently as parents' take a call to satisfy their aspirations and under social pressure. Marks scored in Class X^{th}or XII^{th} (67.04%) also has a vital role to play in the decision-making process. Most often, choice of discipline seems to be correlated with marks. It is often assumed that those scoring higher marks opt for sciences, and arts are for the majority of those who are left with no alternative. Similarly, the peer effect (61.36%) plays an important role. It indicates that the lack of social and cultural capital leads one to follow what others do. Social prestige (58.33%) amongst students that he/she has opted for engineering also becomes a significant decision-making factor. In certain households, children opting for engineering were considered prestigious and perceived as a proud moment for families. However, sibling education (41.66%) is recognized as the least important factor in pursuing engineering.

The study further probes into the factors that affect the choice of engineering by controlling certain socio-economic factors. This may help in a better understanding of the decisions taken amongst the marginalized section in particular. In Table *4.2b*, the importance of attributes that affect the decision to pursue engineering concerning their fathers' educational qualification is provided with.

Table 4.2.b: Importance of attributes that affects the decision to pursue engineering amongst those with differential educational qualification of the father (in percentages)

Attributes	Lower qualification of father	Educational qualification of father above high school
Male	87.95	78.96
Female	12.04	21.02
Unreserved category	71.08	83.52
Reserved category	28.91	16.48
State-funded institutes	22.89	17.03
Centrally funded institutes	24.09	18.68
Privately funded institutes	53.01	63.73
Family income 2-5 lakh (annually in Rs.)	61.44	28.02
Family income 5-8 lakh (annually in Rs.)	20.48	29.12
Family income 8 lakh and above (annually in Rs.)	18.07	42.30
Parental desire an important factor	69.87	65.93
Social prestige an important factor	66.26	54.39
Personal interest an important factor	60.87	71.98
Marks an important factor	61.44	69.23

Early employability an important factor	85.54	87.36
Peer effect an important factor	65.06	59.34
Sibling education an important factor	38.55	42.86
The subject is analytical and practical, an important factor	57.83	67.03
Post marriage family constraints an important factor	19.27	10.44
Source: Based on field survey		

Educational qualification of father

Table *4.2b* shows that for those whose fathers' educational qualification is lower, the proportion of girls pursuing engineering degrees is lesser (12.04%) than those whose father's educational qualification is above high school (21.02%). This shows that an educated father has a positive impact on female education, unlike illiterate parents' who mainly prioritize male education (87.95% in the case of those whose father qualification is lower as against 78.96% whose father education is above high school) over females. Likewise, the proportion of those who belong to the reserved category (SC, ST, and OBC's) is higher (28.91%) among those whose fathers' qualification is lower. Additionally, higher proportions amongst them are enrolled in central (24.09%) and state-funded institutes (22.89%) in comparison to those whose fathers' educational qualification is above high school (18.68%- Central and 17.03% - State). This speaks about the reservation policies that may have benefitted them and helped them secure a seat in a better institute. Also, a more significant proportion of those candidates studying in privately funded institutes whose fathers' educational qualification is above high school (63.73%) reflect that there is a possibility that they are in a better position to pay high fees for such institutes. This is indicated by a larger proportion of these candidates whose family income is higher than Rs. 8 lakh (42.30% compared to 29.12% in the Rs. 5-8 lakh income category and 28.02% belonging to income category of up to Rs. 5 lakh income category). Moreover, a substantial proportion who could not enrol themselves in government-funded institutes in case of those whose fathers' educational qualification is lower found themselves in privately funded institutes (53.01%). This expresses that education is one of the ladders through which they can acquire mobility to higher occupational strata; in some instances, they even opt for educational loans[27] to pursue engineering as a broader discipline.

Among the factors affecting engineering choice, early employability is identified as the most preferred reason for choosing engineering irrespective of the categorization of fathers' education (85.54% and 87.36%). This indicates that the projection of engineering as a career is identified as one that might lead to early returns. This is followed by personal interest (71.98%) in opting for engineering in the case of those whose fathers' qualification is higher. This indicates that child's interest is considered by them. Further, for those whose father's educational qualification is lower, the significance of parental desire (69.87%) is higher because, in the absence of socio-cultural and economic capital as well as existing information asymmetry, the less educated parents' think that they are choosing (*imposing*) the best available option for their child. This highlights that choosing a career is often a family/parents' decision rather than an individual's interest. This is again overweighed by the importance given to social prestige (66.26%) in the choice of discipline. Parental desire and how parents' inform others about their child becoming an engineer is a matter of prestige for them. The combination of these two factors often works in coherence that puts pressure on the child to look beyond their interests. Sometimes, this leads to a mismatch in the expectations and one's aspirations.

Further, pursuing engineering for this category (educational qualification of a father is lower) is a decision influenced by peer effect (65.06%). For a more significant proportion, under inadequate information and, therefore, uninformed choices, there is a tendency to follow what others might do. Contrariwise, whose fathers' educational qualification is higher; personal interest factor for choosing engineering is followed by marks that one had scored in Class X^{th} and XII^{th}. For this categorization[28], marks that one had scored in previous classes play a role in choosing engineering as a discipline. It is often argued that those scoring higher marks opt for sciences and those with lower marks go for arts/humanities. Further, the subject's perception as analytical and practical played a vital role in the decision-making process for students belonging to this category. What it indicates is that for a more significant proportion,

[27] This is represented through the correlation between educational qualification of father and the family income evidenced in the Appendix table A.1.
[28] Educational qualification of father is higher than high school.

the choice of engineering is a subjective evaluation in terms of personal interest (71.98%) followed by marks (69.23%) and the role of the subject as a discipline (67.03%) which influences the decision. All these factors act conjointly in the decision-making process. Unlike those whose fathers' educational qualifications is lower, the influencers' (parental desire, peer effect) impact is overshadowed by subjective evaluation of oneself. One of the least important factors for this category[29] is sibling education (38.55%) influencing the decision to pursue engineering. This is because they cannot afford everyone's education, and engineering education is relatively costlier than general humanities courses. It is a tough decision for the family to let every child pursue engineering. The least important factor for both categories in choosing engineering is that one might face constraints in joining work after marriage (19.27% and 10.44%), which would dissuade them from opting for engineering. This is particularly true for females (evidenced in Table 4.2c) because of the structural barriers existent in society. It also is because of the importance both categories have given to the employability factor for choosing engineering as a discipline in its totality that this factor is least important. What the analysis illustrates is that for those whose fathers' educational qualification is lower, their freedom *(imposition of choice*) to choose engineering is more a reflection of one's state of affairs as engineering is considered a social ladder to increase their acceptability and thereby lead to one's mobility and social upliftment. It can also be argued that those whose educational qualification of the father is above high school reflect an informed choice behaviour. Due to the existence of socio-cultural capital at one's disposal, their decision depicts long-term planning rather than realizing immediate needs.

4.2.1 Factors determining the decision to pursue engineering as a discipline: t-test [30]

The study identified different factors that determine the decision to pursue engineering. The fathers' qualification (M=3.55) was the most influential factor, which has outweighed other factors in pursuing engineering. This represents that decision is not individualistic, and the fathers' educational qualification played a significant role in decision-making. This is further followed by sibling education

[29] Educational qualification of father is up-to high school.

[30] Throughout the writings in the thesis whenever *t* test is conducted, the data is treated as an interval data and accordingly the analysis is carried out.

(M=2.25), which is more often a factor in pursuing engineering. This is followed by teachers' role (M=2.12) in advising the students to pursue engineering. Therefore, the data depicts that siblings opt for the same subject in the absence of sufficient information. Sometimes, even the teachers' advice is considered for the decision to pursue engineering. Additionally, it is because that the type of job that the elder sibling landed into persuaded one to opt for engineering as a broader discipline. Social prestige (M=1.68) also played an essential role because pursuing engineering by children becomes a matter of pride for parents'. In certain circumstances, even peers (M=1.54) influence the decision. Because of an existing wave of engineering, most of the students followed what others opted for. Subject characteristics (M=1.43) also play a part as it is often described as being more analytical in approach. This is followed by parental desire (M=1.31). Family income (M=1.25) becomes significant in enroling their wards for engineering education as it involves a substantial sum of money. When engineering institutions were mushrooming in India, there were two most popular careers for students. One was engineering, and the other was medicine. Engineering became the easy way out because both the time and money involved were less in comparison to medicine. However, the marks scored in earlier classes (M=1.23) were not a decider as other factors outweighed it. It is because of the lack of options (information) available for taking further studies that one pays lesser importance to the marks scored in Class $X^{th}$and XII^{th}. Neither personal interest (M=1.10) nor early employability (M=1.02) was a significant influencer in the decision-making process. Post-marriage family constraints were the least important factor influencing one's decision to pursue engineering, with a mean score of M=0.13. This is because with lesser female enroling in engineering education, the significance of post-marriage constraints is thus relegated. However, the results showed interesting findings when controlled for gender.

Table 4.2.c: Factors determining the decision to pursue engineering –general and controlled for gender

Attributes	General	Male	Female	t-statistic	P-value
Educational qualification of father	3.55 (.08)	3.48 (.09)	3.89 (.16)	1.88	0.06*
Family income	1.25 (.08)	1.15 (.08)	1.70 (.19)	2.63	0.00***
Parental desire	1.31 (.08)	1.33 (.08)	1.25 (.18)	-0.39	0.68
Social prestige	1.68 (.08)	1.62 (.09)	2.00 (.21)	1.68	0.09*
Personal interest	1.10 (.07)	1.13 (.08)	0.97 (.16)	-0.80	0.42
Marks scored in Class X^{th} and XII^{th}	1.23 (.07)	1.28 (.08)	0.97 (.15)	-1.64	0.10
Early employability	1.02 (.07)	0.98 (.08)	1.20 (.18)	1.17	0.24
Teachers' advice	2.12 (.08)	2.19 (.09)	1.81 (.20)	-1.77	0.07*
Peer effect	1.54 (.07)	1.53 (.08)	1.56 (.17)	0.12	0.89
Sibling education	2.25 (.09)	2.26 (.10)	2.20 (.23)	-0.24	0.80
Subject is analytical and practical	1.43 (.08)	1.46 (.09)	1.30 (.18)	-0.70	0.48
Post marriage family constraints	0.13 (.02)	0.11 (.02)	0.22 (.06)	2.19	0.02**
Source: Based on field survey					

p*<0.1; p**<0.05; p***<0.01 and the figures in parentheses indicate robust standard error.

Factors determining the decision to pursue engineering -controlled for gender

To emphasise, female represents 18% of the sample. When we controlled for gender, the t-test revealed significant differences in the educational qualification of the father, family income, social prestige, teachers' advice, and post-marriage family constraints. Educational qualification of father results in higher means for female education. Fathers' educational qualification plays a vital role in daughters pursuing an engineering education. The mean value for family income score is higher for females than males. This implies that family income plays a determining role more so in female education than their male counterparts. In families with low income, there are chances of males receiving a higher preference for pursuing higher costs of education, unlike daughters of the family. This is because parents' think that daughters would be married off early and would like to shudder away from the responsibility of educating them. Social prestige plays a positive role in favor of females pursuing an engineering education. Compared with males, it is much of a matter of prestige for females seeking engineering as engineering is mainly stereotypical as a male-dominated discipline. Nevertheless, the teacher's advice while deciding to pursue engineering has a significant influence on males than females. This is because of existing information asymmetry, and teachers' are most often assumed to be reliable sources of information. Hence, with a more significant proportion of males pursuing engineering education, the teachers' advice becomes a last resort for them to process and decide on the available information. Likewise, post-marriage family constraints have an essential role for females pursuing an engineering education. This constraint may dissuade them from pursuing engineering education because their chances of joining work after completing education are low.

Table 4.2.d: Factors determining the decision to pursue engineering –controlled for reserved category

Attributes	**Reserved**	**Unreserved**	**t-statistic**	**P-value**
Educational qualification of father	3.07 (.21)	3.68 (.08)	-2.91	0.003***
Family income	0.72 (.15)	1.39 (.09)	-3.34	0.000***
Parental desire	1.35 (.18)	1.30 (.08)	0.21	0.83
Social prestige	1.74 (.20)	1.67 (.09)	0.29	0.76
Personal interest	1.01 (.15)	1.12 (.08)	-0.59	0.55
Marks	1.27 (.15)	1.21 (.08)	0.32	0.74
Early employability	1.09 (.17)	1.00 (.08)	0.47	0.63
Teachers' advice	2.18 (.18)	2.10 (.09)	0.36	0.71
Peer effect	1.75 (.17)	1.48 (.08)	1.46	0.14
Sibling education	2.29 (.21)	2.24 (.10)	0.20	0.83
Subject is analytical and practical	1.51 (.19)	1.41 (.09)	0.47	0.63
Post marriage family constraints	0.12 (.04)	0.13 (.02)	-0.07	0.94
Source: Based on field survey				

p ***<0.01 and the figures in parentheses indicate robust standard error.

Factors determining the decision to pursue engineering –controlled for reserved category

Controlling for the category, the t-test revealed significant differences in the educational qualification of the father, and family income. Educational qualification of father reported higher means for unreserved than reserved categories. This is because they are more educated, better informed, and better positioned to influence their ward's decisions. Likewise, family income plays a dominant role for the unreserved category. Since engineering education is costlier than general education, family income must be revisited and considered while pursuing engineering. Since the unreserved have to pay the full amount, and there is no subsidy in fees, it is reconsidered for the decision-making process, unlike their reserved counterparts.

Table 4.2.e: Factors determining the decision to pursue engineering –controlled for the educational qualification of father

Attributes	Educational qualification of the father (higher than high school)	Educational qualification of the father up to high school	t-statistic	P-value
Family income	1.50 (.09)	0.71 (.12)	-4.65	0.000***
Parental desire	1.34 (.09)	1.26 (.15)	-0.44	0.65
Social prestige	1.80 (.10)	1.44 (.15)	-1.90	0.05**
Personal interest	1.07 (.08)	1.16 (.14)	0.57	0.56
Marks	1.19 (.08)	1.30 (.13)	0.65	0.51
Early employability	0.94 (.08)	1.19 (.13)	1.55	0.12*
Teacher's advice	2.16 (.09)	2.03 (.16)	-0.72	0.47
Peer effect	1.63 (.09)	1.33 (.13)	-1.83	0.06*
Sibling education	2.20 (.11)	2.36 (.17)	0.74	0.45
Subject is analytical and practical	1.38 (.09)	1.56 (.16)	1.00	0.31
Post marriage family constraints	0.10 (.02)	0.19 (.04)	-1.95	0.05**
Source: Based on field survey				

p*<0.1; p**<0.05; p***<0.01 and the figures in parentheses indicate robust standard error.

Factors determining the decision to pursue engineering –controlled for the educational qualification of father

Controlling for the educational qualification of the father, the *t*-test revealed significant differences for family income, social prestige, early employability, peer effect, and post-marriage family constraints. There seems to be a positive relation of family income with the educational qualification of the father. The mean for family income is higher amongst those whose fathers' educational qualification is above high school. This implies that family income is an important factor determining enrolment in engineering as they are aware that professional education is a costlier affair. Social prestige is considered an important factor for pursuing engineering amongst those whose fathers' educational qualification is above high school. This indicates that children pursuing engineering enhances social prestige for parents', unlike their counterparts who, because of information asymmetry, may not gauge the importance of their child's decision. Early employability is an essential factor for choosing engineering amongst those whose fathers' educational qualification is lower. Unlike those whose educational qualification of the father is above high school, the purpose of education is not merely a source of employment. Likewise, the peer effect has a higher mean for those whose educational qualification of the father is above high school. This implies that such was the effect of everyone (peers) opting for engineering that it became a vital decision-making factor even amongst those with educated fathers'. Also, the mean being higher in post-marriage family constraints for whose fathers' educational qualification is lower, assuming females working after marriage are not accepted as they are supposed to look after household chores. Consequently, this factor dissuades females from participating in engineering education.

4.2.2 Discussion: Stratified choice

This section attempts to look at the possible factors that influenced the decision to pursue engineering. It also analyses the socio-economic variation of the respondents in the sample set under investigation. When controlled for gender, female students who opted for engineering their fathers' role were an essential encouragement. Family income, social prestige, and post-marriage family constraints had higher means for females than male graduates. Based on the analysis, for those with educated fathers', it is the social prestige, family income, and peer effect that influences the decision. On the contrary, those with less-educated fathers', early employability, and post-marriage family constraints influence the decision to pursue engineering. Further, for those with less-educated father, the descriptive statistics portrays the parental desire besides the early employability as the most important factor to pursue engineering. And the descriptive statistics for those with highly educated fathers' represent the personal interest, marks scored, and the subject characteristics (practical) as the factors influencing the engineering choice (in addition to early employability).

When the income of the household is taken into account, female education is considered to be income elastic. Furthermore, male-dominated fields have a better social status than female-dominated fields (Chatman and O'Reilly, 2004), and educated fathers' are more likely to associate occupational status when a child chooses a discipline. Post-marriage family constraints are understood in terms of what Giddens (1984) refers to as '*dialectic of constraint*.' Choices made by females' would not fructify if there are constraints that stop her from pursuing their career goals. Thus, for females, the choice is most often determined within socially constructed milieu and the imposed limitations given the institutionalization of subject choice at early stages (Chanana, 2007; Velaskar, 2007).

Engineering being a professional course, early employability is one of the pertinent factors behind choosing engineering as a major discipline by both categories of students (Education qualification of father high and low). Engineering as a field is a surer way of uplifting because of direct linkages with the job market. For those with educated fathers' (cultural capital), there is a sense of freedom as their father has income to support their choice. Also, for them the choice is influenced by the social prestige that the discipline entails. Influenced by one's marks scored, and personal interest, as well as the discipline characteristics, conjointly helped them to form their own decisions highlighting a move towards their independent choice making.

4.3 Mismatch in choice of the stream: An analysis of the factors

This is concerning the choice of a particular major within a broader area. In other words, once the decision of opting for engineering as a more comprehensive discipline is resolved, the individual is faced with another round of decision-making in terms of choice of stream within engineering. There is a likelihood of a mismatch in stream selection, i.e., what stream an individual wants to study and what she ended up studying. There could be different possible reasons for this mismatch. The mismatch can be due to low marks scored in the qualifying exam, or it may be the outcome of broader career options in some other stream than the one they wanted to study. Also, the stream mismatch may vary according to gender. Social prestige also leads to mismatches in stream choices.

Table 4.3.a: Mismatch in stream choice and proportion of student's choice restricted due to qualifying rank

	Choice of stream restricted due to qualifying rank		
Mismatch	No	Yes	Total
No	97.78	2.22	180
Yes	2.38	97.62	84
Total	67.42	32.58	264
Source: Based on field survey			

i) Qualifying rank:- Admission in engineering colleges takes place on the basis of entrance examinations, which vary from JEE Advanced to JEE Main to state PET to institutional level entrance examination like BITSAT. Thus, there is an expectation that students may fare better in specific exams, and in particular, they may not. Due to the low qualifying rank in some of these entrance examinations, there is a possibility that one could qualify for the branch they wanted to study. For example, a student would not have performed better at the central level exam but would have fared better in state PET. He would then be in a delusion of making a choice of opting for the stream, and it may happen that because of scoring low at the central level exam, he failed to get the stream he wanted to study. Under this circumstance, some candidates opting for the institution that accepts central examination results may be prioritized. One gives up in terms of opting for the stream he wanted to study and opt for some other stream. This may lead to a mismatch in stream choice due to his low rank scored in the examination. Another possibility could be that a student would have cleared even JEE advanced, but in that case, he might not be getting the branch he wanted to study at the IITs. For example, he wanted to opt for the IIT Madras electronics stream. But not scoring amongst the best ranks would have led him to change his engineering stream and hence a mismatch due to low qualifying rank. Among those who faced mismatch, there is a larger proportion (97.62%) whose cause of mismatch was low rank secured in qualifying examinations.

Table 4.3.b: Mismatch and social prestige proportion

	Social prestige		
Mismatch	Not Important	Important	Total
No	42.78	57.22	180
Yes	39.29	60.71	84
Total	41.67	58.33	264
Source: Based on field survey			

ii) Social prestige:- Amongst those who faced mismatch, there is a larger proportion for who even the choice of different stream within engineering was a matter of prestige (60.71%) for their parents' or sometimes even for the candidates. This indicates that entries to certain government jobs require prerequisite eligibility and training in certain streams in India. It thus points towards the fact that certain jobs are considered prestigious, and to gain entry into some of these jobs, a prospective candidate faces a mismatch in terms of the stream choice. However, social prestige (39.29%) was not an important factor for the mismatch for a substantial proportion. This is because it is not always that they opted for a particular stream because of prestige, but the other factors were more important than the role social prestige entails.

Table 4.3.c: Mismatch and institute ranking proportion

	Classification of Institutions based on NIRF 2018			
Mismatch	Lower-tier	21-40	1-20	Total
No	86.11	10.56	3.33	180
Yes	86.90	4.76	8.33	84
Total	86.36	8.71	4.92	264
Source: Based on field survey				

iii) Institutional ranking:- Amongst those who face mismatch in stream choice, there are a substantial proportion in the case of lower-tier (86.90%) institutes who face mismatch. This indicates that even in institutes not ranked in the top 40, certain state or privately funded institutes have been prioritized by the candidates. For example, NIT Raipur, Maulana Azad NIT did not feature in the top 40 rank institutions but may be a priority for students to pursue engineering. Hence, it may happen that seats in electronic in these institutes are left unfilled. This persuades the prospective candidate to opt for NIT Raipur and choose electronic engineering barring his electrical choice, which he would have pursued elsewhere. This points out that even in lower-tier institutes, the mismatch is a possibility. Also, interesting is that there is a larger proportion amongst those in the top 20 (8.33%) who faced mismatch in choice of stream, unlike those who did not face mismatch (3.33%) and enrolled in top 20 institutes. This points that enroling in the top 20 does not necessarily reflect one's choice of the stream they wanted to study. However, because they were getting admission in the top 20 ranked institutions, they would have compromised their stream choice and hence a mismatch.

Table 4.3.d: Mismatch and wider career choice proportion

	Wider Career choice		
Mismatch	Not Important	Important	Total
No	12.78	87.22	180
Yes	19.05	80.95	84
Total	14.77	85.23	264
Source: Based on field survey			

iv) Wider career choice:- Mismatch in the selection of the stream can also be possible due to more comprehensive career options (80.95%) available in other streams than what the candidate wanted to study. It is a possibility that someone wanted to pursue chemical engineering but could not pursue it because of limited career options one would have to adhere to in the future if he opted for what he wanted to study. This dissuades one from opting for the stream he wanted to study, and because of broader career opportunities available in the case of common stream, there is a possibility of a mismatch in one's choice of stream.

Table 4.3.e: Mismatch and better employability and placement proportion

	Better employability		
Mismatch	Not Important	Important	Total
No	10.56	89.44	180
Yes	10.71	89.29	84
Total	10.61	89.39	264
	Placement		
Mismatch	Not Important	Important	Total
No	10.00	90.00	180
Yes	16.67	83.33	84
Total	12.12	87.88	264
Source: Based on field survey			

v) Better employability/placement:- Among those who face mismatch, a more significant proportion believes that better employability (89.29%) in other streams would lead one to pursue the other stream than the one they wanted to study. It is evidenced that initially, the choice of engineering would have been driven by early employability, and further, even stream choice is influenced by better employment possibilities. For example, somebody would have wanted to pursue electrical engineering, but in India, given limited job opportunities in that stream and the prospective student not finding him/her self enrolled in top 40 institutes, his/her probability of getting a job related to electrical engineering would have severely diminished. Resultantly, he/she would face a mismatch in terms of opting for the stream which would guarantee better employability, such as Computer science/IT, than the one he/she wanted to opt for.

In line with the argument of better employment opportunities, there is a larger proportion amongst them for whom placement (83.33%) was an important reason for the mismatch. This indicates that because placement in certain branches is guaranteed, there is a likelihood of mismatch in the stream choice. Because of better placement opportunities in certain streams in some institutes, the prospective student might face mismatch issues. For example, suppose the placement of mechanical engineering in BITS Pilani is better (giving opportunities for working abroad) than the placement of electronics. In that case, there is a change in one's choice of stream.

Table 4.3.f: Mismatch and stream ranking proportion

	Ranking of the stream		
Mismatch	Not Important	Important	Total
No	25.00	75.00	180
Yes	26.19	73.81	84
Total	25.38	74.62	264
Source: Based on field survey			

vi) Ranking of the stream:- There is a possibility that someone would have got the top institute, but the stream that he wanted to study is not the best ranked in that institute. Under this scenario, it is possible that he might face a mismatch in the stream choice because of the stream's ranking. For example, someone got through NIT Surathkal, but the stream that he wants to study does not yield a better outcome. Thus, it is a possibility that the candidate may give his choice of the stream a miss over the stream ranked higher (73.81%) in that institute.

Table 4.3.g: Mismatch and gender proportion

	Mismatch		
Gender	No	Yes	Total
Female	75.00	25.00	48
Male	66.67	33.33	216
Total	68.18	31.82	264
Source: Based on field survey			

vii) Gender:- Amongst those who face mismatch, there is a larger proportion of males' (33.33%) facing mismatch in choice of stream. This is understood how in certain families when the twin effect of better employability with males pursuing engineering is called for, given his circumstances, he would often opt for the stream with quick returns. Also, considering the family's high expectations, there are fewer chances of him being a risk-taker. This dissuades him from pursuing what he wants and opting for the stream which would yield easy and speedy returns. Likewise, for females (25%), a certain proportion agreed that there was a mismatch in what they wanted and what they ended up studying. This indicates gender stereotyping and stigmas associated with specific jobs related to the stream that dissuade them from taking the stream because of their sexuality.

Having discussed the descriptive statistics for the factors involved, the study would like to model in order to make predictions with respect to mismatch in stream choice.

4.3.1. Specification of the Model

To determine the mismatch between the desired and actual branch of study, the mismatch variable is coded 1 if there is a mismatch or else 0.

Table 4.3.h: Variables and Measures

Sr. No.	Name of the variable	Nature of the variable	Coding of the variable	Type of the variable
1	Mismatch in stream	Dependent variable	1- Mismatch 0- No mismatch	Binary
2	Educational qualification of father	Independent variable	1- Up-to high school or lower 0- Higher than high school	Binary
3	Choice of stream restricted due to qualifying rank	Independent variable	1-Yes 0-No	Binary
4	Wider career choice	Independent variable	1-Very Important/Important 0-Moderately Important/Somewhat Important/Not Important	Binary
5	Better employability	Independent variable	1-Very Important/Important 0-Moderately Important/Somewhat Important/Not Important	Binary
6	Ranking of the stream	Independent variable	1-Very Important/Important 0-Moderately Important/Somewhat Important/Not Important	Binary
7	Social prestige	Independent variable	1-Very Important/Important 0-Moderately Important/ Somewhat Important/Not Important	Binary
8	Institution ranking	Independent variable	0----Lower-tier 1-----21-40 2-----1-20	Multiple

Since the dependent variable is categorical, logistic regression analyses the factors affecting mismatch in the stream choice.

The Model

In the analysis of mismatch in choice of the stream, the model begins with indicators of choice of subject restricted due to qualifying rank, wider career choice, better employment possibilities[31], and branch ranking. The control variable is the educational qualification of the father, followed by others. The model specification is as follows:-

Y= b_0 +$b_1 X$ +$b_2$educational qualification of father[32] +e[33]………………..…… **Model 1**

With Y = dependent variable (Mismatch in choice of stream)

X= a vector of variables (**choice of subject restricted due to qualifying rank, wider career choice, better employment possibilities, and ranking of the branch**)

In Model (2), we add social prestige as a factor that affects engineering choice as a broader discipline.

Y= Model 1+ b_3 social prestige + e…………………………. **Model 2**

In the case of Model (3), we incorporate the institutions.

Y= Model 1 + b_4 institutional ranking + e………………………... **Model 3**

In the case of Model (4)

Y= Model 3 + b_3 social prestige + e……………… **Model 4**

[31] Because of multicollinearity amongst the variables like placement and better income and thus by adding and dropping these variables, the model was best fit by including the variable of better employment possibilities.
[32] This variable is included to find a systemic relationship with the mismatch in choice of stream.
[33] e reflects the error term, which is based on the assumption that the null hypothesis is rejected and the alternate hypothesis is accepted since it has a low likelihood of occurring.

Table 4.3.i: Results of the regression analysis with the dependent variable mismatch in choice of stream

	Model 1	**Model 2**	**Model 3**	**Model 4**
Educational qualification of a father up to high school or lower	-0.93 (1.01)	-1.75 * (1.18)	-0.81 (.921)	-1.69* (1.10)
Choice of subject restricted due to qualifying rank	9.77 *** (2.37)	11.14*** (2.45)	9.77*** (2.28)	11.00*** (2.35)
Wider career choice	1.11* (.66)	1.86* (.96)	1.40* (.76)	1.87* (1.04)
Better employment possibilities	2.35 ** (.96)	1.94** (.87)	2.46*** (.92)	2.02** (.81)
Ranking of the stream	1.73 * (1.29)	1.40 (1.18)	1.59 (1.27)	1.29 (1.25)
Social prestige	-	2.57*** (.812)	-	2.42*** (.820)
21-40 ranked institutions	-	-	-0.28 (.917)	0.08 (.93)
1-20 ranked institutions	-	-	1.68** (.79)	0.81 (.91)
Constant	-9.18 *** (2.56)	-11.30*** (2.76)	-9.51*** (2.55)	-11.19*** (.82)
Pseudo R^2	0.875	0.887	0.878	0.888
Prob>chi2	0.0000	0.0000	0.0000	0.0000
Number of observations	264	264	264	264
Source: Based on field survey				

p*<0.1; p**<0.05; p***<0.01 and the figures in parentheses indicate robust standard error.

4.3.2 Regression analysis with the dependent variable mismatch in choice of the stream

In Model 1, factors affecting the choice of different streams because of which mismatches could arise are added along with the educational qualification of the father as the control variable. The R^2 is 0.8753. The results describe that expectation of facing a mismatch is lower for those whose fathers' educational qualification is lower. This is because fathers' do not have information about the scope of different streams and, in turn, would not impose their choice on the offspring. Due to the lack of guidance, the child opts for the stream they wanted to study, and the mismatch is lower than their counterparts whose fathers' educational qualification affects the choice of stream and leads to mismatches. Also, the choice of the stream subject to restriction due to qualifying rank is statistically significant and positively affects mismatch. Scoring low in the entrance examination is an important factor limiting stream choice and leading to mismatches. Besides, wider career options availability in streams other than the one the candidate wanted to opt for leads to a mismatch. Likewise, better employment probability in some streams influences one's choice. The student opts for the stream with better employment opportunities barring the one he wanted to study, leading to a mismatch in the stream choice. Similarly, the stream's ranking in the college/institute positively influences mismatch.

In Model 2, social prestige is added to capture its effect on the mismatch. R^2, in this case, is 0.8878, which is just slightly higher than Model 1. This is because of an additional factor included in the model to explain its effects on mismatch. Social prestige has a positive influence on mismatches. This is because opting for a particular stream because of the prestige it accrues in the future in terms of job prospects may force one to opt for the stream that they didn't want to study and lead to mismatches in choice of stream.

In Model 3, institutional ranking is controlled for. Unlike those in the top 21-40 ranked institutions, those enrolled in the top 20 are statistically significant and positive. This is because for those who are getting enrolled in the top 20 institutes there is a likelihood that they are giving preference to institute over the stream of study that they wanted to opt for. It is not always necessary that one may get both the stream and the institutions of their choice. This is true for those students who scored high in the entrance exams. However, for others, there is substitutability in terms of one factor, i.e., either stream choice or institute choice. Thus, the result indicates that giving top-ranked institutions a priority implies forgoing one's stream choice. However, for those enrolled in 21-40 ranked institutions, the probability of mismatch is lower. This is because they prefer the stream of their choice and enrolled in 21-40 ranked institutions.

In Model 4, R^2 is 0.8883, which is the highest amongst all the models. This is because of the inclusion of all the control variables together. After controlling for the variables included in the model, social prestige, educational qualification of father, institutional ranking, stream restriction due to qualifying rank, wider career choice, and better employment opportunities are statistically significant.

4.3.3 Discussion: Hierarchy in stream choice

This section pertains to understanding the mismatch in stream choice. Is there a mismatch in terms of the stream that an individual wanted to study but could not pursue? What are the possible factors that affect the mismatch in choice of the stream? The findings indicate that for those who secured low qualifying rank in the entrance examination for them mismatch is inevitable. Wider career choice in a particular stream and better employment opportunities in streams other than the one that graduates wanted to pursue are factors determining mismatch. Social prestige associated with choosing a particular stream also leads to mismatch in stream choice. Additionally, the opportunity to get enrolled in top institutes reflects a mismatch in stream choice in terms of prioritizing the institutional brand.

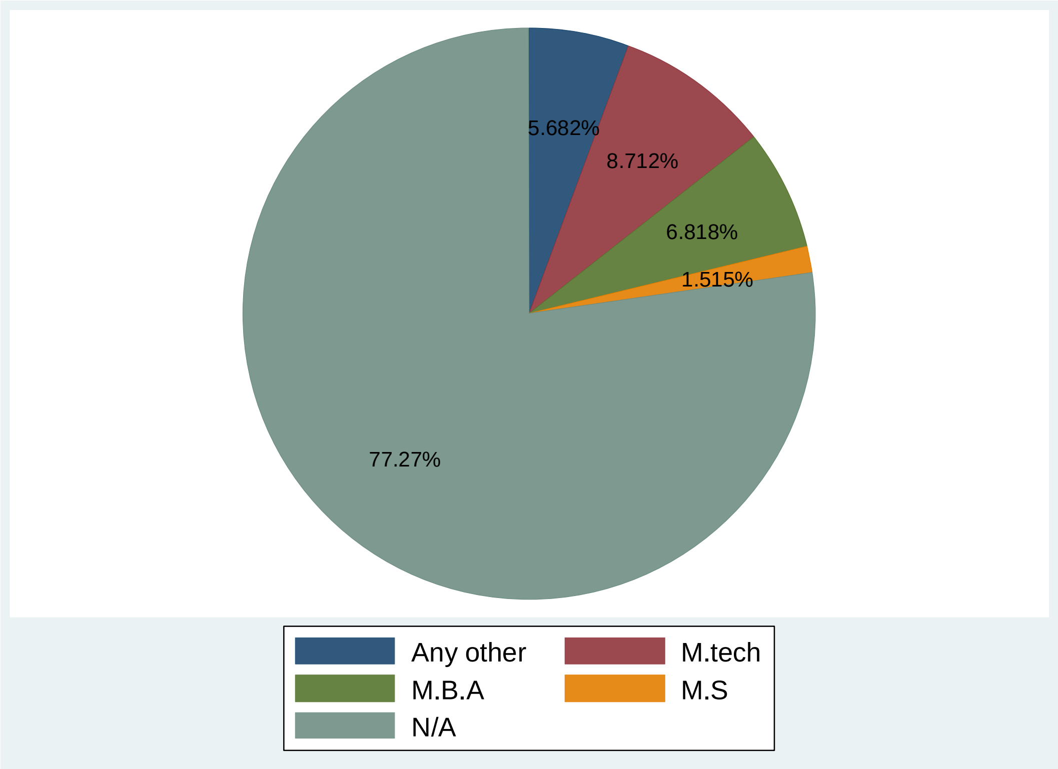
While making stream choices, consumerist behaviour is observed amongst the graduates. Engineers ascribed the choice of the stream to the labour market outcomes. They were choosing a stream that could lead to positive employment opportunities. The choice of the stream was more particularly viewed in the sense of opening up a more comprehensive range of career opportunities that might otherwise be limited if opting for the other stream. There seems to be an internalization of the employability discourse amongst engineers that even while choosing stream within a major, they were particular about its better employment prospects. Mismatch in the choice of the stream may be understood as a '*defensive*' choice (Thurow, 1983) as a means to avoid the otherwise unfavorable repercussions of the labour market, such as work prospects in specific streams being limited.

For those who could compete for the top institutions, the freedom to choose institutions is overpowered by the freedom to choose the product (stream). This is because leading institutions are like brands in the job market, with a high level of prestige. For others, the freedom to choose a provider is limited by one's ability to score qualifying marks in the entrance examinations. It emerges from the data that it sometimes is a matter of prestige when one opts for a major with a more comprehensive vision and is not always short-term. Many jobs in the public sector, such as those related to Bharat Electronics Limited, ONGC, Indian Oil Corporation, NTPC, Bhabha Atomic Research Centre, to name a few, are considered as esteemed ones and use GATE score for selecting students. Thus, this prestige associated with such jobs lures one to look for longer-term rather than something that would yield quick returns. This might lead one to choose a stream that would furnish their dreams of being a part of such organizations and may lead to a mismatch in choosing the streams they wanted to opt for.

4.4 Pursuing additional credential: An analysis

This section illustrates an overall percentage of the sample amongst those who pursued a Masters degree. It determines the emancipation of demand for a Masters degree amongst those from different institutions. It also tries to locate the reason for the addition of credentials amongst engineers.

Figure 4.4: Distribution of additional degree amongst engineers



The figure depicts that most of those who pursued an engineering degree did not seek any Masters degree (77.27%). This is because they might be satisfied with their performance in the job. It also is a possibility that they do not want to go for further studies. In certain circumstances, it is not feasible because of financial constraints.

Amongst those who continued further studies, the largest proportion pursued M.Tech (8.71%) degree. This may be because of their interest in the subject. It may be because of their ambition to pursue research-related activities. It also may be a possibility that they were not satisfied with the job hence continued further studies. It also indicate that because they pursued engineering from low-tier universities, they thought an additional credential would 'stand out' in the market, given engineers' employability. This is followed by those who pursued M.B.A (6.81%) after completion of their engineering degree. It is a possibility that they want to redefine their skills according to the market needs. It is pursued because of the media portrayal of fat salaries that M.B.A's earn. Likewise, a certain proportion of the engineers pursued Masters other than M.B.A or M.Tech or M.S (5.68%). It is a possibility that they might have pursued M.C.A because of their interest in computer applications or probably an M.A. It is possible that they thought an additional degree could outweigh their engineering credibility in the job market if they were having difficulties in the present job. The most negligible proportion amongst the engineers pursued M.S (1.51%). This is because there are hardly 1 or 2 institutes granting the degree and course pursuance in India. What is of further curiosity is the distribution amongst those pursuing Masters across differently ranked institutes.

Table 4.4.a: Proportion who pursued Masters degree across differently ranked institutions

Pursued Masters	**Lower-tier**	**21-40**	**1-20**	**Total**
Any other	86.67	13.33	0.00	15
M. tech	91.30	8.70	0.00	23
M.B.A	83.33	11.11	5.56	18
M.S.	75.00	25.00	0.00	4
N/A	86.27	7.84	5.88	204
Total	86.36	8.71	4.92	264
Source: Based on field survey				

Masters degree across differently ranked institutions

The data reveals that amongst those who were enrolled in top 20 institutions, engineers from those institutions if opted for further study have entered only M.B.A courses (5.56%), and none of them have opted for M.Tech (0.00) or M.S (0.00) or any other specialization. This is because M.B.A has become an additional criterion to differentiate oneself from other like-minded engineers. It is a possibility that they may not have been able to enrol in the top 3 or top 5 engineering institutes. To compete with them in the job market, those from other than the top 5 institutes would emphasise getting an additional credential. It also may indicate that for quick promotion, they would go for an additional degree. Only M.B.A being pursued by them suggests that they align their choices with the industry's demand. They did not pursue any further degree closest to their graduate degree because these top institutes had well equipped them with the necessary training and skills required of them.

What is evident from those who enrolled in institutes ranked in 21-40, the least (7.84%) amongst them did not go for any Masters degree. The largest proportion amongst these pursuing MS (25%) degrees speak volumes about the fact that with intense competition in the job market amongst those from already existing top 20 institutes, they would have considered an option of redefining their skills in a better way by pursuing M.S. Also, since the institutes granting such degrees are relatively less in India, this opens an option for them to move abroad for further studies.

Concerning those who are in lower-tier institutes, the largest proportion has opted for M.tech (91.30%) followed by different specialization like M.C.A or M.A, etc. (86.67%), which is further followed by M.B.A (83.33%) and then M.S. (75.00%). Therefore, what becomes evident is that given the competition they have at hand and being fully aware of one's potential, they are in need of an extra credential to nullify the effect of a lower-tier university. Thus, by pursuing M.tech, they may gain access to a deeper understanding of concepts and a chance to redefine their skills with up-gradation. It is a probability that they want to pursue M.tech out of one's interest. M.S. being the least popular amongst them indicates that their likelihood of going abroad for further studies is dim.

However, what is interesting is that amongst the three classifications of institutes, the largest proportions who are adding further credentials are those from lower-tier institutes. This directs us to delve deeper into the analysis to find out the possible reasons for it.

Importance of attributes amongst those engineers who pursued and those who did not pursue Masters from lower-tier institutes

There are specific candidates who not only pursued engineering but also went on for a Masters. Interestingly, for those who went for Masters, a larger proportion is from lower-tier institutes (87%). This is because, for them, an additional degree is the only differentiation. They would opine that an additional credential would prove to be beneficial given a large number of untrained engineers in the economy. Also, a certain proportion pursuing engineering from institutes ranked in the top 40 (12%) represent that since they couldn't find themselves enrolled in the top 20 engineering institutes, they might as well pursue an additional degree which would pave the way for either going abroad to pursue MS or that they would have better opportunities in the job if added an extra credential.

Table 4.4.b: Institutional Ranking and the proportion who pursued Masters

Institutional Ranking	Masters
1-20 ranked institutions	1
21-40 ranked institutions	12
Lower-tier institutes	87
Source: Based on field survey	

However, the most significant proportion pursuing master amongst lower-tier institutes requires a deeper probe. This would entail a profound understanding of their attitudes to who are pursuing Masters, their job characteristics, and the like. Is there a general pattern in their orientation towards the labour market? Thus, the table below displays a comparison between those from lower-tier institutes who added credentials and those who did not.

Table 4.4.c: Characteristics of engineers from lower-tier institutes who added an extra credential and those who did not (proportion)

Lower-tier institutes		
Attributes	**Additional credential**	**No additional credential**
Male	82.69	82.38
Female	17.30	17.61
Unreserved category	76.92	79.54
Reserved category	23.07	20.45
Educational qualification of father up-to high school	21.15	33.52
Educational qualification of father higher than high school	78.84	66.47

Personal interest an important factor	73.07	68.18
Marks an important factor	71.15	64.20
Subject analytical and practical an important factor	69.23	59.09
Parental desire an important factor	61.53	69.31
Social prestige an important factor	65.38	56.25
Mismatch in choice of stream	19.23	35.79
Centrally funded institutes	17.30	18.75
State-funded institutes	21.15	22.15
Privately funded institutes	61.53	59.09
Satisfaction from the quality of training in engineering	32.69	38.06
Satisfaction from the possibility of using acquired knowledge in practice	38.46	40.34
Satisfaction from updated curriculum	30.76	36.93
Satisfaction from quality faculty	42.30	36.36
Satisfaction from industry-academia linkage	28.84	34.09
Satisfaction from student-professor interaction	46.15	43.18
Satisfaction from an emphasis on passing the exam rather than acquiring skills	46.15	42.05
Large-sized firm	53.84	68.75
Small-sized firm	46.15	31.25
Working in the Private sector	71.15	61.36
Working in the Government-owned sector	28.84	38.63

Work experience less than 1-2 years	50.00	56.81
Work experience 2-5 years	26.92	30.68
Work experience 5-8 years	23.07	12.50
Job satisfaction	80.76	67.61
Source: Based on field survey		

Differences in attitudes and orientation amongst those from lower-tier institutes who added an extra credential and those who did not.

For those enrolled in lower-tier institutes (other than the top 40), a discussion through the cross-tabulation is carried out. The following section discusses the differences in attitudes and orientation amongst graduates from lower-tier universities who added an extra credential and those who did not.

i) Social factors:- A comparison amongst those who pursued Masters after engineering demonstrates that there is an equal percentage amongst males' (82.69%) who opted for a Masters degree in comparison to those who did not pursue a Masters degree (82.38%). Likewise, an equal proportion of females' (17.30) opted for a Masters compared to those who did not pursue a Masters degree (17.61%). Amongst those females' who could not pursue a Masters, it is that household responsibilities[34] have dissuaded them from pursuing higher career options, or they did not have any interest in pursuing it. Their chance of enroling in further education is comparatively lower. However, a substantial proportion of females have opted for Masters. This implies that irrespective of socio-economic concerns, they are interested in pursuing the course. Among males pursuing Masters it indicates that since an engineering degree was identified as a threshold, they need to add credentials to their resume in order to give them a competitive edge (differentiate) over those without Masters.

There is a smaller proportion in the unreserved category that opted for Masters (76.92%) in comparison to those who did not pursue Masters (79.54%). This indicates that the unreserved category may have been satisfied with the job they got after

[34] Or what is discussed in terms of post marriage family constraints in the earlier section.

engineering and would not be facing too much hindrance with the skill utilization and mismatches in the job. It also is a possibility that they are reluctant to go for further studies as their wants might have been fulfilled. Contrariwise, those from the reserved category represent a larger proportion amongst those who pursued Masters (23.07%), unlike those who did not go for Masters (20.45%). This reflects that because of existing reservation policies, they would have got entry to specific institutions. Still, when performance was to be evaluated in terms of job outcome, they may not be finding themselves performing at their best. Hence, it is a possibility that they might want to upgrade their skills for better performance.

Also, interesting here is that for those whose fathers' qualification is lower (21.15%), their probability of doing Masters is low. A larger proportion amongst them is without a Masters (33.52%). This indicates that their concern of getting an engineering degree for employment purposes is fulfilled, and they do not want to invest further in their studies. On the contrary, for those whose fathers' educational qualification is higher, there is a higher percentage amongst them who pursued Masters (78.84%), unlike those who did not pursue Masters (66.47%). This indicates that those whose fathers' were educated did not primarily relate education to employment and would have motivated their child if he/she wanted to invest in further studies.

ii) Discipline Influencers:- The attitude differences amongst those with extra credential portrays that the importance given to personal interest (73.07%), followed by marks (71.15%) and the subject being analytical and practical (69.23%), were the factors that were most significant for them while choosing engineering unlike those who did not add any credential. For them, parental desire (69.31%) was followed by personal interest (68.18%), and marks (64.20%) played a role in the decision to pursue engineering. This indicates that those with an extra credential, choice of subject, were more related to their interest. Simultaneously, the discipline's practicality and the marks scored made the decision an easy one for them. The emphasis on the characteristic of a discipline also played an essential role in their decision-making. On the other hand, the importance given to factors while choosing engineering (amongst those who did not add extra credentials) was parental desire followed by personal interest and marks scored in Class $X^{th}$and XII^{th}. The parental desire for the choice of engineering gives a picture that it is a coerced choice or a choice under information asymmetry and that these candidates were not in a position to exercise their choice vehemently. This is followed by personal interest, which is coupled with marks for the decision-making process.

For those who added extra credentials, it is illustrated from the table that there is a lower proportion amongst those who faced mismatch in stream choice (19.23%) compared to those who did not add any extra credential (35.79%). What has been statistically proven in the previous section is that mismatch in stream choice is an outcome of low qualifying rank or employment probabilities or wider career opportunities in other streams. Low qualifying rank for these students not enrolled in institutes in the top 40 (lower-tier) is a reason for mismatch in stream choice. However, amongst these candidates, a larger proportion facing mismatch and falling in the category of not adding extra credential is because of employment or wider career options in other streams, unlike those with an additional credential. This implies that Masters students are much clearer about what they want to achieve and pursue accordingly, hence a lower mismatch. For them, Masters is an addition to their skill by specializing in the course.

iii) Institutional Factors:- There is a comparatively smaller proportion amongst those who completed engineering from Central (17.30%) and State (21.15%) universities and went on to pursue Masters degrees than those who did not pursue Masters (18.75%- Centre and 22.15%- State). Contrariwise, there is a larger proportion amongst those who pursued engineering in privately funded institutes and went on to pursue Masters (61.53%) in comparison to those who opted for engineering from privately funded institutes and did not pursue Masters (59.09%). This is because those in state and centrally funded institutes are better qualified in jobs, unlike those from privately funded institutes. Quality in privately funded institutes has been subject to criticism, and this has been evidenced by constant complaints from employers about a large number of engineers lacking basic programming skills. Thus, for some engineers in privately funded institutes who pursued Masters, it reflects that they needed up-gradation of skills. There is a possibility that they are dissatisfied with the job compared to their satisfied counterparts and are more competitive and wanted to add an extra credential thinking it would benefit them compared to those with only engineering degrees. For central and state-funded institutes those pursuing Masters, it is a possibility that they would gain diverse skills. Likewise, it is evident that for those enrolled in centrally funded institutes, there is a lower proportion amongst them who pursued Masters in comparison to those who did not pursue Masters. This is because they have received the best training that the institutions could provide. However, those in state-funded institutions represent a larger proportion amongst those who pursued Masters to those who did not pursue Masters. This point towards that they are equally good in their job performance and would not be facing difficulties in their job, but to be better off, they have pursued a Masters.

Factors affecting satisfaction from studying in a chosen institute are taken into account amongst those with an extra credential. The data indicates that the satisfaction is least from industry-academia linkages (28.84%) followed by suitability and up-dation of the curriculum (30.76%) and the quality of training (32.69%). For those without an extra credential, the satisfaction is least from industry-academia linkages (34.79%), quality faculty (36.36%), and suitability and up-dation of the curriculum (36.93%). This indicates that their satisfaction from factors related to implications in the job market is low. Due to higher dissatisfaction from these job implications factors, there is a likelihood of improvising by adding to their existing credential. It demonstrates that although the institutes they attended for acquiring engineering degree has the same dissatisfaction parameters, it is a difference in attitudes and orientations of individuals amongst these low-tier institutes that they go on to earn further credentials.

iv) Job-Related Factors:- Amongst those with an extra credential, there is a smaller proportion working in large-sized firms (53.84%) in comparison to those without extra credentials (68.75%). This is because in a large-sized firm, the work that an individual is assigned is too specific due to the division of labour. Contrariwise, a larger proportion amongst those with an extra credential (46.15%) is found in small-sized firms compared to those who do not have an addition of credentials (31.25%). This indicates that those with extra credentials working in small-sized firms are adaptive to the different types of jobs they are assigned to. They want to learn and add to one's skills and knowledge. This point towards the fact that in a small firm, there is not just a requirement of specialized skills but diverse skills are required because the number of employees is small and is required to do a plethora of work.

Among those working in private firms, a larger proportion of them pursued Masters (71.15%) than those who did not pursue Masters (61.36%). For those working in Government organizations, there is a smaller proportion amongst them who pursued Masters' (28.84%) in comparison to those who did not pursue Masters (38.63%). This is because those who gained entry into government organizations after completing engineering are not willing to leave their jobs. These jobs are limited in number, and access to these jobs is not easy and is a prestigious one. On the contrary, those working in private firms were large in number, and to gain an advantage over others they needed to upgrade to compete in the job market.

For those whose work experience is less than two (50%) or less than five years (26.92%), their probability of pursuing Masters is lower in comparison to those who did not pursue a Masters degree (56.81% and 30.68%). Among those with higher work experience, a larger proportion pursued Masters (23.07%) compared to those who did not do Masters (12.5%). This indicates that opting for a Masters is more related to one's career evolution. With the increase in work experience, they are in need to add more to their credentials to prove their competence. Amongst those with lesser work experience representing a lower proportion of those pursuing Masters. It indicates that they want to gain experience in the job market. Only when one experiences stagnant growth in their profession or realizes a slow change in their career, they opt for a Masters.

Further, it is displayed that job satisfaction is higher (80.76%) amongst those with extra credentials compared to those without an additional credential (67.61%). This indicates that the addition of credentials has benefitted them in their job choices.

Having discussed the descriptive statistics for the factors involved, the study would like to model in order to make predictions with respect to those graduates from lower-tier institutes who pursued Masters.

4.4.1 Specification of the Model

To find out the difference between those who did Masters and those who did not pursue Masters from lower-tier institutes, the Masters variable is coded 1 if they have pursued Masters or else 0.

Table 4.4.d: Variables and Measures

Sr. No.	Name of the variable	Nature of the variable	Coding of the variable	Type of the variable
1	Masters with engineering	Dependent variable	0- No 1-Yes	Binary
2	Gender	Independent variable	0-Female 1-Male	Binary
3	Category	Independent variable	0-Reserved 1-Unreserved	Binary
4	Educational qualification of father	Independent variable	0-Completed Bachelors/Post Graduate 1-Up-to High school/Diploma	Binary
5	The subject is analytical and practical	Independent variable	1-Very Important/Important 0-Moderately Important/ Somewhat Important/Not Important	Binary
6	Mismatch in choice of stream	Independent variable	1-Yes 0-No	Binary
7	Quality faculty	Independent variable	1-Very Satisfied/Satisfied/ Moderately Satisfied 0- Dissatisfied/Very Dissatisfied	Binary
8	Industry academia linkage	Independent variable	1-Very Satisfied/Satisfied/ Moderately Satisfied 0- Dissatisfied/Very Dissatisfied	Binary
9	Work experience	Independent variable	0-less than 1and up to 2 years 1-2-5 years 2-Above 5 years and up to 8 years	Multiple
10	Size of the firm	Independent variable	1-Above 5000 employees 0-Less than 5000 employees	Binary
11	Type of workplace	Independent variable	1-Private/Self-employed 0-Government	Binary

Since the dependent variable is categorical, logistic regression is used to analyse the factors affecting the choice of pursuing a Masters.

The Model

In the analysis of engineering with Masters, the model begins with indicators of the subject is analytical and practical, mismatch in choice of stream, quality faculty, industry-academia linkages, sizes of firm, work experience, and type of workplace with as control variable being category, educational qualification father and gender. The model specification is as follows:-

Y= b_0 $+b_1X$ $+b_2$ category+ b_3 educational qualification of father + e………………**Model 1**

With Y = dependent variable (Engineering with a Masters degree)

X= a vector of variables (**the subject is analytical and practical, mismatch in choice of stream, quality faculty, industry-academia linkages, size of the firm, work experience, type of workplace**)

In Model (2), we add gender as a control variable

Y= Model 1+ b_4 gender + e………………………….**Model 2**

Table 4.4.e: Results of regression analysis with dependent variable engineering with Masters

Attributes	**Model 1**	**Model 2**
Male	-	0.15 (.46)
Unreserved	-0.71* (.43)	-0.70* (.43)
Educational qualification of a father up to high school or lower	-0.66* (.39)	-0.67* (.39)
Subject analytical and practical an important factor	0.60* (.38)	0.60* (.38)
Mismatch in choice of stream	-0.85** (.38)	-0.86** (.38)
Quality faculty	0.52 (.41)	0.54* (.41)
Industry academia linkage	-0.68*	-0.71*

	(.44)	(.45)
Private sector	0.40 (.41)	0.40 (.41)
Large sized firm	-0.62* (.36)	-0.61** (.36)
Work experience 2-5 years	0.12 (.40)	0.10 (.40)
Work experience 5-8 years	0.90** (.46)	0.88* (.46)
Constant	-0.71 (.63)	-0.84 (.75)
Pseudo R^2	0.091	-0.091
Prob> chi^2	0.019	0.025
Number of observations	228	228
Source: Based on field survey		

p*<0.1; p**<0.05 and the figures in parentheses indicate robust standard error.

4.4.2 Regression analysis with dependent variable engineering with Masters

The above table displays the regression analysis of engineering with a Masters degree amongst those from lower-tier institutes. In Model 1, the factors affecting the probability of pursuing Masters are added along with variables relating to the category and educational qualification of the father. The model represents that only 9.10% of the engineering with Masters degrees differences can be explained by the model's variables. The R^2 seems to be a little low, but one should consider the group's homogeneity in terms of the different lower-tier institutions they were enrolled in. This is possibly because the factors included are diverse, ranging from individual and socio-economic characteristics to institutional factors and job characteristics which represent different stages of one's career progression.

There is a significant negative effect amongst those who are from the unreserved category. This implies that these unreserved have access to social and cultural capital at their disposal which acts as a catalyst for them, and they gain entry to specific positions. Also, whose fathers' education qualification is lower, there is a negative effect of pursuing a Masters after engineering. This is because those whose fathers' qualification is at low levels do not attach significance to further studies. Those students who opted for engineering because of its disciplinary characteristics are at this stage opting for Masters. This reflects that they are adaptable and flexible to an understanding of what is required in the market. Further, those who pursued Masters, for them mismatch in choice of the stream, were lower. This implies that these students reflected an independent approach and were firm in what they wanted to pursue. Likewise, amongst those who pursued a Masters, it is evidenced that faculty quality during the engineering stage was satisfactory. However, it is interesting that their dissatisfaction was higher from industry-academia linkages. This weak linkage of the industry with academia in the engineering stage forced them to readapt to the industry's requirements, and they pursued Masters. Those working in large-sized firms had a lower probability of pursuing a Masters. Similarly, those with higher work experience had a significantly higher chance of pursuing a Masters than their counterparts. This is because of saturation achieved in the area of their specialization. Also, this implies that they require progression in their career, and pursuing Masters would help in achieving it.

In Model 2, gender acts as a controlled variable. The expectation of males pursuing Masters is positive in comparison to females. This is true because of the structural issues related to female education. However, with the inclusion of gender, there is hardly an improvement in R^2, which implies that enroling for Masters at this stage is more of an independent decision, and gender has a minimal role to play. Thus, it can be argued that the agency has a more prominent role to play at this stage of one's career.

4.4.3 Discussion: Job competition

In this section, the study attempts to understand the issue of opting for a Master degree. Engineering is a market-oriented course and is mainly pursued because of quick returns from the job market due to early employability. The data represents that some are opting for Masters and some are joining work after the completion of Bachelors. The study analyses who all are doing Masters when they could enter the job market after completing engineering course. Masters degree gives more skills, and there are possibilities that graduates want to pursue because of interest in the subject or want to pursue Ph.D. But given early employability a concern, why are graduates not taking up jobs? Who are doing Masters and who are joining the job market?

The findings indicate an apparent paradox. Engineers from top-ranked institutions had more competence to do Masters because they were supposed to be the best students (competence-based on GATE scores) instead they joined the job market, but the graduates from lower-ranked institutes were not entering the job market they are doing Masters. The findings indicate that amongst those graduates from lower-tier institutes it is evident that those whose fathers' qualifications were lower, their likelihood of pursuing Master was less. Through the analysis, it is observed that graduates who opted for engineering because of disciplinary characteristics go for Masters. For those who faced mismatch in stream choice, there was a lesser likelihood of choosing Masters. Those with higher work experience and dissatisfaction with the weak linkages between industry and academia are pursuing Masters. It is evidenced that gender has a limited role to play amongst those who pursue Masters from lower-tier institutes.

At this stage, it is apparent that choice is 'individualistic,' and the decision determined by social structures seems to be fading away. The job they land into after passing out from low ranked institutions (dissatisfaction with the linkages) and salary is not lucrative at all, so they think that after Masters they get more time, will gain specialization, and enter the job market with a better pay scale, so there is a possibility of postponing entry into the job market because it is not lucrative for them. The addition of credentials is perceived as giving an advantage to individuals over others and thereby positions them against others to access jobs. They need to keep upgrading in order to compete in the job market. They had to add something *extra* to their graduate profile to leverage over time the mobility in the labour market. They appeared to be adaptive and flexible in their careers; correspondingly, they seem to be managing their employability. The addition of credentials was seen as negotiation by the individual through one's agency and resources at one's disposal.

Job competition theorists argue that workers compete with each other for jobs that offer differential earnings, unlike human capital theorists who say that workers with differing levels of human capital compete with each other over wages. Thurow (1983) argues that educational expansion may not be perceived as a need for qualified personnel but due to increased expectations by prospective students. Thus, from this view, education is argued to be a ‘defensive necessity’. With the increase in labour supply, individuals try to improve their current educational levels to preserve their present income positions. If they don’t, it would be difficult for them to survive in this cut-throat competitive market. It is a need of being caught in the competitive race to keep one ahead in the job market. On the contrary, what can be said for those without extra credentials is that they are passive in their approach, and work is a means to an end (achieving a future income), expecting a return from investment in education. They are the ones who, despite viewing limited opportunity structures in the labour market, are not willing to expand their ‘horizons of action’ (Hodkinson *et al*., 1996).

4.5. Conclusion

It is clear from the findings of the investigation that there are many factors involved in the decision-making process. The more significant questions that the study tries to decipher are indeed striking. It argues that decision-making in the Indian context is not individualistic at the UG level, but at a higher level it is. Thus, decision-making is informed by a multitude of factors acting together and against each other, culminating in a final choice. It also discusses who all are pursuing Masters if early employability remains to be the concern. The point of contention is not the soft skills, but given the variation in quality, it is more about what ‘hard skills’ one has gained in one’s study duration. However, through controlling factors, the effort is directed to find a generalizable pattern of choice-making among engineers.

CHAPTER 5: INFORMATION, CHOICE, AND EVALUATION OF INSTITUTIONS

5.1 Introduction

The preceding chapter discussed the factors affecting the choice of engineering and the distortions in making stream choice. It also elaborated on the decision by those from lower-tier institutes to take up Masters in the later period. The present chapter deliberates upon the choice of an institute for pursuing an engineering education. The specific research questions discussed in this chapter are: What are the different sources of information used while making institution choices? Can sources of information collected be a reflection of one's situational characteristics? What are the factors that determine the decision of selection of institutions? What are the factors that affect the satisfaction/dissatisfaction amongst institutes of different ranking?

Once the predisposition stage of choosing the product (engineering and choice of different streams) is done away with, individuals are expected to be engaged in search of institutions. Information sources for choosing an institute may reflect one's personal and situational characteristics. The study identifies the various sources of information that one collects to make a final choice of the institute. It also tries to seek how the information gathered varies according to the qualification of the father of the individual. Further, how the issue of the different sources of information one resorts vary according to the institute's funding, is reflected upon.

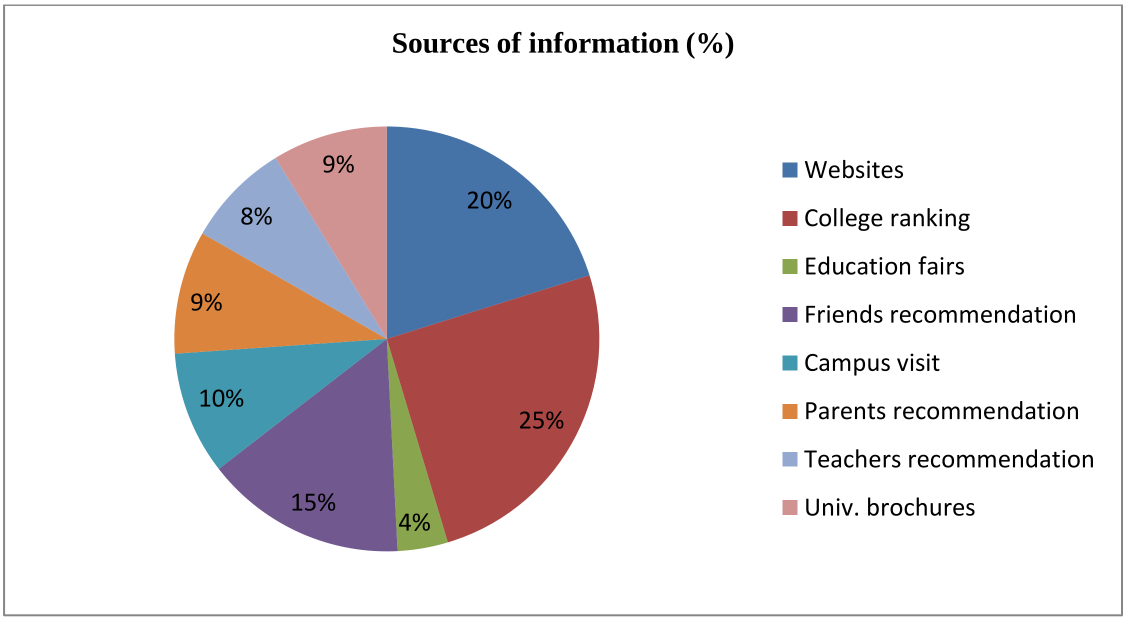
At the choice stage, the factors that affect the final choice of an institute are detailed. However, the choice of an institute is not a one-way process. Both institutes and students choose each other. The students select the institute and based on that the institutes select the students and generally based on objective criteria or admission policy, the institutions' selection prevail upon. In top-ranked institutes, student choice is limited by one's ability to secure good marks in the entrance examination. These entrance examinations play a crucial role in determining one's career as job seekers emphasize the brand of the institutes. Thus, higher the marks scored by one in the qualifying examination, the higher the chances of one being admitted to a top-tier institute. Anyhow, this section deliberates upon the various factors taken into consideration while making institutional choices. Later, by controlling certain factors, a t-test and one-way analysis of variance (ANOVA) are carried out. The study tries to locate the differences between the various factors that affect engineering choice among those from different tier institutes and how the factors vary according to gender or differential family income is reflected upon.

After discussing the choices concerning different sources of information and selecting institutions, this chapter evaluates one's satisfaction from studying in these institutes. Since the study was conducted in a retrospective manner, the justification for including this section falls therein. Now that the engineers are in the job market, they are better positioned to evaluate the degree of satisfaction/dissatisfaction from studying in these institutes. Thus, through their assessment, the study locates the reasons for complaints about lower quality engineers being churned out.

5.2 Sources of Information

Gathering information through different sources is primarily a universal task undertaken by most students while contemplating the choice of higher education institutes'. Hence, the following graph depicts the relative importance of the different search engines catered to by the candidate while making choices of institution. This comprises the search stage (2^{nd} stage). The graph illustrates the relative importance of the different information sources.

Fig: 5.2: Relative importance of the sources of information



The figure represents the different tools of information that are resorted to by the students. What is indicative is that ranking is identified as the most important source of information dissemination. Ranking (25%) of a university is a tool that helps one gauge the performance of the institutes. Websites (20%) also convey certain information that is not easy for one to gather. Specific inquiries that one would want to delve into might be addressed via visiting the institute website. In certain circumstances, the website might serve as an advertisement tool to attract a prospective buyer. For some, even a recommendation by friends (15%) is considered an essential source of information. This may be true because when information does not flow freely and the age at which one is forced to make a career decision, one resorts to all kinds of information one has access to. Campus visit (10%) is not a very prevalent source of information in Indian institutes. Sometimes, even entry to certain campus premises may be restricted, limiting the scope of such sources of information. In certain instances, even parents' (9%) play a role in information spread. It is that educated parents' have access to information because of their existing social or cultural capital, which is helpful for the child's better future. In most Indian families, parents' often take decisions as it is argued that the child is not aware of the outcome of his choices because of existing information asymmetries. University brochures (9%) do play a role in the spread of information. But in the age of websites and rankings, its role as dissemination of information is relatively diminished. Some students also resort to teachers' (8%) for their recommendation for gathering information about certain institutes. This is a possibility among those who possess minimal knowledge or may not have access to other information sources. It also is a possibility that some bright students belonging to low socio-economic backgrounds might give importance to teachers' recommendations as an efficient source of information. In certain circumstances, the teachers' recommendation serves as additional information when the other sources do not suffice or there are concerns with the authenticity of the information. Lastly, educational fairs (4%) may disseminate additional details about certain institutes that otherwise are not accessible or publicized elsewhere.

Further, it can be argued that the importance given to the different sources of information that one relies upon varies according to one's socio-economic background or the type of institute that one chooses to opt for. The study now attempts to estimate the relative difference amongst the different sources of information that one caters to while contemplating the institute decision by accounting for the difference between one's educational qualification of father and the type of institutions one lands into.

Table 5.2.a: Educational qualification of father and reliability on different sources (proportion)

	Educational qualification of the father	
Sources of information	**Educational qualification of father is lower**	**Educational qualification of father higher than high school**
Websites	26.92	73.07
Rankings	28.31	71.69
Educational fairs	26.08	73.91
Friends' recommendation	32.29	67.71
Campus visits	25.86	74.14
Parents' recommendation	22.03	77.96
Teachers' recommendation	22.00	78.00
University brochures	22.22	77.78
Source: Based on field survey		

5.2.1 How the sources of information collected vary according to the educational qualification of the father

Among those engineers whose educational qualification of the father is lower, their reliability on friends' recommendation (32.29%) is highest amongst the different sources of information that one resorts to. It is because, at the earlier stages, peer effect played a significant role in engineering choice as a broader discipline amongst these students' categories. It is a possibility that their reliability on friends' recommendation is higher in this phase too. Thus, in the absence of social or cultural capital, the most reliable sources are friends' recommendations followed by websites (26.92%) and rankings (28.31%). Websites have become a significant information source in present times. It is an easy way out for gathering information. Rankings give information regarding the performance of institutes that one is looking for. Also, for this category, information through educational fairs (26.08%) is of significance.

Further, in the absence of a literate father, their priority is lower on one's parent's recommendation (22.03%). Because their parents' are not literate, one does not consider them an efficient source of information. Similarly, teachers' recommendation (22%) is not considered a viable source of information. University brochures (22.22%) do not play their part in the era of website and rankings. Also, just obtaining a degree is essential; hence visiting campus (25.86%) for gathering information does not occupy a prevalent space in information dissemination.

On the contrary, in the case of those whose fathers' qualification is higher, the teachers' recommendation (78.00%) is given its undue importance. For them, the information dissemination on the part of teachers' has an active role to play. Likewise, parents' recommendations (77.96%) and university brochures (77.78%) are considered essential information sources. Having literate parents' have social and cultural capital advantages, which serve as a critical information flow. Also, the reliability of university brochures is high. What it indicates is that for those falling in this category, their reliability on the first-hand sources of information is relatively higher (Teachers' recommendation, parents' recommendation, university brochures) than on the external sources like websites (73.07%), rankings (71.69%), educational fairs (73.91%) and friends' recommendation (67.71%). Relevant search flows were found to be neither rational nor irrational because they were framed by diverse persons' perspectives——by "the social, cultural and geographical position from which they view the world" (Hodkinson, 1998:160).

Table 5.2.b: Different sources of information and institutional funding (proportion)

	Institutional funding		
Sources of information	**State**	**Central**	**Private**
Websites	18.46	23.08	58.46
Rankings	15.66	23.49	60.84
Educational fairs	4.34	8.69	86.95
Friends' recommendation	17.70	18.75	63.54
Campus visits	13.79	8.62	77.58
Parents' recommendation	18.64	16.95	64.41
Teachers' recommendation	20.00	26.00	54.00
University brochures	12.97	16.67	70.37
Source: Based on field survey			

How the sources of information collected vary according to institutional funding

For those enrolled in central or state-funded institutes, the highest proportion amongst them have relied on teachers' recommendations (26%-central and 20%-state) as a primary source of information to choose a university/institute. In privately-funded institutes, teachers' recommendation (54%) as a source of information is the least important factor compared to the different sources of information. This emphasizes the importance of teachers' as information sources possess credible details on institutions. Likewise, the least resorted information source for those enrolled in centrally funded institutes is educational fairs (8.69%) and campus visits (8.62%). And there is an emphasis on the use of ranking (23.49%) and website (23.08%) as a source of information. What is of more significance for them is the reliability on the ranking of the institutes. Thus, it can be argued that in government-funded institutes, the authenticity of information is not questionable, and reliability on such sources is higher. Therefore, by relying on websites and ranking, one gets the additional information one is seeking for.

Contrariwise, reliability is the highest on educational fairs (86.95%) and campus visits (77.58%) as a source of information for those enrolled in privately funded institutes. For those enrolled in privately funded institutes, campus visits serve as an essential source of information dissemination as they are paying more than their counterparts in central and state-funded and thus demand better amenities. Hence, campus visits give them a feel of the amenities one would enjoy after enrolment. Also, a more significant proportion considering educational fairs as information spread emphasizes the role of advertisements undertaken by universities. For some privately funded institutes, educational fairs serve as a platform to publicize their institutes and gather public attention. Not only the teachers' recommendation (20%) but websites (18.46%) and parents' recommendations (18.64%) are the most commonly used sources of information amongst those enrolled in state-funded institutes.

5.2.2 Discussion: Information asymmetry

This section was attributed to understanding the different sources of information that individuals rely on while deciding to choose an institute for pursuing engineering. It also attempts to understand if sources that one relies on vary according to fathers' qualifications and institutional funding. The findings indicate that ranking of the institute, website, and friends' recommendation are the three most important sources of information. In the internet age, campus visit is less likely to be undertaken. Based on the analysis, for those whose fathers' qualifications are lower, reliability is greater on website, ranking, friends, and educational fairs. For those enrolled in centrally funded institutes, the reliability on ranking, websites, and teachers' recommendation is greater.

Rankings are measured at global, national, and at the local level. Because of limited proximity to institutions, the ranking agency sometimes misleads the gullible students seeking admission to specific institutions. Website plays a vital role in determining choice because most of the information is available there. By way of their designs and color, websites appeal to the graduates, and essential information gets suppressed. Friend recommendations play a more prominent role than those of parents' and teachers' as sources of information reveal how it is not just in the 1st stage (peer effect) while making engineering choices as well as while making institution choices friends have an integral part to play. The sources one resorts to may not be efficient because of information asymmetries existent in the education market. Because education is an experience good (Teixeria *et al*., 2004), the genuine judgement of the quality of education obtained can only be made after an individual has gone through the educational process. Therefore, choices made by students are more likely to be distorted.

Further, for first-generation learners, parents' do not constitute reliable sources because of their limited understanding of decision-making for career. Unlike those whose fathers' qualifications are higher, their reliability on parents' and teachers' as information sources is greater. This is because of the cultural capital at their disposal that gives one the confidence to rely on them. According to Menon (2004), high socioeconomic students may have more access to information, whereas low socioeconomic students are more inclined to participate in the search process.

For those enrolled in centrally funded institutes, relying on a campus visit or gathering information through educational fairs is not required because of the reputation attached to the institute. For those in state-funded institutes, reliability is highest on teachers' recommendations followed by parents' recommendations, and websites. For those choosing privately funded institutes, information reliability is lowest on teachers' recommendations and highest on educational fairs followed by campus visits. Expectations are not realized after the experience of education from low-quality institutes.

5.3 Factors affecting the choice of institution

The choice of an institution is an important career decision undertaken by students. The choice of the product (subject choice) and the provider (institute) are influenced by different factors. It is the interplay of the various factors that affect the final selection of an institute. Through cross-tabulations, the study initially tries to identify the important factors[35] considered while making institution choices. Later, by controlling for certain factors, the study identifies the significant factors that affect the choice of an institute.

Table 5.3.a: Institute ranking and Fees (proportion)

	Fees		
Type of institution	Not Important	Important	Total
Lower-tier	28.51	71.49	228
21-40	34.78	65.22	23
1-20	46.15	53.85	13
Total	29.92	70.08	264
Source: Based on field survey			

i) Fees:- Amongst those engineers for whom fees was an important factor while deciding to enrol in institutes, there is a larger proportion of engineers amongst all the three classifications of institutes (71.49%-lower-tier; 65.22%-21-40; 53.85%-1-20 ranked institutions). There is a considerable proportion even in the case of top 40 institutes; this is because when it comes to fees, it forces one to think that enroling in some of the top institutes, fees which comprise the largest share of the cost of education needs to be considered in the choice-making process. However, within the classification of institutions, the largest proportion for whom fees have a significant role is those who were admitted in the lower-tier institutes, which requires a deeper

[35] The factors for which larger proportion did not consider it as an important factor is included in the appendix.

analysis. Therefore, the following table determines the possible reasons for giving significance to fees amongst those enrolled in lower-tier institutes.

Table 5.3.a.i: Fees as an important factor, and simultaneously studying in lower-tier institutes

Factors	**Proportion**
Family income 2-5 lakh (annually in Rs.)	45.12
Family income 5-8 lakh (annually in Rs.)	25.00
Family income 8 lakh and above (annually in Rs.)	29.88
Early employability an important factor for choosing	89.63
Early employability, not an important factor	10.37
Reserved category	21.34
Unreserved category	78.66
Centrally funded institutes	17.68
State-funded institutes	23.17
Privately funded institutes	59.15
Source: Based on field survey	

The table indicates a larger proportion within this category [36] among those who belong to the lower-income group[37] (45.12%). Also, a larger proportion of them belong to the unreserved category (78.66%), and simultaneously larger proportion enrolled in privately funded institutes (59.15%). Hence, it is a possibility that these unreserved students do not avail of any kind of scholarship because of reservation policies. Fees become an important criterion as a large proportion (45%+25%) live under an annual income of Rs. 8 lakhs or less (70%). Also, the indication of a larger proportion belonging to lower family income and fees being a consideration depicts an effort by them to benefit from the early employability factor of choosing engineering by paying higher fees. The outlook on early employment is robust

[36] For whom fees was an important factor and who studied in lower-tier institutes.
[37] Annual income Rs. 2-5 lakh.

(89.63%). It may be that fees are important, but the expectation of early employability outweighs the cost because of expectations from the job market.

Table 5.3.a.ii: Fees and annual family income proportion

	Annual family income (Rs.)			
Fees	Rs. 2-5 lakh	Rs. 5-8 lakh	Rs.8 lakh and above	Total
Not Important	31.65	27.85	40.51	79
Important	41.62	25.95	32.43	185
Total	38.64	26.52	34.85	264
Source: Based on field survey				

Further analysis of fees with the family income is probed. Amongst those for whom annual family income was less than Rs. 5 lakh, there is a more significant proportion for whom fees was an important criterion (41.62%), followed by those whose annual family income was Rs. 5 to 8 lakh (25.95%) and Rs. 8 lakh and above (32.43%). However, a certain percentage whose family income is less than Rs. 8 lakh and fees was not an important criterion. An inquiry into this is carried out in the following table.

Table 5.3.a.iii: Fees, not an important factor, and family income less than Rs. 8 lakh

Factors	**Proportion**
Early employability an important factor for choosing engineering	89.36
Early employability, not an important factor	10.64
Centrally funded institutes	25.53
State-funded institutes	19.15
Privately funded institutes	55.32
Campus placement an important factor	76.60
Campus placement, not an important factor	23.40
The credibility of the institution an important factor	72.34
The credibility of the institution, not an important factor	27.65
Parental desire an important factor	59.57
Parental desire, not an important factor	40.42
Social prestige an important factor	63.83
Social prestige not an important factor	36.17
Source: Based on field survey	

This table indicates a larger proportion in this group for whom early employability (89.36%) is an important criterion for choosing engineering as a broader discipline. Also, belonging to the low-income category does not sway them from enroling in privately-funded institutes (55.32%) even if they could not find themselves enrolled in Government-funded institutions. Likewise, there is a larger proportion amongst them for whom enroling in these institutions was based on the importance given to campus placement (76.60%). They are more concerned about the credibility of the institution (72.34%) and their employability after graduation. Also, a larger proportion had desirability from parents' (59.57%) about choosing engineering, and in most cases, it was a matter of social prestige (63.83%) that the child was pursuing engineering. This mainly indicates the higher expected return that would accrue to one after completion of their engineering degree. Hence, data suggests that expectations of returns outgrow their expenditures over a period of time, and therefore, fees are not considered important while choosing an institution in the present time.

Table 5.3.b: Institutional ranking and distance from home proportion

	Distance from home		
Type of institution	Not Important	Important	Total
Lower-tier	53.07	46.93	228
21-40	56.52	43.48	23
1-20	76.92	23.08	13
Total	54.55	45.45	264
Source: Based on field survey			

ii) Distance from home:- Regarding the factor concerning distance from home is considered, there is an obvious outcome. There is a larger proportion amongst the engineers for whom distance was not important while deciding to enrol in all the three categories of institutions. But what is noticeable here is that for a specific group, the distance of institution from one's hometown plays an important role even among those enrolled in top 40 institutions (23.08% in 1-20 and 43.48% in 21-40). Those enrolled in lower-tier institutions distances from hometown playing a role can be understood in terms of cost of living, fees, etc., because expectations relatively may not be too high. But what is of curiosity is that those enrolled in the top 40 have distance as a factor to be considered. This is dealt with in the following table.

Table 5.3.b.i: Distance from home an important factor and studied in top 40 institutes

Factors	**Proportion**
Family income Rs. 2-5 lakh (annually)	7.69
Family income Rs. 5-8 lakh (annually)	30.77
Family income Rs. 8 lakh and above (annually)	61.54
Campus placement an important factor	100
Campus placement, not an important factor	0
The credibility of the institution an important factor	100
The credibility of the institution, not an important factor	0
Teachers' credential an important factor	92.31
Teachers' credential not an important factor	7.69
Source: Based on field survey	

The analysis shows that there is a larger proportion amongst them who belong to a higher family income group (61.54%). Hence, income may not be a reason for considering distance as an important criterion for most of them. However, the fact that almost all of them belonging to this group prioritized campus placement (100%) and credibility (100%), as well as the quality of teachers' (92.31%), is of utmost importance. Suppose a combination of it is found near their hometown. In that case, this section prefers an institution closer to their proximity fulfilling these criterions rather than opting for an institute at a considerable distance from their hometown. For example, someone staying in Kanpur got through both IIT Kanpur and IIT Delhi. But since he can get the same combination[38] at Kanpur, he would prefer IIT Kanpur because of its closer proximity to home. Although he would compromise with his preferred institution, the distance is important given the role of other factors. In some instances, they might prefer stream over institutions. It could be that he got the stream

[38] In terms of teachers' credential, credibility and placement.

he wanted at the IIT Kanpur than what he wanted at the IIT Delhi; hence, the distance becomes a consideration in the decision-making process. It also implies that one expects to look at one's convenience if choices are available.

Table 5.3.c: Institutional ranking and teachers' credential proportion

	Teachers' credential		
Type of institution	Not Important	Important	Total
Lower-tier	49.12	50.88	228
21-40	26.09	73.91	23
1-20	38.46	61.54	13
Total	46.59	53.41	264
Source: Based on field survey			

iii)Teachers' credential:- What one can decipher from this variable is that for a larger proportion in case of all the categories, viz. top 20 (61.54%), 21-40 (73.91%) ranked institutions and lower-tier institutes (50.88%), there is a larger proportion for whom teachers' credential is an important decision making factor. However, what is worrying is that in the case of the lower-tier institutions,' there are almost an equal proportion of those for whom teachers' credential (49.12%) is not an important factor for consideration. This group, which considers the teachers' credentials as not an important decision-making factor, requires a deeper probe.

Table 5.3.c.i: Teachers' credentials not an important factor for those studying in the lower-tier institution

Factors	**Proportion**
Early employability an important factor	87.50
Early employability, not an important factor	12.50
Reserved category	24.11
Unreserved category	75.89
Centrally funded institutes	24.11
State-funded institutes	22.32
Privately funded institutes	53.57
Educational qualification of a father up to high school	32.14
Educational qualification of father higher than high school	67.86
Campus placement an important factor	82.14
Campus placement, not an important factor	17.86
Source: Based on field survey	

Through the following table, it is evident that there is a larger proportion of unreserved category (75.89%) students who had enrolled themselves in privately funded institutes (53.57%), and for a larger proportion, early employability (87.50%) was a criterion for pursuing an engineering education. Also, campus placement (82.14%) was an important factor in the decision-making process. The fact that teachers' credential is not of importance brings forth the discrepancies associated with recruiting teachers'. In some instances, institutes not fulfilling the eligibility criterion for teachers' recruitment have led to a decline in the quality of engineering education. Also, there is a larger proportion amongst them whose fathers' qualification is higher (67.86%) and fails to give significance to the teacher's credential is a point worth noting. This signifies that fathers' are aware of the quality of teachers' in such institutes. Thus, not giving importance to teachers' credibility, one considers enroling in institutes based on other factors' significance.

Table 5.3.d: Institutional ranking and campus placement proportion

	Campus placement		
Type of institution	Not Important	Important	Total
Lower-tier	10.96	89.04	228
21-40	4.35	95.65	23
1-20	15.38	84.62	13
Total	10.61	89.39	264
Source: Based on field survey			

iv) Campus placement:- Campus placement is an important criterion for taking decision to enrol in an institute (84.62% in 1-20; 95.65% in 21-40; 89.04% in lower-tier). However, better employability being one of the reasons for choosing a major within engineering forces one to rethink why certain categories of people would not give importance to campus placement while deciding to enrol in institutions, especially those who are not enrolled in the top 40. What are the reasons they are pursuing engineering for?

Table 5.3.d.i: Campus placement not an important factor, and studying in lower-tier institutes

Factors	Proportion
Early employability an important factor	80.00
Early employability, not an important factor	20.00
Parental desire an important factor	48.00
Parental desire, not an important factor	52.00
Wider career choice an important factor	80.00
Wider career choice, not an important factor	20.00
Educational qualification of father up to high school or lower	28.00
Educational qualification of father higher than high school	72.00
Source: Based on field survey	

From the analysis, it becomes evident that although for a larger proportion, parental desire (52%) was not a factor for choosing engineering but early employability (80%) was cited as a reason for choosing engineering. However, a possibility that campus placement is not given priority by some in the case of lower-tier institutes is because of a wider career option (80%) that pursuing engineering as a whole might open to the prospective candidates. It is a possibility that since there was no parental pressure for the majority of them and lack of available career options at the time of decision making[39] or information asymmetry, they pursued engineering, thinking that they could switch to options where their choice of engineering as a discipline proves to be fruitful by giving them an edge in analytical skills over the regular degree pass-outs. Also, with the majority having higher qualifications of the father (72%), one is not opting for shorter/quicker period benefits from education.

[39] In case of India there were only two options worthy of consideration in career either engineering or medicine.

Table 5.3.e: Institutional ranking and graduate profile proportion

	Graduate profile		
Type of institution	Not Important	Important	Total
Lower-tier	28.07	71.93	228
21-40	17.39	82.61	23
1-20	38.46	61.54	13
Total	27.65	72.35	264
Source: Based on field survey			

v) Graduate profile:- As far as the graduates' profile[40] is concerned, there is a larger proportion amongst the engineers for whom it was an important criterion. However, for those of whom graduate profile was not an important category, there is a larger proportion in the top 20 institutes (38.46%). The possibility of them approaching the pass-outs for choosing institutes is dim. The reputation these highly ranked institutes enjoy may be taken in good faith by the students, hence a possibility of lower importance being given to graduate profile while making institution decisions.

Table 5.3.f: Institutional Ranking and hostel facilities proportion

	Hostel facilities		
Type of institution	Not Important	Important	Total
Lower-tier	53.51	46.49	228
21-40	43.48	56.52	23
1-20	30.77	69.23	13
Total	51.52	48.48	264
Source: Based on field survey			

vi) Hostel facilities:- Regarding hostel facility, there is a larger proportion amongst those who got enrolled in the top 40 for whom hostel facility was an important criterion for selecting institution (69.23% in 1-20 and 56.52% in 21-40). Unlike those students who got enrolled in lower-tier institutions, there is a larger proportion for

[40] This refers to those candidates profile who passed out from prospective institutions.

whom hostel facility (53.51%) was not an important factor while making decisions. It is because since they are not enrolled in the top 40, it indicates that the majority might as well study engineering in their hometown while the hostel facility may not come into play. Or it is possible that the majority do not prefer staying in the hostel, so it is not an important criterion for decision making. Also, the hostel facilities do not play that significant a role in decision-making as other factors outweigh the decision of choosing an institute.

Table 5.3.g: Institutional ranking and living cost proportion

	Living cost		
Type of institution	Not Important	Important	Total
Lower-tier	39.91	60.09	228
21-40	47.83	52.17	23
1-20	38.46	61.54	13
Total	40.53	59.47	264
Source: Based on field survey			

vii) Living cost:- Cost of living comprises a massive expenditure of the household. Therefore, it becomes imperative to consider and give it due importance in the decision-making process. However, there is a certain proportion amongst engineers for whom it was not of that significance, and those enrolled in 21-40 ranked institutions (47.83%) comprised the largest proportion in this category. This is because their living cost may not be too high as they would be availing advantages in terms of subsidies on various fronts. It is a possibility that the expected long-term benefits are high, so a short-term high living cost is not a problem for them. Likewise, for those in institutes enrolled in lower-tier (39.91%), it is a possibility that they are enrolled in institutes not situated in the metropolitans; hence the cost of living is not a point of worry in that case as they are comparatively charging lesser than those in metropolitans.

Table 5.3.h: Institutional ranking and college facilities proportion

	College facilities		
Type of institution	Not Important	Important	Total
Lower-tier	24.56	75.44	228
21-40	30.43	69.57	23
1-20	30.77	69.23	13
Source: Based on field survey			

viii) College facilities:- College facilities refer to facilities provided by the college in the form of laboratories, computer appliances, wi-fi, library, resource materials, etc. A high proportion in all the three categories of institutions considered college facilities an important factor for the choice of institutions (69.23% in 1-20; 69.57% in 21-40 and 75.44% in lower tier). The results indicate that facilities' availability is important because practical knowledge would require access to computer labs in certain branches like IT or computer science. Likewise, for other streams, resources to carry out practical classes are of necessity. This further indicates an emphasis on practical knowledge rather than giving importance to understanding just the concepts and theory.

Table 5.3.i: Institutional ranking and credibility of institution proportion

	Credibility of the institution		
Type of institution	Not Important	Important	Total
Lower-tier	10.96	89.04	228
21-40	8.70	91.30	23
1-20	0.00	100	13
Total	10.23	89.77	264
Source: Based on field survey			

ix) Credibility of the institution:- Almost all those enrolled in the top 20 institutes have given importance to credibility in institution choice. The lowest proportion giving priority to credibility was those enrolled in lower-tier institutes (89.04%). This points that some of those in lower-tier institutes are not worried about whether institutes are under the purview of the AICTE or not. They appear to be short-sighted and looking for immediate gains without knowing its consequences. This emphasises the surge in demand for engineering and a large number of private players involved in its provisioning. This leads one to think that these institutes play the role of degree-granting.

Table 5.3.j: Institutional ranking and choice of institution restriction due to qualifying rank proportion

	Choice of institution restricted due to qualifying rank		
Type of institution	No	Yes	Total
Lower-tier	16.67	83.33	228
21-40	26.09	73.91	23
1-20	15.38	84.62	13
Total	17.42	82.58	264
Source: Based on field survey			

x) Choice of institution restricted due to qualifying rank:- There is a possibility that it is not always that the prospective student will get the institute of his/her choice. Because entry into engineering colleges is often through competitive examinations, it is possible that the low qualifying rank hinders one's decision to enrol in a particular institute. The analysis indicates that even amongst those enrolled in the top 20 (84.62%), there is a higher proportion whose choice of the institution was restricted due to scoring low qualifying rank. This indicates that they could not be in probably the topmost or top 5 institutes. The procedure that students follow is to try to get into the best institutions since the best ones are like "brands" that command status in the job market. Thus, the freedom to choose the provider is backed by merit for the pursuit of excellence and not money.

5.3.1 Factors determining decision about the choice of institutions – t-Test

Among the factors considered for determining an institute's choice, one of the most influential factors was family members (M=2.87) studied in the institution, followed by media advertisement (M=2.60). This was followed by distance from hometown to the institution (M=1.93). Lower means were reported for hostel facilities (M=1.84), teachers' credentials (M=1.68), and living costs (M=1.5). This is followed by the lowest means for fees of the institution (M=1.14), graduate profile (M=1.13), and college facilities (M=1.06), with placement (M=0.54) and credibility (M=0.52) occupying the least important position. These results indicate an inclination towards the role family members (peer effect/sibling education) have in influencing the choice of engineering as a discipline in the first stage and have an important say in an institution's choice. This is the outcome of those engineers who could not find themselves enrolled in top institutes. The media's role in advertising institutes becomes an important determining factor for choosing institutes. The factors like family members and media advertisement score the highest mean portray that institutes' choice is more influenced by factors not concerning institutes' characteristics per se. Since one could not score high in qualifying exams, it acts as a restraint in applying to certain institutes, and this is responsible for making factors like family members studied in the institute and media advertisement as key determinants while choosing institutes. Also, distance from hometown amongst the top 3 factors represents that external factors have a more prominent role in institutions choice.

Further, hostel facilities identified amongst the top five factors influencing the choice of institution speaks volume that rather than factors intrinsic to institutes (teachers' credential, living cost, fees, graduate profile, college facilities, placement, and credibility), the prospective candidates choose an institution only for the acquisition of degree and have less concern with the credential teachers' possess, exorbitant fees that the institutes charges, living expense that may be skyrocketing during their study. After passing from institutes, graduates' profiles, placement facilities, and college facilities do not occupy a prominent role in their decision-making factors. The institution's credibility representing the lowest means displays that students are more inclined towards degree acquisition and whether the institutes fulfill their compliance with the AICTE regulations does not come under their decision purview.

Further, the results are compared to determine the relative importance of these factors when controlled for gender, institutional ranking, and family income. These are elaborated in the following sections.

Table 5.3.k: Factors determining decision about the choice of institution- general and controlled for gender

Factors	General	Male	Female	t-statistic	p-value
Fees	1.14 (.08)	1.16 (.08)	1.04 (.20)	-0.57	0.56
Distance from home	1.93 (.09)	2.03 (.10)	1.47 (.20)	-2.27	0.02**
Teacher's credential	1.68 (.08)	1.71 (.09)	1.52 (.18)	-0.91	0.35
Media advertisement	2.60 (.07)	2.61 (.08)	2.58 (.18)	-0.16	0.87
Campus placement	0.54 (.05)	0.54 (.06)	0.54 (.13)	-0.03	0.97
Graduate profile	1.13 (.07)	1.16 (.08)	0.97 (.19)	-0.92	0.35
Hostel facilities	1.84 (.08)	1.85 (.09)	1.83 (.21)	-0.08	0.93
Family members studied in the institute	2.87 (.08)	2.87 (.09)	2.87 (.20)	0.02	0.98
Living cost	1.5 (.08)	1.49 (.09)	1.60 (.19)	0.53	0.59
College facilities	1.06 (.07)	1.07 (.08)	1.00 (.16)	-0.38	0.69
Credibility	0.52 (.05)	0.52 (.06)	0.54 (.13)	0.12	0.89
Source: Based on field survey					

p**<0.05 and the figures in parentheses indicate robust standard error.

Factors determining the choice of the institution–controlled for gender

The result shows an interesting finding when controlled for gender. The t-test revealed a significant difference with respect to the distance of institution from hometown. Distance from home for the male students' is perceived to be more important for enroling in institutes than their female counterparts. This is because with a larger proportion of male opting for engineering and with the majority prioritizing factors external to the institution, male students might as well opt for institutes closer to their hometown if they perforce take admission in the lower-tier institutes. This reflects that they are more pragmatic in their approach by choosing an institute within their proximity. Suppose two institutes serve the purpose of granting degrees (wherein factors intrinsic to institutes do not hold good). In that case, one will choose an institute closer to their hometown than the one away from their hometown which entails high expenses.

Table 5.3.l: Factors determining decision about the choice of the institution- controlled for ranking of institutes

Factors	1-20 ranked	21-40 ranked	Lower-tier	F statistics	p-value
Fees	1.23 (1.23)	0.86 (1.14)	1.16 (1.33)	0.55	0.57
Distance from hometown	2.07 (1.38)	2.34 (1.61)	1.88 (1.53)	1.03	0.35
Teachers' credential	1.46 (1.71)	1.34 (1.36)	1.72 (1.31)	1.02	0.36
Media advertisement	2.61 (1.19)	2.34 (1.40)	2.63 (1.25)	0.55	0.58
Campus placement	0.15 (.55)	0.52 (.84)	0.57 (.93)	1.29	0.27
Graduate profile	0.69 (.75)	0.78 (1.12)	1.19 (1.29)	1.93	0.14*
Hostel facilities	1.76 (1.42)	1.82 (1.40)	1.85 (1.39)	0.03	0.97
Family members studied in the institute	2.53 (1.56)	3.00 (1.44)	2.87 (1.40)	0.46	0.63
Living cost	1.00 (.912)	1.43 (1.16)	1.54 (1.36)	1.09	0.33
College facilities	0.69 (1.10)	0.91 (.99)	1.09 (1.21)	0.90	0.40
Credibility	0.53 (.87)	0.13 (.34)	0.56 (.94)	2.40	0.09*
Source: Based on field survey					

p*<0.1 and the figures in parentheses indicate the standard deviation.

Factors determining the choice of institutes–controlled for the ranking of institutes

ANOVA was undertaken to identify the significance of factors affecting the choice of an institute on differently ranked institutions. There were statistically significant results for two factors, viz., graduate profile and credibility of the institution. The mean of a graduate profile is higher in the case of lower-tier institutes (1.19), followed by 21-40 (0.78) ranked institutions, and the least is in 1-20 ranked institutes (0.69). Similarly, the importance given to institution credibility while deciding to enrol in an institution has the highest mean for lower-tier institutes, followed by institutes with a 0.53 mean in 1-20 ranked institutions and 0.13 mean in case of 21-40 ranked institutions. This implies that while choosing institutes in the case of the lower-tier category, the graduate profile becomes an important factor for selecting an institute as one looks into the outcome of the decision-making process. Lower means were reported for those enrolled in institutes in 21-40 with the least in top 20 ranked institutes. This implies that in the case of top institutes, looking at graduate profile is not much of an influencer as one is likely aware of their placement, and they don't need to gather information regarding the best institutes as it is taken into consideration in case of lower-tier institutes.

In terms of the institution's credibility, the highest mean is reported by lower-tier institutes. This implies that due to the mushrooming of institutes in the private sector, it becomes imperative for a few prospective candidates who cannot enrol in the top 40; to prioritize the institutes' credibility. This is because many unregulated colleges and middlemen lure students into taking admission, so it becomes vital for the students to know the institutes' credibility. It points toward an easy approval granting policy by the AICTE. In many cases, the institutes' credibility comes into question, thereby impacting the quality of education imparted, and more often, degrees may not reveal the actual quality of students.

Table 5.3.m: Factors determining decision about the choice of the institute - controlled for annual family income

Factors	Annual family income below Rs. 8 lakh	Annual family income Rs. 8 lakh and above	t-statistics	p-value
Fees	0.72(.03)	0.65 (.04)	-1.25	0.20
Distance from hometown	0.45(.03)	0.44 (.05)	-0.21	0.83
Teachers' credential	0.53(.03)	0.53 (.05)	-0.03	0.97
Media advertisement	0.19 (.03)	0.25 (.04)	0.98	0.32
Campus placement	0.87(.02)	0.92 (.02)	1.15	0.24
Graduate profile	0.68 (.03)	0.79 (.04)	1.94	0.06*
Hostel facilities	0.45 (.03)	0.53 (.05)	1.13	0.25
Family members studied in the institute	0.19 (.03)	0.29 (.04)	1.88	0.06*
Living cost	0.63 (.03)	0.51(.05)	-2.03	0.04**
College facilities	0.72 (.03)	0.78 (.04)	0.99	0.32
Credibility	0.88 (.02)	0.91 (.02)	0.59	0.54
Source: Based on field survey				

p*<0.1; p**<0.05 and the figures in parentheses indicate robust standard error.

Factors determining the choice of the institute–controlled for family income

When controlled for family income credibility of an institution (M=0.88) and campus placement (M =0.87) followed by fees (M =0.72) and college facilities (M =0.72) was more of an important factor while making institution choice for those whose annual family income was less than Rs. 8 lakh. Both campus placement and the credibility of an institution seem to be in tandem, which points that in the case of families with lesser income, placement occupies the foremost significance simultaneously; credibility also is taken into account because without one, the other may not materialize. Further, the t-test indicated statistically significant differences with respect to the three factors. Family members studied in the institute were more important factors for choosing an institution for higher family income groups than for lower family income groups. This is because, in families with higher income, there is more often a pattern of younger siblings following the footsteps of the elder one.

Likewise, a graduate profile becomes important for higher family income groups to emphasise the social prestige associated with the jobs. Further, the living cost is significant and has a higher mean score for the lower family income group. This implies that even if the expectation regarding placement is high, they are willing to forgo the cost of education in terms of high fees with the expectation of higher returns. But living costs are a burden for them in the current period.

5.3.2 Discussion: S-competition and accentuation of hierarchy

In this section, factors that affect the choice of institution are discussed. The discussion is elaborated with specific reference to gender and institutional funding. An attempt is to understand the factors that affect institution choice and how they vary across gender and different institutional funding. Based on the t-test analysis, the findings indicate that the factors like family members studied in the institute or media advertisement have reported the highest means that affect the decision to enrol in the institute. When controlled for gender, distance from home town reported higher means for male in comparison to female. Based on the analysis, for those enrolled in lower-tier institutes (other than the top 40), graduates' profile[41] and institutes' credibility affect the decision to enrol in institutions.

Fees do not have a significant role while choosing institutions, and this is because engineering is an investment good, and for many, even the capitation fee would not matter because they possibly expect to recover the high cost, legitimate and illegitimate. This is because of the expectation of higher "perceived" economic return and the course (professional degree) offering quicker employability gains. The students who perforce have to take admission in the institution lower down the rank generally prefer to look/get an idea about quality based on the profile of the graduate churned out/passed out of these institutions in the absence of other authentic information. The institute's credibility assumes significant importance because of the criticism leveled against the regulatory policies of the AICTE. There is a convergence of those scoring low at low-tier institutes, just as there is a convergence of high and cream students at top-tier institutes. Students from top institutions benefit from high-ranking positions, whereas students from lower-ranking colleges suffer losses. The market becomes a zero-sum game due to "positional competition" (Marginson,

[41] The profile of the pass-outs from those low tier institutes.

2004:186). However, the intention is not to stigmatize low scorers. Due to a shortage of seats and stringent entrance standards at these elite universities, as well as a surge in demand for engineering degrees, several private colleges have opened in this field. In the case of professional courses, the freedom to choose fields and not institutions, takes precedence other than the top-ranked ones'. The existence of freedom to choose the product (engineering) over provider explains proliferation of low repute private institutions offering market-oriented professional courses in the pursuit of high demand for such courses. It is not wrong to argue that those with low marks in qualifying entrance exams are more likely to enrol in these institutions where admission is less competitive and contemplates decisions based on factors not intrinsic to the institute. This sets in the spiral of qualifications/degrees, which individuals are not bereft of. Thus, it's a two-way process; one, there is a demand for such institutions, which is responsible for such institutes' existence. Two, there is no shortage of such degree-granting institutions in the market.

Glennerster (1991:1270) argues that in markets for education, the competition is Selection-based and not Exchange-based. Both the students and teachers' choose institutions, and the institutions also choose good quality teachers' and students. However, the competition is imperfect since the best institutions have the best minds and high credibility. An institution's credibility and reputation take years to build. This establishes a hierarchy among institutions, as the finest ones is well-funded, allowing them to attract the highest-quality staff and students while maintaining their position at the top (Winston, 1999), and the mediocre ones have to be content with their relative positions in the ranking and not-so-good ones have to be content with their position at the bottom.

5.4 Satisfaction/dissatisfaction from studying in different institutes

The previous section discussed the different sources of information one gathers and makes a final choice of the institute for pursuing an engineering education. It primarily dealt with the issues of choice concerning one's education. However, the present section looks into the evaluation of the choices made about the institutes. The study tries to locate the evaluation differences among those in the top 40 institutes compared to those in the lower-tier institutes regarding the quality of training, timely update of curriculum, quality faculty, and other factors. The inclusion of this section gains significance in the light of existing studies where it is argued that satisfaction from university/institutes affect the performativity of students (Bean and Bradley, 1986; Pike, 1991) alternatively, it makes the institute more competitive, attracting more students (Lee *et al*., 2000). Thus, the following table engages with the discussion about the evaluation of engineers' institutional choices.

Table 5.4.a: Institutional ranking and training proportion

	Quality of training		
Type of institution	Dissatisfied	Satisfied	Total
Lower-tier	63.16	36.84	228
21-40	43.48	56.52	23
1-20	38.46	61.54	13
Total	60.23	39.77	264
Source: Based on field survey			

i) Quality of training:- Among those enrolled in the top 40, there is a larger proportion (61.54% in 1-20 and 56.52% in 21-40 ranked institutions) satisfied with the quality of training imparted in their institutes. In the case of lower-tier institutes (63.16%), a larger proportion represents those who seem to be dissatisfied with the quality of training they received. It is a possibility that the training they have received does not suffice in developing an understanding of the different applications when at work. Lack of quality training results in lower efficiency and lowers one's productivity in the job. There has been a constant complaint from the demand side of the market (i.e., employers) about the quality of training received by engineers, which fails to meet industry standards. However, dissatisfaction is not just the case in lower-tier institutes. A substantial proportion in the top 40 reported dissatisfaction (38.46% in 1-20 and 43.48% in 21-40 ranked institutions) from the quality of training they received. Their expectations about the quality of training are at a higher level. This is not fulfilled because some are not enrolled in one of the topmost or top 5 institutes where they would have been granted the best that the institution could offer in terms of the training. Similarly, it could be a possibility that the training received did not materialize their dream of being innovators. A certain proportion enrolled in lower-tier institutes (36.84%) reported satisfaction from training quality. It is a possibility that given their rank, they are the best judge of what could be expected out of those institutes under the information they received, thereby reflecting their satisfaction. It also points towards the fact that work is identified as a ritual process, and they are passive in their approach and simultaneously tend to scale down their aspirations.

Table 5.4.b: Institutional ranking application of knowledge proportion

	Possibility of using acquired knowledge in practice		
Type of institution	Dissatisfied	Satisfied	Total
Lower-tier	60.09	39.91	228
21-40	26.09	73.91	23
1-20	46.15	53.85	13
Total	56.44	43.56	264
Source: Based on field survey			

ii) Possibility of using acquired knowledge in practice:- It is evidenced that for the top 40 institutions (53.45% in 1-20 and 73.91% in 21-40 ranked institutions), a large proportion is satisfied with the application of knowledge in practice. However, the dissatisfaction (60.09%) is highest among those from lower-tier institutions. This is because of the lack of significance these institutes had attributed to teachers' credentials (discussed in an earlier section), thereby leading to a possibility that they have failed to perform diligently, resulting in low employability returns amongst engineers. However, studies have emphasized students' involvement in internship programs during one's course of study, which is a step in the right direction. Also, an emphasis on industry-academia linkages can help students get practical hands-on training, which would pave the way for better applying what one learns in theory. The satisfaction is highest in institutes ranked in 21-40 (73.91%). This indicates that they have given preference to stream over institutes, and that resulted in higher satisfaction from the subject knowledge. There is a substantial proportion even in the top 40 (46.15% in 1-20 and 26.09% in 21-40 ranked institutions) who is dissatisfied with the applicability of knowledge in practice. In some instances, they would have prioritized the brand of the institute over the choice of the course; resultantly, their expectations failed to be realized hence a dissatisfaction from the acquired knowledge in practice.

Table 5.4.c: Institutional Ranking and curriculum suitability proportion

	Suitability and updated curriculum		
Type of institution	Dissatisfied	Satisfied	Total
Lower-tier	64.47	35.53	228
21-40	39.13	60.87	23
1-20	53.85	46.15	13
Total	61.74	38.26	264
Source: Based on field survey			

iii) Suitability and updated curriculum:- A larger proportion in 21-40 (60.80%) ranked institutions is satisfied with the suitability and updated curriculum. However, not only those enrolled in lower-tier institutes (64.47%), among those enrolled in the top 20 (53.85%) institutes, a larger proportion is dissatisfied with the suitability and the updating of the curriculum. Amongst those in jobs and pass-outs from the top 20, they opine that the usefulness of curriculum with the market's needs may not be evident. In the top 20 institutes, it is only because of the quality training they received that they better understand the nuances of the technical problems. For those in the lower-tier institutes, the dissatisfaction indicates that the same curriculum is taught to generations. Resultantly, they are in a worse off position because of not only keeping pace with the "newness" but also how the other factors are downplaying it conjointly.

Table5.4.d: Institutional ranking and quality faculty proportion

	Quality faculty		
Type of institution	Dissatisfied	Satisfied	Total
Lower-tier	62.28	37.72	228
21-40	17.39	82.61	23
1-20	46.15	53.85	13
Total	57.58	42.42	264
Source: Based on field survey			

iv) Quality faculty:- There is a larger proportion of engineers who are satisfied with the quality of faculty in case of those enrolled in the top 40 institutes (53.85% in 1-20 and 82.61% in 21-40 ranked institutions), unlike those who are dissatisfied (46.15% in 1-20 and 17.39% in 21-40 ranked institutions). This is because the faculty's quality is expected to be among the best in these top 40 institutes. However, in the case of lower-tier institutes, a larger proportion is not satisfied (62.28%) with the quality of faculty in their institutes. This is because of shortages of qualified faculty or faculty not having expertise in their domains, deficits of faculties with Ph.D.'s, etc. This is identified as a perennial problem reported in many of the studies. In institutes ranked in the top 20 (46.15%), a substantial proportion is dissatisfied with the faculty's quality/shortages of quality faculty in their institutes. This indicates that the reason for the scarcity of quality faculty is the low salary packages given to teachers' compared to the fat salaries that they would earn working in MNC's, which dissuade them from entering into the profession in the near future. Also, the satisfaction from quality teachers' being highest amongst 21-40 ranked (82.61%) institutions indicates that prioritizing the stream of their choice over the institution's brand has given them satisfactory outcomes. It is a possibility that they have opted for the stream because of the availability of quality faculty in that stream.

Table 5.4.e: Institutional ranking and industry-academia linkage satisfaction proportion

	Industry academia linkages		
Type of institution	Dissatisfied	Satisfied	Total
Lower-tier	67.11	32.89	228
21-40	39.13	60.87	23
1-20	46.15	53.85	13
Total	63.64	36.36	264
Source: Based on field survey			

v) Industry academia linkages:- In the case of institutes ranked amongst the top 40 (53.85% in 1-20 and 60.87% in 21-40 ranked institutions); the proportion of engineers who are satisfied with the linkages between industry and academia is higher than those who are dissatisfied (46.15% in 1-20 and 39.13% in 21-40 ranked institutions) with the linkages. However, in lower-tier institutes, a larger proportion of engineers (67.11%) are dissatisfied with the linkages. It is not only those from lower-tier institutes but also substantial proportion from the top 40 is dissatisfied with the linkages. This is because, in the case of lower-tier institutes, they have either weak/low or no linkages with the industry, because of which engineers now are retrospectively able to gauge the linkages' essence and find it affecting their employability. It implies that reputed institutes are dissatisfied because the linkages have not been materialized as per one's expectations, or the linkages have not been effectively implemented. Studies have often emphasised establishing this linkage with the industry as both academia and industry complement each other.

Table 5.4.f: Institutional ranking and professor-student relation proportion

	The relation between professors and students		
Type of institution	Dissatisfied	Satisfied	Total
Lower-tier	56.14	43.86	228
21-40	30.43	69.57	23
1-20	46.15	53.85	13
Total	53.41	46.59	264
Source: Based on field survey			

vi) Relation between professors and students:- The factor discussing the relationship between professors and students, there are larger proportion (53.85% in 1-20 and 69.57% in 21-40 ranked institutions) who feel satisfied in case of top 40 than in case of the lower-tier institutes (43.86%). The relation between the two is considered better in top institutes as the hierarchy between students and teachers' is not visible, leading to an easy flow of interaction. Resultantly, easy approachability and clarification of one's doubt are smooth. However, in the case of the lower-tier institute, there is a hierarchy between students and professors, and approaching the professors becomes a difficult task. Therefore, the engineers representing these institutes show dissatisfaction concerning student-professor interaction. This low level or no interaction adds to these students' existing concern of the deteriorating quality of institutes.

Table 5.4.g: Institutional ranking and emphasis on examination proportion

	Emphasis on passing an exam rather than learning and acquiring skills		
Type of institution	Dissatisfied	Satisfied	Total
Lower-tier	57.02	42.98	228
21-40	56.52	43.48	23
1-20	46.15	53.85	13
Total	56.44	43.56	264
Source: Based on field survey			

vii) Emphasis on passing exams rather than learning and acquiring skills:- In the case of engineers in the top 20 institutes, 53.85% are satisfied with the emphasis on passing exams rather than learning and acquiring skills, unlike 46.15% who are dissatisfied with the emphasis on passing the exam. Those who feel satisfied represent a larger proportion because they are not facing problems with skill utilization. Also, treating skill and education as different may not be a question; hence, they are satisfied. For them, both education and skill are complementary to each other, and that good quality education instils skills simultaneously.

However, in the case of engineers belonging to either 20-40 (56.52%) or the lower-tier (57.02%) institute, there is a larger proportion who are dissatisfied with the emphasis on the passing of the examination rather than learning and acquiring skills because firstly they are facing a problem with the utilization of skills and have not developed the skills required for the job. Thus, it can be argued that an overemphasis on examination results in producing engineers who are ill-trained when it comes to performing high-skilled jobs.

Table 5.4.h: Institutional ranking and engineering education equipped for job market proportion

	Engineering education equipped to perform		
Type of	Agree	Disagree	Total
Lower-tier	51.75	48.25	228
21-40	86.96	13.04	23
1-20	92.31	7.69	13
Total	43.18	56.82	264
Source: Based on field survey			

viii) Engineering education equipped to perform:- In India, it is reasoned that engineers are often perceived as working not only in their disciplines but have primarily been serving the service economy. This is because of the characteristics that engineering as a discipline possesses and is considered far more analytical than other disciplines. In this context, it is often argued that engineers can be the best fit for work not only in their area but in the broader array of disciplines. Resultantly, engineering is the most demanded discipline for the Indian population. From the table, it becomes evident that a larger proportion amongst those enrolled in institutions in the top 40 (92.31% in 1-20 and 86.96% in 21-40 ranked institutions) agree that engineering education equipped them enough for the job market. This implies that their engineering education sharpened their analytical skills and prepared them better for the world of work.

Also, there is a substantial proportion in the case of those who are enrolled in the lower-tier (48.25%) institutes that are in disagreement with the statement that engineering education equipped them enough for the job market. As discussed earlier, this is because those who passed out from these institutes are not the best minds; also, they suffer from the lack of quality training and quality faculty. Since they are in a disadvantaged position, the perceived role engineering education plays gets diminished.

Table 5.4.i: Institutional ranking and developed engineering skills for job proportion

	Developed engineering training and skills in meeting job requirements		
Type of institution	Satisfied	Dissatisfied	Total
Lower-tier	64.47	35.53	228
21-40	82.61	17.39	23
1-20	61.54	38.46	13
Total	65.91	34.09	264
Source:- Based on field survey			

ix) Developed engineering training and skills in meeting job requirements:- What is of curiosity in the following table is that a larger proportion in not only top 40 institutes (61.54% in 1-20 and 82.61% in 21-40 ranked institutions) but also in lower-tier institutes (64.47%) are satisfied with the overall engineering training and skills in meeting job requirements. This is because, given their background in terms of the training received, quality of faculty, interaction with the professor, and linkages with the industry, they are better placed to judge their expectations under such uncertainty. Thus, a larger proportion may have indicated satisfaction, being aware of one's ability. The perceived labour market outcomes for them have 'narrow horizons of action.' And within this narrow horizon, they are satisfied with the outcome.

5.4.1 Factors contributing to satisfaction from studying in a chosen institute – t-test and one-way ANOVA

To analyse the impact of control variables (institutional ranking) on the satisfaction/dissatisfaction from studying in a chosen institute, one-way Analysis of variance[42] is carried out, followed by further discussion.

[42] This is used in case of ranking of institutes where the categorical independent variable has two or more categories and the dependent is a normally distributed interval variable.

Factors contributing to satisfaction from studying in a chosen institute – controlled for ranking of institutes

The most satisfying factor from studying in a chosen institution concerns engineering training and skills in meeting job requirements with a mean score of M=0.65, followed by satisfaction from the opinion that engineering education equipped them enough for the job market with a mean score of M=0.56. Lower means were reported for factors like the relation between students and professors (M=0.46), emphasis on passing exams rather than acquiring skills (M=0.43), as well as for the factor like the possibility of using acquired knowledge in practice (M=0.43). Amongst the factors which reported much lower means was satisfaction from quality faculty (0.42) followed by suitability and updated curriculum (0.39) and quality of training (0.38), with industry-academia linkages (0.36) reporting the lowest mean.

The results indicate that the highest satisfaction factor (the training and skills in meeting job requirements and engineering education equipped one enough for the job market) emphasises the direct linear relationship between education and employment. The respondents tend to agree that engineering education provides them with the requisite skills and training required for the job market. The dissatisfaction with quality faculty and outdated curriculum represents that if teachers' quality is worked through to satisfactory levels, there can be a change in satisfaction related to the curriculum. This is because once good quality teachers' are appointed; they would make an effort to revise the curriculum according to the market needs. Also, with the quality of training remaining at deficient satisfaction levels, it points to the constant complaint about engineers lacking basic programming skills to perform their tasks.

Table 5.4.j: Factors contributing to the satisfaction from studying in a chosen institute - controlled for ranking of institutes

Factors	General	Lower-tier	21-40 ranked	1-20 ranked	F statistics	p-value
Quality of training	0.39 (.49)	0.36 (.48)	0.56 (.50)	0.61 (.50)	3.08	0.04***
Possibility of using acquired knowledge in practice	0.43 (.49)	0.39 (.49)	0.73 (.44)	0.53 (.51)	5.36	0.005***
Suitability and updated curriculum	0.38 (.48)	0.35 (.47)	0.60 (.49)	0.46 (.51)	3.06	0.048***
Quality faculty	0.42 (.49)	0.37 (.48)	0.82 (.38)	0.53 (.51)	9.53	0.000***
Industry academia linkages	0.36 (.48)	0.32 (.47)	0.60 (.49)	0.53 (.51)	4.54	0.011***
Relation between professors and students	0.46 (.49)	0.43 (.49)	0.69 (.47)	0.53 (.51)	2.95	0.054***
Emphasis on passing exams rather than acquiring skills	0.43 (.49)	0.42 (.49)	0.43 (.50)	0.53 (.51)	0.29	0.7466
Engineering education equipped one to perform in the job market	0.56 (.49)	0.51 (.50)	0.86 (.34)	0.92 (.27)	9.31	0.000***
Developed engineering training and skills in meeting job requirements	0.65 (.47)	0.64 (.47)	0.82 (.38)	0.61 (.50)	1.59	0.2063
Source: Based on field survey						

p***<0.01 and the figures in parentheses indicate standard deviation.

The results uncovered differences in satisfaction from studying in a given institute by using One-way analysis of variance. The results revealed that it was significant for almost seven factors out of nine factors taken into consideration. Regarding the satisfaction from the quality of training and the factor that engineering education equipped them enough for the job market has the highest mean for 1-20 ranked institutions followed by 21-40 ranked institutions, which is further followed by lower-tier institutions. The satisfaction is higher because being in one of the top 20 one experience the best training from the best minds available. They are highly satisfied to be equipped enough for the job market, given the best faculty and other factors. The satisfaction in case of certain aspects has the highest mean for 21-40 ranked institutions. These factors include the possibility of using acquired knowledge in practice, curriculum suitability, quality faculty, industry-academia linkages, and the relation between students and professors. This is followed by satisfaction in 1-20 ranked institutions with the lowest means in lower-tier institutions. This is because in these cases, such as quality faculty or industry-academia linkages, there still is scope for further improvement in the best institutions. Also, it is a possibility that their expectations from the institute regarding certain factors are not fulfilled; thereby, they appear not to be fully satisfied. Also, what is evident from the table is that satisfaction is the lowest for most of the factors in the case of lower-tier institutions. This portrays that these students who are enrolled in these institutes are the most dissatisfied and bring forth the engineering institutions' problems. Since most are private-funded, followed by state-funded institutes, there have been complaints about the unregulated mushrooming of privately funded institutes. There is a constant complaint about the lack of skills among engineers and that they are not performing their tasks diligently. Likewise, there is criticism about their training quality, thereby adding to low employability skills amongst the pass outs from these institutes. Thus, an individual's satisfaction from such institutes is comparatively lower than their counterparts in the top-ranked institutions.

5.4.2 Discussion: Discontentment of students

This section elaborates the discussion on the evaluation of the institutes. Through the analysis, it is evidenced that dissatisfaction amongst graduates from lower-tier institutes is the highest in comparison to the top institutes, pointing towards the poor quality of engineers churned out from these institutes. The dissatisfaction for quality faculty, suitability and timely update of the curriculum, the applicability of acquired knowledge, and quality of training is the highest amongst the graduates from lower-tier institutes. Through the entrance examination, the most preferred choice is to enrol in 1-40 ranked institutions. Those who don't get there perforce opt for the lower-ranked institution. However, the quality of all institutes is not good because of the wide variation in the quality of human capital, i.e., students and teachers'. The low-quality institutions end up delivering poor quality education. The question that needs attention is why students accept low-quality education?

There is a concentration of a large number of engineers in the lower tier, and there is also maximum dissatisfaction. Good quality education requires quality infrastructure/faculty, and cost minimization[43] would not fructify without a clearly defined production function as both cost and quality are positively related[44] in higher education (Chattopadhyay, 2012a). Students' agency and effort depend on the level of capability[45]as quality is a social construction and co-produced by the stakeholders involved. Students accept low quality out of compulsion because the effort is dependent on quality. It is the absence of a well-defined production function that many private providers of low repute have utilized to their advantage and ended up providing subpar quality of education,[46] thereby diminishing the significance of education to a mere paper qualification and a degree certificate (Chattopadhyay, 2009). The providers of some of these lower-tier institutes have failed to provide quality education, and students, on the contrary, value certification to gain entry into the job market. There is no competition amongst students once admitted to these institutions. In the process the gullible students are taken for a ride. They have no other option left. They cannot leave engineering after investing time in its acquisition. Thus, the students get trapped[47]. Students cannot reverse choice very easily. Certificates fail to perform their roles as degrees are granted for sale (Chattopadhyay and Mukhopadhyay, 2013).

5.5 Conclusion

The chapter adds to the understanding of the search process involved in institutional choice and the factors that affect the final selection of institutes. Choice of institute is not a one-way process. Institutes also choose students as the top ranked institutions chose the best students to maintain the hierarchy and the quality in the process of teaching and learning. Those who are unable to make it to the top-ranked institutions perforce take admission in the lower-tier ones. And it is the demand for engineering degree that has added to the supply of many private institutes to meet the existing demand. However, the business of granting degrees outweighed the rigorous process of teaching and learning. This adversely affected the quality of graduates churned out from the institutes.

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[43] Siphoning out surplus and affecting quality by employing faculty at low remuneration.

[44] Except in the cases where provision for education is highly subsidized, price (cost) charged may not reveal information about the quality.

[45] Students in low ranked institutions lack capability and competence because of S-efficiency and they lack motivation.

[46] There is a tendency to cut cost in case of private players which in turn, adversely affect the quality.

[47] It is a sunk cost for them by investing both time and money in the process involved.

CHAPTER 6: EDUCATIONAL MISMATCH

6.1 Introduction

In the previous chapters, the study analysed the factors that affect the choice of engineering as a degree course and the decision to enrol in institutions to pursue the course. This chapter examines the connections between education and the types of jobs one can get. It seeks to provide a detailed analysis of the issue of educational mismatch, which is the central issue of this study. It tries to seek answers to whether there is an educational mismatch amongst engineers and what are its determinants? The study also attempts to look at the relation of educational mismatch with the utilization of skills and tries to illustrate if the mismatch is a 'formal' or a 'real' one. Lastly, it tries to find out the impact of educational mismatches on the outcomes, i.e., wages and job satisfaction.

Given the employment conditions in the market, the chapter delves into the possible reasons for the acceptance of mismatches, if any. The chapter, therefore, begins with a discussion of the various determinants that cause mismatches. It discusses at length the potential reasons for mismatches that are not only related to one's job characteristics but vary according to institutional profiles and individual abilities. Mismatches are classified as horizontal and vertical mismatches. An employee self-rating method was utilized to measure the educational mismatch with response categories like over-education, under-education, and matched. Next, respondents were asked to indicate the degree of horizontal mismatch if they found their engineering education related to their field of work with response categories:-related, moderately related, slightly related, and irrelevant field of study. This section also discusses the difference in mismatches amongst those working in the IT or Services sector. The section, in its entirety, tries to locate the reasons amongst those reporting vertical[48] and horizontal mismatches through regression carried out separately for the determinants.

The chapter also tries to link educational mismatch with skill utilization to know if mismatches are formal or they are real mismatches. Green and Zhu (2010) created a multi-dimensional assessment to determine whether over-educated is encountering

[48] More so, with reference to over-education.

skill underutilization, and they categorized this group as a ‘real mismatch.’ On the contrary, those who were over-educated but had no skill utilization problem were classified as ‘formal mismatch.’ Following this classification, the study tried to find a correlation between the two variables and whether educational mismatches could account for skill mismatches.

Further, the impact of educational mismatches and skill utilization variables on educational outcomes, i.e., wages and job satisfaction, are carried out. In this last section, the study analyses the returns in the labour market, both pecuniary and non-pecuniary. It tries to identify the impact of over-education, horizontal mismatches, skill utilization on wages, and job satisfaction through regression analysis. It also tries to find if skill mismatches have an equal role in determining educational outcomes and which amongst the real and formal mismatches account for more enormous penalties.

6.2 Vertical and Horizontal Mismatch

This section is an elaboration of the evaluation of respondents when they are in the job market. Not only does the study confine itself to the assessment of institutions discussed in the previous chapter, but it also focuses on the outcome of the decisions taken in the form of mismatches that individuals face in the job market. These mismatches are understood in the realm of vertical/horizontal mismatch that individuals are faced with. The possible reasons that engineers opt for choosing these mismatched jobs are analysed.

Table 6.2.a: Proportion facing Vertical Mismatch/Match

Categories	**Proportion**
Overeducated	32.58
Undereducated	19.32
Vertically Matched	48.10
Source: Based on field survey	

Vertical Mismatch:- In terms of the job that one landed into, 48.10% of the engineers reported that they are in jobs that closely match the level they acquired in education and 32.58% said that they were over-educated in the jobs that they were employed in. Similarly, 19.32% expressed their concern about being in a job where they felt undereducated. Therefore, a total of 51.90% (32.58% +19.32%) faced vertical mismatches, unlike 48.10% who were matched in their jobs. This figure indicates that vertical mismatch is relatively higher in the context of Indian engineers. Further, the percentage of over-educated engineers (32.58%) was higher than undereducated engineers (19.32%). It is a possibility that engineers choose to be over-educated to suit their long-term planning. Information asymmetry and rigidities in the labour market obstruct one's opportunities to join the relevant jobs. These rigidities are related to family situations, marriage, etc., which prevent them from entering relevant jobs. It might be a possibility that due to the changing demand and supply conditions, the number of graduating engineers has outnumbered, and the majority has failed to develop appropriate (desirable) skills, or because of a limited number of jobs available in the sector. These findings of over-education being higher than under-education were similar to the studies by Senarath and Patabendinge (2014), Allen and Velden (2001) and Pietro and Urwin (2006). Further, McGuiness (2006) study reported an average rate of over education, around 30% in Europe and the United States.

Table 6.2.b: Proportion facing Horizontal mismatch

Categories	**Proportion**
A related field of study	17.05
A moderately related field of study	30.30
A slightly related field of study	28.41
Irrelevant field of study	24.24
Source: Based on field survey	

Horizontal Mismatch:- Among the different roles that one is assigned to, 17.05% are working in jobs related to their education field. More than 30% report that they are in jobs that are moderately related to their fields of education. On the contrary, 28.41% represent engineers working in a slightly related job to their educational fields, and 24.24% represent engineers working in areas that are irrelevant to their fields of study. This 52.65% (28.41+ 24.24) proportion represents those who face horizontal mismatch, unlike 47.35% who represent those who are horizontally matched in their jobs. A relatively higher proportion faces horizontal mismatches. This indicates that engineering is considered a fulfillment (criterion) to gain access to specific jobs that otherwise is not accessible without the fulfillment of a degree. Another possibility could be with the presumption of engineering as a discipline, where individuals develop better analytical and mathematical skills. This leads them to join roles where they experience horizontal mismatches in terms of their acquired level of education. It is not only an Indian parents' desire to encourage the child to pursue engineering. Employers too have this conjecture that engineers are well-equipped to perform the task than those from other fields of study.

Approximately half of those surveyed said they were working in occupations for which their education was unrelated, or that their education level was insufficient in the context of the Netherlands (Allen and Velden, 2001). According to Allen and Weert's cross-country investigation (2007), Japanese and British respondents were more likely to work in various professions. Around 16% report being in jobs not related to their education field in Sri Lankan data (2014). As depicted in the analysis shown in the appendix (A.35-A.51), dissatisfaction from training and quality faculty is higher among either over-educated or horizontally mismatched. It is a possibility that the education imparted does not fulfill the needs of the market or that the jobs are limited in number.

Information technology and Services sector

The data collected from the engineers were primarily amongst those who were employed in either IT or Service sectors. The following table shows the distribution of engineers across the two sectors.

Table 6.2.c: Proportion of engineers in different sectors

Sectors	Total number of engineers	Proportion
Services	110	41.67
IT/ITeS	154	58.33
Source: Based on field survey		

There are a larger proportion of engineers working in the IT sector compared to those employed in the Services sector. This is because of a larger number of domains[49] selected for IT than those for the Services sector, where engineers were more likely to be employed. Also, it is because that engineer preferred working in the IT sector over that of the Services sector. And that more opportunities are available for them in IT than in the service sector.

Table 6.2.d: Mismatch and sectors proportion

Mismatch	IT	Services
Over-education	47.67	52.33
Horizontal Mismatch	52.52	47.48
Source: Based on field survey		

Within the IT and services sector, the table displays that those working in the Services sector were more likely to report over-education (52.33%) than their counterparts working in the IT sector (47.67%). This is because those who opted for Masters (the largest proportion were from lower-tier institutes[50]) are likely to comprise a larger proportion working in the service sector in comparison to those with only Bachelor's degrees. With the additional credential, they are facing over-education in their job. This also implies that those with higher work experience they would want a change in their job profile and switch to the service sector and report over-education in their jobs.

[49] This is discussed in methodology chapter.
[50] Discussed through the analysis carried out in the 4th chapter.

Also, what is interesting is that for those reporting horizontal mismatch, there is a larger proportion amongst those working in IT (52.52%) than those in the Services sector (47.48). This implies that those who chose core branches other than IT have found working in IT different from what they studied during their course. Hence, they have reported a horizontal mismatch. It also indicates that some have even joined non-tech jobs, which were in the form of technical content writing, associate ITeS/BPO, etc. They have reported a horizontal mismatch. Similarly, it is a possibility that those from top institutes have preferred IT jobs in pursuit of high pay packages even though they did not possess the degree in that branch of engineering. It also is a possibility that the lack of job opportunities in the core stream has given them options to explore elsewhere.

Table 6.2.e: Institutional ranking and proportion in different sectors

Institutional ranking	**IT**	**Services**	Total
Lower-tier	56.14	43.86	228
21-40 ranked institutions	69.57	30.43	23
1-20 ranked institutions	76.92	23.08	13
Source: Based on field survey			

What is evident from the table is that amongst all the three tiers of institutions the largest proportion amongst them are working in IT-related fields than in Services sector. The data displays that those from the top 20 ranked institutes comprise a larger proportion in the IT field, followed by those from 21-40 ranked institutions and those in institutes of low rank. In other words, for those working in the Services sector, the largest proportion is from institutes of low rank, followed by 21-40 ranked institutions and 1-20 ranked institutions. This indicates that those from top-ranked institutes want to work in IT fields than in the Services sector. Those from lower-tier institutes majorly struggle to find jobs in IT as it gets occupied by graduates from the top 40 institutes. Hence, a larger proportion amongst those from the lower-tier finds themselves in services-related jobs. To compete with them in the job market, they need an extra credential to position them against their competitors from top institutes.

This points towards why a larger proportion from lower-tier institutes goes in for a Masters.

Reasons for accepting the current job

In this section, an attempt is made to seek answers to the reason for choosing their present field of work in which one feels vertically or horizontally mismatched. A t-test is carried out to determine the relative importance of these factors by controlling for vertically and horizontally mismatched compared to those who reported being matched in their jobs.

Table 6.2.f: Reasons for choosing your current job

Factors	**Over-educated**	**Matched**	**Undereducated**	**Total**
Interesting work	83.72**	92.91	94.12	90.15
Job location	72.09	80.31	80.39	77.65
Better than unemployment	67.44	61.42	74.51*	65.91
Suits in short run	58.14	62.20	66.67	61.74
Salary level	83.72***	96.06	90.20	90.91
Career development	88.37***	97.64	96.08	94.32
Job benefits	87.21	90.55	88.24	89.02
Improved job Status	83.72***	94.49	92.16	90.53
Willingness to do a different job	67.44	70.87	82.35*	71.97
Faster technological Change	79.07**	88.98	82.35	84.47
Management decision	52.33***	70.08	74.51	65.15
Observations	86	127	51	264
Source: Based on field survey				

p*<0.1; p**<0.05; p***<0.01 denotes significant difference between matched and mismatch. All measures are reported in percentage. For a given group, the sum of reasons is greater than 100% as various factors may play a role in choosing that particular employment.

Reasons for choosing the current job (Vertically Mismatched)

Amongst those who reported over-education in their jobs, the data indicates that since the work assigned to them was appealing and was of interest to them, they have opted for it. For those who categorized themselves in the over-educated category, they are likely to be fully aware of the knowledge and skills they have acquired compared to their counterparts. Selecting an over-educated job would serve more as career development, given the fact that individuals vary in skill acquisition. Also, their expectations of salary being met for the kind of roles assigned to them as well as an improvement in the job status speaks volumes about the fact that it is not something to do with the short term; instead, it is an accepted phenomenon for a longer duration of their life. The management decision to choose an over-educated employee would result in cost-cutting for the firm, which would be beneficial for the firm. Technological innovation, a significant reason for selecting an over-educated profile, reveals that they are worried about the fact that whatever skill they had acquired during their course of study had become obsolete, and because of continuous advances in the technology, they could join job roles that are available. Thus, for those over-educated, it seems that a foot-in-the-door approach to suit their longer-term career plans may be true but not necessarily as jobs available are limited and one is not only viewed in absolute but in relative terms.

The undereducated do not differ much from matched engineers, as evident from the different factors. This job profile is secured because it is a better option for the candidate to take up the job rather than being unemployed as job opportunities are limited in certain fields. However, this may be true for those who want to work for certain specific firms where jobs might be limited in number. For the engineers experiencing under-education, the largest proportion is the early experience[51] engineers. This indicates that gaining skills and training in the job was easy for them as they belong to better institutes. Hence, they are willing to opt for such a profile (willingness to do a different job) where they are experiencing under-education as it would allow them to learn more through training.

[51] The ANOVA result is displayed in the appendix table A.58.

Table 6.2.g: Reasons for choosing your current job

Reasons	Horizontally Matched	Horizontal Mismatch	Total
Interesting work	93.60	87.05*	90.15
Job location	80.00	75.53	77.65
Better than unemployment	68.00	64.02	65.90
Suits in short-run	66.40	57.55	61.74
Salary level	93.60	88.48	90.90
Career development	96.00	92.80	94.31
Job benefits	92.80	85.61**	89.01
Improved job Status	93.60	87.76	90.53
Willingness to do a different job	70.40	73.38	71.96
Faster technological Change	88.80	80.57*	84.46
Management decision	68.00	62.58	65.15
Observations	125	139	264
Source: Based on field survey			

p*<0.1; p**<0.05 denotes a significant difference between matched and mismatch. All measures are reported in percentage. For a given group, the sum of reasons is greater than 100% as several reasons could be important for choosing that particular job.

Reasons for choosing your current job (Horizontal Mismatch)

The data informs that the horizontally mismatched engineers were likely to admit that interesting work was an important reason for accepting their current job. They seem to have opted for the job to suit their long-term career plans and the job benefits that would accrue to them. The data also displays that they are more likely to accept a job because of faster technological changes. It becomes imperative for one to take up jobs not necessarily related to one's field. Hence, they opt for jobs where they are horizontally mismatched to cope with the faster technological changes as it is not only interesting but pursued because of the benefits the job entails.

The study, therefore, delves into the possible determinants of mismatches, both vertical and horizontal, amongst engineers.

Table 6.2.h: Determinants of Vertical and Horizontal Mismatch (Percentage of the sample)

Determinants	**Over educated (A)**	**Under educated (B)**	**Vertical Mismatch (A+B)**	**Horizontal Mismatch**
Male	83.72	84.31	83.94	83.45
Female	16.28	15.69	16.05	16.54
Married	34.88	27.45	32.11	28.05
Unmarried	65.12	72.55	67.89	71.95
Age <= 25	27.91	37.25	31.38	28.77
Age > 25 & Age <=28	39.53	45.10	41.60	45.32
Age 28> 32	32.56	17.65	27.00	25.89
1-20 ranked institutions	3.49	5.88	4.37	5.03
21-40 ranked institutions	10.47	7.84	9.48	5.75
Lower-tier	86.05	86.27	86.13	89.92
Centrally Funded Institutions	18.60	19.61	18.97	17.26
State Funded Institutions	26.74	19.61	24.08	17.98
Privately Funded Institutions	54.65	60.78	56.93	64.74
Working in Private jobs	51.16	70.59	58.39	64.75

Working in the Government sector	48.84	29.41	41.61	35.25
5000 and above employees (large sized)	74.42	47.06	64.23	67.62
Less than 5000 employees (small sized firm)	25.58	52.94	37.22	32.37
Work experience less than 1 up to 2 years	47.67	70.59	56.20	50.35
Work experience >2-5 years	39.53	23.53	33.57	33.81
Work experience >5- 8 years	12.79	5.88	10.21	15.82
Satisfied with engineering training and skills in meeting job requirements	44.19	66.67	52.55	46.04
Dissatisfied with engineering training and skills in meeting job requirements	55.80	33.33	47.44	53.95
Agree that engineering education equipped enough to perform in the job market	59.30	41.17	52.55	45.32
CTC Rs. 3-6 lakh	45.34	35.29	41.60	40.28
CTC Rs. 6-10 lakh	41.86	21.56	34.30	30.93
CTC Rs. 10 and above	12.79	43.13	24.81	28.77
Over skilled	66.27	31.37	53.28	59.71
Under skilled	16.27	43.13	26.27	17.98
Number of observations	86	51	137	139
Source: Based on field survey				

6.2.1 Determinants of Vertical and Horizontal Mismatch

Amongst those who faced vertical/horizontal mismatch, there are a larger proportion of male (83.94%-VM and 83.45%-HM) in comparison to females' (16.05%-VM and 16.54%-HM). The proportion facing educational mismatch is higher amongst those who reported being unmarried (67.89%-VM and 71.95%-HM). It is possible that unmarried people were risk-taker and flexible in their approach towards the job, unlike their married counterparts, and are open to mismatches. Further, the largest proportion facing mismatch is prime-aged workers (41.60%-VM and 45.32%-HM), followed by young (31.385-VM and 28.77%-HM) and old-aged (27%-VM and 25.89%-HM) engineers. This indicates that as one move from young to prime-age, the proportion facing educational mismatch increases. It may be pointed out that it is better for them to keep themselves employed rather than being out of employment even if it calls for mismatches. It also may be long-term growth in their career trajectory. Or, it is a probability that they are unable to find a well-matched job given their knowledge and skills, and they have accepted it for the time period. The largest proportion facing vertical/horizontal mismatch is amongst those from lower-tier institutions (86.13%-VM and 89.92%-HM), followed by 21-40 (9.48%-VM and 5.75%-HM), and the least is in 1-20 ranked institutions (4.37%-VM and 5.03%-HM). This verifies that those claiming to be vertically/horizontally mismatched are those with lower analytical skills and less able engineers and may be those with lower levels of school achievement. They accept jobs either with over-education or where their skills are not required. Some of those representing horizontal mismatch from top 40 institutes imply that they may, through training, be quick in acquiring skills required in the jobs due to their quality institutions and might perform the task assigned to them. The largest proportion facing vertical mismatch (56.93%, 24.08%, and 18.97%) is from privately funded institutes, followed by state and centrally funded institutes. This indicates a negative relationship between the quality of education imparted and vertical mismatch. The lower is the quality of education imparted, the more likely the possibility of engineers facing vertical mismatch.

Further, the data reveals that those working in private jobs (58.39%-VM and 64.75%-HM) are more likely to face vertical/horizontal mismatch than their counterparts (41.61%-VM and 35.25%-HM). This indicates that because of relative competition, one faces a vertical/horizontal mismatch in jobs. Those in large-sized firms (64.23%-VM and 67.62%-HM) report higher vertical/horizontal mismatch than those in small-sized firms (37.22%-VM and 32.37%-HM). This point out that highly skilled and specialized engineer would be needed to perform the task productively in small-sized firms in contrast to large-sized firms. The largest proportion facing mismatch is those with the least work experience (56.20%-VM and 50.35%-HM), and the least mismatch is amongst those with the highest work experience (10.21%-VM and 15.82%-HM). This implies that engineers join whatever job might come one's way in the initial stage when entering the job market. Because of this, the probability of facing vertical/horizontal mismatches is higher. And once they acquire expertise in their roles, their likelihood of facing a mismatch is diminished.

Also, the fact that a larger proportion admitted that they were satisfied with engineering training and skills in meeting their job requirement (52.55%-VM) reflects that they are aware that everyone with the same qualification may possess skills of different quality and are better rewarded in the sense that they are categorized as over-educated but do not face problem in skill utilization in the job market[52]. Resultantly, this proportion is satisfied that engineering education met their requirement and equipped them with the skills required in their job profile, hence the satisfaction (52.55%-VM). Contrariwise, the dissatisfaction with engineering training and skills in meeting job requirements is higher amongst those who report facing horizontal mismatches (53.95%). This implies that they face difficulties in applying the skills they acquired during their engineering training and hence faced a horizontal mismatch. Those facing vertical/horizontal mismatch reported that a larger proportion amongst them reported income in the lowest category (41.60%-VM and 40.285-HM), followed by the middle (34.30%-VM and 30.93%-HM) and high-income category (24.81%-VM and 28.77%-HM). This implies that over-educated are working below their level and possess less human capital (in terms of ability) than their well-matched counterparts and hence are earning less. Simultaneously, with increased work experience, the probability of falling into the vertical/horizontal mismatch category is low. However, a larger proportion accepted that they were over-skilled[53] in the job (53.28%-VM and 59.71%-HM). It is a possibility that they have failed to develop

[52] This is where signaling becomes effective and brand of the institution conveys information about the employee.

[53] It is defined as a counterpart of skill underutilization.

skills while at institutions. It is that they are in jobs that do not attach importance to analytical and problem-solving skills or that they lack such skills, which prevent them from working in jobs that might appear as per their formal qualification. In turn, this point towards shortages of skills often complained about by employers. Thus, in terms of formal qualifications, one finds them over-educated, but they depict shortages in terms of the application of skills in the job market. There could be two reasons for skill not being utilized to full capacity; it could imply that there would have been a compromise with the quality of education imparted or quality of input admitted in these institutes. However, a smaller proportion reported under-skilled for the job (26.27%-VM and 17.98%-HM) they were performing, which point towards the fact that because of acceptance in top-ranked institutions, they have been granted these jobs whereby it would be up to the company/organization to develop the requisite skills in the individual by providing them adequate training.

6.2.2 Specification of the Model

The study tries to model the determinants to make predictions of educational mismatches. To determine who reported being over-educated, the vertical mismatch variable is coded 1 if the individual identified him/herself as over-educated or else 0.

Table 6.2.i: Variables and measures

Sr. No.	Variable name	Nature of the variable	Coding of the variable	Type of variable
1	Vertically Mismatched	Dependent variable	1- Overeducated 0- Not overeducated	Binary
2	Gender	Independent variable	1- Male 0- Female	Binary
3	Age	Independent variable	0-age <25 1-25-29 1-29-32	Multiple
4	Marital status	Independent variable	1-Married 0-Unmarried	Binary
5	Institutional ranking	Independent Variable	0---Lower-tier 1---21-40 2---1-20	Multiple
6	Type of workplace	Independent variable	1-Private/Self employed 0-Government	Binary
7	Job-status	Independent	0-Part time/contractual	Binary

		variable	1-Full time/permanent	
8	Size of workplace	Independent variable	1-5000 and above employees 0-5000 employees	Binary
9	Work experience	Independent variable	0-- if total work ex =less than 1 year, 1, 2 1-- if total work ex =3,4, 5 2--if total work ex =6,7, 8	Multiple
10	Career development	Independent variable	1-Very Important/Important 0-Moderately Important/ Somewhat Important/Not Important	Binary
11	Better than unemployment	Independent variable	1-Very Important/ Important 0-Moderately Important/Somewhat Important/Not Important	Binary
12	Job benefits	Independent variable	1-Very Important/Important 0-Moderately Important/Somewhat Important/Not Important	Binary
13	Job security	Independent variable	1-Very Important/ Important 0-Moderately Important/Somewhat Important/Not Important	Binary
14	Management decision	Independent variable	1-Very Important/ Important 0-Moderately Important/Somewhat Important/ Not Important	Binary
15	Satisfaction from engineering training and skills in meeting job requirements	Independent Variable	1-Very Satisfied/Satisfied/Moderately Satisfied 0-Dissatisfied/Very Dissatisfied	Binary
16	Working in IT/Service sector	Independent variable	1-IT sector 0-Service sector	Binary
17	Over skilled	Independent variable	1-Strongly Disagree/Disagree 0-Somewhat Agree/Agree/Strongly Agree	Binary
18	Under skilled	Independent variable	1-Strongly Agree/Agree/ Somewhat Agree 0- Disagree/Strongly Disagree	Binary

To better understand the factors contributing to over-education, this section estimates logistic regression to quantify the probability of over-education and then uses socio-economic factors as independent variables. The dependent variable is over-education. The set of explanatory variables include socio-economic background, institutional characteristics, job characteristics, skill-job match.

The Model

Y is dependent variable under consideration (over-education) X= vector of variables (institutional ranking, job status, type of workplace, size of the workplace, work experience, career development, better than unemployment, job benefits, job security, management decisions, satisfaction from training) with gender, marital-status and skill mismatches being control variables.

Y= a_0+a_1X+a_2 gender+$a_3$marital-status+ e…..Model 1

In the case of Model 2:-

We incorporate measures of over skilled variable

Y =Model 1+ a_4 over-skilled + e ……… Model 2

In the case of Model 3:-

We incorporate both skill mismatches

Y =Model 2+ a_5 under-skilled + e……… Model 3

Table 6.2.j: Determinants of over education (logistic regression)

Determinants	**Model 1**	**Model 2**	**Model 3**
Male	0.86 (.40)	0.00 (.42)	0.00 (.42)
25-28 years	-0.11 (.42)	-0.11 (.42)	-0.11 (.42)
28-32 years	0.42 (.48)	0.39 (.49)	0.39 (.49)
Married	0.17 (.37)	-0.06 (.38)	0.06 (.39)
21-40 ranked institutions	1.08 (.50)**	1.13 (.55)**	1.13 (.54)**
1-20 ranked institutions	-0.21 (.66)	-0.21 (.70)	-0.20 (.70)
Working in Private jobs	-0.16 (.40)	-0.16 (.40)	0.16 (.40)
Permanent employee	-0.57 (.77)	-0.65 (.80)	-0.65 (.81)
5000 and above employees	0.90 (.35)***	0.92 (.37)**	0.92 (.37)**
Work experience >2-5 years	0.12 (.37)	0.25 (.37)	0.25 (.38)
Work experience >5-8 years	-0.28 (.54)	0.00 (.56)	0.00 (.37)

Career development	-1.40 (.66)**	-0.99 (.68)*	-0.99 (.68)*
Job benefits	1.35 (.62)**	1.24 (.63)*	1.24 (.63)*
Better than unemployment	0.57 (.37)*	0.65 (.39)*	0.65 (.39)*
Job security	-0.99 (.59)*	-0.85 (.67)	-0.85 (.66)
Management decision	-0.79 (.35)**	-0.83 (.36)**	-0.84 (.37)**
Satisfied with engineering training and skills in meeting job requirements	-1.50 (.31)***	-1.2 (.33)***	-1.28 (.34)***
Working in IT	-0.59 (.35)*	-0.46 (.37)	-0.46 (.37)
Over skilled	-	1.14 (.32)***	1.14 (.33)***
Under skilled	-	-	0.016 (.44)
Constant	1.40 (1.16)	0.31 (1.22)	0.31 (1.22)
Psuedo R^2	0.1926	0.2309	0.2309
Prob>chi^2	0.0000	0.0000	0.0000
Number of observations	264	264	264
Source: Based on field survey			

p*<0.1; p**<0.05; p***<0.01; and the figures in parentheses indicate robust standard error.

6.2.3 Analysis of the factors determining over-education

In Model 1, those ranked in the top 20 institutes, their probability of reporting over-education is low. This implies that over-education has much to do with the quality of education imparted. Those in 21-40 ranked institutions reported over-education, and the results are statistically significant. Thus, as one moves away from top institutes, the probability of facing over-education is increased. This is because the well-matched jobs are offered to the graduates from top institutes, leading others to face mismatches in the form of over-education in the roles offered.

Similarly, working in large-sized firms, their probability of falling in the over-educated category is high. This reflects that since many people are involved in a large-sized firm, the firm may not be adamant about people possessing specific skills. They are keener on providing them with job training. However, the engineer could join thinking that this over-education would not be for a long-term plan of their career development. For him, he might take it as something better than being unemployed. Additionally, the job benefits in medical/lunch facilities, sabbatical, etc., drive one to join the mismatched job. Also, to avoid being unemployed, they might as well compromise job security for over-education. It might be at the company's disadvantage (management decision) to opt for over-educated candidates compared to well-matched graduates because that might affect the company's productivity and turnover ratio.

Further, those who were satisfied with engineering training and skills in meeting their job requirements did not report over-education. This points that satisfaction from engineering training and skills was least amongst those from lower-tier institutes, as evident from the analysis carried out in chapter 5. This may imply that over-education is related to the quality of education imparted and is more prominent among lower-tier institutes. Those who appeared dissatisfied with engineering training and skills in meeting job requirements have reported higher mismatches in the form of over-education[54]. This reflects that they are over-educated only in terms of formal qualifications (degree requirement). Therefore, what becomes evident through the regression results is that the impact of job and institutional characteristics dominate over individual factors for the determination of over-education status. For those

[54] The results are shown in appendix tables A.35 to A.42.

working in IT jobs, their probability of facing over-education is low. This reflects that over-education is not the outcome of institutional rigidities, but a structural issue not only concerned with the low quality of education imparted but also depends on the availability of jobs in the economy.

With the addition of the over-skilled variable in Model 2, the R^2 improves and is reported at 23.09%. The addition of the variable is statistically significant and is positively related to over-education. The addition of the over-skilled implies that it does affect the incidence of over-education. This indicates that even skills would not have been developed while at university. These skills hold significance in determining over-education, and most graduates depict a shortage of such skills. What becomes evident by including this variable is that engineers might be possessing skills of sub-standard quality.

Lastly, in Model 3, the addition of an under-skilled variable does not improve the model's fit. It is the same as R^2 in Model 2. This implies that skills deficit may not have a relationship with over-educated employees. This points that over-educated are not reporting skills deficits in their jobs. It is primarily the relation of skills not being utilized to full capacity with over-education, pointing towards the gaps in education.

6.2.4 Specification of the Model

To find out who reported horizontally mismatched in jobs, the horizontal mismatch variable is coded 1 if there is a horizontal mismatch or else 0.

Table 6.2.k: Variables and measures

Sr.No.	Variable name	Nature of the variable	Coding of the variable	Type of variable
1	Horizontally Mismatched	Dependent variable	1-Horizontally Mismatched 0-Horizontally matched	Binary
2	Marital Status	Independent variable	1-Married 0-Unmarried	Binary
3	Age	Independent variable	0---age <25 1---25-29 2----29-32	Multiple
4	Institutional funding	Independent variable	0- State Funded 1-Centrally Funded 2-Privately Funded	Multiple
5	Type of workplace	Independent variable	1-Private/Self employed 0-Government	Binary
6	Job-status	Independent variable	0-Part-time/contractual 1-Full time/permanent	Binary
7	Size of workplace	Independent variable	1-5000 and above employees 0-1-5000 employees	Binary
8	Work experience	Independent variable	0-if total work ex =less than 1 year, 1, 2 1-if total work ex =3,4, 5 2-if total work ex =6,7, 8	Multiple
9	Satisfaction from engineering training and skills in meeting job requirements	Independent variable	1-Very Satisfied/Satisfied/ Moderately Satisfied 0-Dissatisfied/Very Dissatisfied	Binary
10	Engineering education equipped them enough for the job market	Independent variable	1-Strongly Agree/Agree/ Somewhat Agree 0-Disagree/ Strongly Disagree	Multiple
11	Willingness to do a different job	Independent variable	1-Very Important/Important 0-Moderately Important/ Somewhat Important/ Not Important	Binary
12	Suits in the short-run	Independent variable	1-Very Important/ Important 0-Moderately	Binary

			Important/Somewhat Important/ Not Important	
13	Technological changes	Independent variable	1-Very Important/ Important 0-Moderately Important/ Somewhat Important/ Not Important	Binary
14	Working in IT/Service sector	Independent variable	1-IT 0-Service	Binary
15	Choice of stream restricted due to Rank	Independent variable	1-Yes 0-No	Binary
16	Over skilled	Independent variable	1-Strongly Disagree/Disagree 0-SomewhatAgree/Agree/Strongly Agree	Binary

To better understand the factors contributing to horizontal mismatch, this section estimates logistic regression to quantify the probability of horizontal mismatch and then uses socio-economic factors as independent variables. The dependent variable is a horizontal mismatch. The set of explanatory variables include socio-economic background, institutional characteristics, job characteristics, skill job match.

The Model

Y is dependent variable under consideration (Horizontal mismatch) X= vector of variables (institutional funding, job status, type of workplace, size of the workplace, work experience, quality of training, engineering education equipping them to perform in the job market, suits in short-run, willingness to do a different job technological changes) with age, marital status being control variables.

Y=a_0+ a_1X+ $a_2$age+ $a_3$marital status + e…….. Model 1

In the case of Model 2:-

We incorporate measures of stream restriction due to qualifying rank

Y =Model 1+ a_4 stream restriction due to rank+ e ……… Model 2

In the case of Model 3:-

We incorporate the measure of over skilled variable

Y =Model 2+ a_5 over skilled + e……… Model 3

Table 6.2.l: Determinants of Horizontal Mismatch (logistic regression)

Determinants	**Model 1**	**Model 2**	**Model 3**
Married	-0.61* (.442)	-0.62* (.42)	-0.67* (.41)
Age > 25 & Age <=28	0.66* (.41)	0.55* (.41)	0.72* (.43)
28> 32	0.34 (.51)	0.22 (.52)	0.04 (.54)
Centrally Funded Institutions	0.53 (.51)	0.56 (.52)	0.83* (.55)
Privately Funded Institutions	.95** (.41)	1.17*** (.42)	1.53*** (.44)
Working in Private jobs	0.82* (.49)	0.55 (.49)	0.74 (.55)
Permanent employee	0.20 (.76)	0.11 (.83)	0.36 (.75)
5000 and above employees	0.86** (.34)	0.73** (.35)	0.77** (.38)
Work experience >2-5 years	0.13 (.40)	0.14 (.40)	0.21 (.40)
Work experience >5-8 years	0.43 (.52)	0.50 (.52)	1.11** (.55)
Satisfied with engineering training and skills in meeting job requirements	-2.40*** (.36)	-2.38*** (.37)	-2.22*** (.40)
Agree that engineering education equipped enough to perform in the job market	-0.72** (.31)	-0.73** (.33)	-0.82** (.37)
Suits in Short run	-0.35	-0.35	-0.17

	(.344)	(.34)	(.38)
Willingness to do a different job	0.31 (.35)	0.29 (.34)	0.30 (.38)
Technological changes	-0.39 (.43)	-0.35 (.42)	-0.14 (.47)
Working in IT	-0.83** (.40)	-0.60* (.41)	-0.55* (.45)
Choice of stream restricted due to qualifying rank	-	0.72** (.33)	0.71* (.33)
Over skilled	-	-	1.81*** (1.01)
Constant	0.78 (1.02)	0.69 (1.04)	-1.44 (1.03)
Psuedo R^2	0.2427	0.2513	0.3290
Prob>chi^2	0.0000	0.0000	0.0000
Number of observations	264	264	264
Source: Based on field survey			

p*<0.1; p**<0.05; p***<0.01 and the figures in parentheses indicate robust standard error.

6.2.5 Analysis of the factors determining the horizontal mismatch

Model 1 depicts that there is a negative relationship of marriage[55] with the horizontal mismatch. This implies that for those who are married, their probability of reporting horizontal mismatches is low. Prime aged workers are more likely to join jobs where they face horizontal mismatch. This implies that they are ready to join such jobs during this age because this is an evolutionary stage of their career, and they are risk-taker as responsibilities are low at this age. Thus, they try working in fields where they can be deemed fit through on-the-job training. Those from privately funded

[55] In India, the marriage and the job market is very much related. It is only when one is settled in terms of earnings that one decides to get married. ANOVA results of marriage with earnings are positively related as shown in appendix A.68. Hence, with earnings there is higher stability amongst married people and lower probability of mismatches.

institutions are more likely to report horizontal mismatch. This implies that those from privately funded institutes have given the least preference in the job related to their education field. With a limited number of jobs, those from the best institutes have been given priority in the specialized field over those from privately funded. Resultantly, engineers from privately funded institutes are more likely to be horizontally mismatched. Those working in the private sector are more likely to report horizontal mismatches. Those working in large-sized firms are more likely to report horizontal mismatch. Those reporting satisfaction from engineering training and skills in meeting job requirements are less likely to face horizontal mismatch. Similarly, those who said that engineering education equipped them enough to perform in the job market are less likely to report horizontal mismatch. This, in turn, is related to the quality of education imparted. Those from lower-tier institutes are more likely to disagree that engineering education equipped them for the job market[56]. This implies that many graduates have not been well-equipped for performing in other fields.

In Model 2, the variable that mismatch in their engineering stream choice is due to qualifying rank shows statistically significant results and depicts positive relation with the horizontal mismatch. R^2 improves slightly to 25.13%. This implies that engineers are joining job roles related to the stream they wanted to pursue initially in the choice stage but could not choose the stream due to their low qualifying rank in the entrance examinations.

Further, in Model 3, an over-skilled variable is added, and R^2 improves significantly to 33%. This implies that this variable has a positive relationship with the horizontal mismatch. The skilling variable is added to the model; even those from centrally funded institutes report facing horizontal mismatches, and the results are statistically significant. This implies that even those from the best institutes report horizontal mismatch are facing initial difficulties in the job roles assigned to them concerning skill utilization. Those with higher work experience are more likely to report horizontal mismatch. This implies that a person would be willing to join different fields for their long-term goals throughout their career. This denotes that horizontal mismatch is more of a career evolution for certain engineers as the job and individual

[56] The results are discussed in the appendix wherein it displays that those reporting horizontal mismatch from lower-tier institutes disagree that engineering education equipped them with the job market.

and institutional characteristics play a significant role and is statistically significant for determining horizontal mismatch. This depicts that it is not necessary that out of compulsion they are joining such jobs, but it reflects their choice of such jobs. With more work experience, one adds more learning and wishes to continue the job for a longer duration.

6.2.6 Discussion: Institutional Rigidities

In this section, the study aims at understanding if there is an educational mismatch (vertical/horizontal) amongst employed engineers and what are the factors that lead to mismatches. Since mismatches in the job market are not independent of the decision taken earlier in one's career trajectory, the institutional and individual factors, along with the availability of jobs and prevailing market conditions, all conjointly affect the final outcome in the job market.

Based on the analysis, the study represents the existence of over-education and horizontal mismatches faced by engineers. There is a negative relationship among those enrolled in the top 20 institutes and facing over-education. Those who were satisfied with engineering training and skills reported a lower probability of facing over-education. It has been analysed in the previous chapter that dissatisfaction with respect to institutional evaluation was the highest amongst those from lower-tier institutes. Those working in IT fields, their likelihood of facing over-education are lower. Through the descriptive analysis, it is represented that working in IT, a higher proportion of them are pass-outs from top institutes. Those joining over-educated jobs reported that they were not joining these jobs because of career development; instead, it was to avoid unemployment. This point towards the fact that with limited job opportunities, there is a probability of mismatches. In large-sized firms, there is a likelihood of one facing over-education. Also, for those who reported that they faced difficulty in utilizing skills in the job market, their probability of facing mismatches is higher. It is both the job and institutional characteristics that affect the outcome of one reporting over-education.

Among those reporting horizontal mismatch, it is represented that those who were married their likelihood of facing mismatch is low. The horizontal mismatch was higher amongst the prime-aged worker. And those who were pass-outs from privately funded institutes are more likely to be horizontally mismatched. Those who were satisfied with the engineering training reported low horizontal mismatches. Also, those working in large-sized firms reported higher mismatches. When the over-skilled variable is added, the likelihood of reporting horizontal mismatch is higher amongst the pass-outs from centrally funded institutes and those with higher work experience. In this case, the individual, institutional, and job characteristics are important in determining horizontal mismatches. With new types of jobs emerging in the service sector, as discussed earlier, even those from centrally funded face issues with skill utilization.

A study by Green *et al*. (2002) analysed that married workers have a higher likelihood of reporting over-qualification in jobs due to family reasons (presence of partner, children, etc.). On the contrary, Green and McIntosh (2007) study depict that there is a lower likelihood of reporting over-qualification amongst married workers. Mcgoldrick and Robst (1996) found no impact of marriage on one facing mismatches. Over-education varies due to school achievement, type of training undertaken, work experience, and job tenure (Green and McIntosh, 2007). Robst (1995) argues that those joining the lowest quality institutes are over-educated all through their career. Those who enrol in a better institute, on the other hand, will be able to advance in their careers. Human capital theorists claim that people who work below their educational level are doing so because they have a limited amount of human capital on average, not because the job limits their productivity. Dolton and Vignoles (2000), in the case of UK graduates and Frenette (2004) for the Canadian sample, have documented that over-qualification has a degree of permanence for some individuals. Thus, over-education can be either temporary or permanent depending upon the individual, job, and institutional characteristics.

6.3 Skill Utilization[57] and Mismatch

The study decomposes over-education and horizontal mismatch into two categories according to skill[58] utilization. One such type is referred to as "*Real Mismatch*," (Green and Zhu, 2010), wherein the individual is either vertically or horizontally

[57] These refer to the specific skills that one acquires through engineering education.

[58] The study does not seek to prove the existence of a certain skill, but rather to investigate the possibilities of skills utilization.

mismatched, and there is the utilization of skills not to the full capacity [59](skill underutilization). The other is termed "*Formal Mismatch*," (*ibid*), where the individual is either vertically/horizontally mismatched and skills[60]are fully utilized.

Turning to the skill utilization variable, this was based upon the following two questions: - How much do you agree or disagree with the following: "My current job offers me sufficient scope to use my knowledge and skills?" and "In a job, you are able to utilize your engineering skills to the best of your capacity?" The employees were asked to indicate the extent to which they agreed with the following questions. The responses to these questions reveal the degree to which available skills are being utilized; skills not being used to full capacity (a skill counterpart of over-education) are indicated by the extent to which one disagrees with this statement.

A Real mismatch scale is computed as the average of the two questions (1 and 2). The above compound measure then makes the Real mismatch scale a continuous variable. It is made into a binary variable by recoding the continuous variable's value, which falls under the category of greater than 3 into 1 or else 0. A 0/1 dummy is created for skill utilization final variable where 1 is assigned when the respondent disagrees with questions 1 and 2, and 0 otherwise.

The descriptive statistics analyse whether there is an educational mismatch among Indian engineers and whether the mismatch is a real or a formal one. Secondly, the chi-square test is undertaken to examine the relationship between two categorical variables, i.e., skill utilization with over-education and horizontal mismatch.

6.3.1 Typology of skill utilization and mismatch

The classification into real and formal mismatch is depicted below in the following table.

Table 6.3.a: Typology of skill utilization and mismatch

Skill fully utilized	OE=1 and OS=0 **(Formal Over-education Mismatch)**	HM=1 and OS=0 (**Formal Horizontal Mismatch**)
Skill not utilized to full capacity (underutilized)[61]	OE=1 and OS=1 (**Real Over-education Mismatch)[62]**	HM=1 and OS=1 (**Real Horizontal Mismatch)**

[59] It is assumed that the individual is pushed into the job.
[60] Individual faces differences in skill utilization.

Here, the relationship between educational mismatch and skill not being utilized to full capacity is displayed through cross-tabulations.

Table 6.3.b: The relation between educational mismatch and skill underutilization (in proportion)

	Skill underutilization	
Educational mismatch	No	Yes
Over-educated	15.12	84.88
Undereducated	54.90	43.14
Horizontally Mismatched	23.02	76.98
Source: Based on field survey		

The relation between educational mismatch and skill utilization

Among those who were over-educated and reported skills underutilization, they represent a larger proportion (84.88%) than those who did not report a problem with skills utilization (15.12%). This implies that the larger proportion is facing difficulty in their skill utilization amongst those reporting over-education. It is a probability that they are experiencing shortages of skills or, rather, they do not possess such skills. These engineers may fail to add to the firm's productivity and may cost more to the firm in terms of in-house training. They represent the category of '*real over education*.'

On the contrary, a smaller percentage (15%) reported being over-educated but had no difficulty in utilizing their skills. They are those engineers who are not only over-educated in terms of their formal qualification, but as far as the application of skill is concerned, they fully utilize their skills. They reflect the '*formal mismatch'* category of engineers. Further, amongst those who reported under-education in their jobs, a larger proportion reported that they did not experience problems in the utilization of

[61] Skill deficit is not used as a measure of lacking skills since employees were questioned based on their self- assessment and there would have been biasedness towards the outcome.
[62] In the present study taking engineers as group it is hypothesized that those belonging to real mismatch category have difficulty in utilizing skills to the best capacity.

skills (54.90%). This implies that since they were in roles above their level of education, they are better off depicting a basic understanding of engineering skills than their over-educated counterparts; they are not experiencing difficulty in utilizing their skills acquired during engineering education. They indeed represent the best minds. However, there is a smaller proportion amongst these undereducated engineers who reported skills not being utilized to full capacity (43.14%). They indicate that although they are in jobs where they perform tasks above their level of education and when the question of skill applicability arises, they are experiencing a problem in its utilization. Lastly, a larger proportion of those reporting horizontal mismatch reported that they experienced difficulty in skill utilization (76.98%) in their job roles. This indicates that they are in jobs where they depict deficiency in practical applicability. Their inability to apply theory into practice could not have been used in jobs not related to their field of education. A larger proportion reflects the problem in utilizing such skills to full capacity. This category represents '*real horizontal mismatch*.' However, a smaller proportion amongst those facing horizontal mismatch reported no issue in skill utilization (23.02%). They are those engineers working in other fields of education and are actually in a job where their skills and knowledge developed while at the university are in accord with their job profile, and they do not face problems with practical application. They represent the '*formal horizontal mismatch'* classification of engineers.

Further, an effort is directed to find out the characteristics of those who reported real mismatches. This is because they are the ones representing the trouble in the utilization of skills. They are the ones who are at a greater risk of facing unemployment in case the employment situation worsens. Thus, what could be the possible determinants of these engineers facing real mismatches who cannot depict skills applicability while working?

Table 6.3.c: Determinants of real mismatch (in proportion)

Determinants	Real over education	Real horizontal mismatch
Centrally Funded Institutions	16.54	16.86
State Funded Institutions	28.07	21.68
Privately Funded Institutions	64.39	61.44
5000 and above employees (large-sized)	77.19	71.08
Less than 5000 employees (small-sized firm)	22.80	28.91
Work experience less than 1 up to 2 years	49.12	49.39
Work experience >2-5 years	42.10	37.34
Work experience >5- 8 years	8.77	13.25
Satisfied with engineering training and skills in meeting job requirements	42.10	42.16
Dissatisfied with engineering training and skills in meeting job requirements	57.89	57.83
Agree that engineering education equipped enough to perform in the job market	57.89	46.98
Disagree that engineering education equipped enough to perform in the job market	42.10	53.02
CTC 3-6 lakh	49.12	43.37
CTC 6-10 lakh	36.84	28.91
CTC 10 and above	14.03	27.71
Source: Based on field survey		

6.3.2 Determinants of real mismatch

Amongst those falling in the real over-education or real horizontal mismatch category is that the largest proportion amongst them is from privately funded institutes (64.39%-OE and 61.44%-HM), followed by state (28.07%-OE and 21.68%-HM) and centrally funded institutes (16.54%-OE and 16.86%-HM). This implies that mismatch has linkages with the quality of education imparted. However, some proportions even report real over-education mismatch from state and centrally funded institutes. It may be those engineers belonging to the reserved category and have achieved access to these institutes via affirmative policies; however, they are unable to match up with those amongst the best minds.

The data represents that in the case of those engineers working in large-sized firms (77.19%), the problem of real over-education is bigger. This follows that small-sized firm that are specialists in works do not hire those who have a superficial understanding of the concepts. In the case of large-sized firms, it becomes easy to trickle down the work assigned to others if one may not be specializing in it. Thus, the probability of real over-education is higher in large-sized firms since one can quickly get away with the work assigned to them. Further, there is a drastic decline in the proportion reporting real over-education with increased work experience for more than 5 years (8.77%). This implies that with one's practical applicability of skill usage, the probability of facing difficulty in skill utilization diminishes. This indicates disjointedness between practical knowledge with theoretical learning during the study. Also, it is evident that for those falling in the category of real over-education, the proportion is higher who reported dissatisfaction with engineering training and skills in meeting their job requirements (57.89%) but is in agreement with the fact that engineering education equipped them to perform in the job market (57.89%). This is because the prime reason cited for opting for a different stream while pursuing engineering education is that it would give them better employability; hence are satiated with the fact that engineering education could at the least equip them to become marketable in the job market by granting them degrees. The highest proportion facing real over-education mismatch earn minimal wages (49.12%). Therefore, it becomes imperative to understand that over-education in terms of qualification may be a misnomer. Hence, it is of utmost significance to link it to skill utilization to understand the difference between those with over-education just in name and those with over-education in actuality.

A chi-square test is undertaken to determine whether a significant relationship exists between the two variables, vertical/horizontal mismatch and skill underutilization.

Table 6.3.d: Correlation between vertical/horizontal mismatch and skill underutilization

Skill underutilization		**Over education**	**Under education**	**Horizontal Mismatch**
	Pearson chi2	34.1786	5.4167	37.3372
	Pr.	0.0000	0.020	0.0000
	Cramer's V	0.3598	-0.1432	0.3761
Source: Based on field survey				

6.3.3 Correlation between skill utilization and mismatch

According to the correlation results illustrated above, it is evident that over-educated[63] engineers show a positive[64] correlation with the skill variable. This shows that over-educated engineers have a problem in utilizing their skills in their current job. Under-education has a negative association with under-utilization of skills, as well as the perception that their profession demands additional abilities and that they have been able to use their existing skills. Additionally, those with horizontal mismatch indicate a positive correlation with the skill underutilization variable. They are unable to apply their engineering knowledge and abilities since they have chosen to work in other domains/sectors. Correlation results show a strong correlation between skill utilization and educational mismatch in Indian engineer's labour market. This conclusion contradicts Allen and Velden's (2001) findings.

The correlation of over-education and horizontal mismatch with skill underutilization suggests that those who reported over-education/horizontally mismatched face

[63] This is displayed in table 6.2.3(d) that as one move away from the top institutes, one's probability of facing over-education is increased. Thus, over-education has much to do with the quality of education imparted.

[64] Depicted through Cramer's V.

difficulty in skills being utilized to full capacity. This implies that they are facing a gap between the skills required in the market and those acquired by them in their duration of obtaining the engineering degree. It means that the quality imparted amongst these engineers may be questionable. The study depicts that skill not being utilized to full capacity is derived from the educational mismatch. It implies that the increase in enrolment in engineering institutes is only for fulfilling the eligibility criterion for jobs and showcase of degrees. The engineers fail to a more considerable extent to depict the basic understanding of their field of study and depict inabilities to independently carry out tasks assigned to them. This skill mismatch is very much the outcome of the problems faced by the education system, notwithstanding the prevailing labour market conditions and job availability, and institutional rigidities. Although existing research claims that both educational and skill mismatches have different identities, this study shows that they are correlated, and more often, educational mismatches lead to skill mismatches. This point towards the fact that with more graduates pursuing engineering degrees, this may reflect more on individuals' desire to earn a qualification and add to one's credential instead of obtaining skills and knowledge gained through education. The teaching profession, in India's case, is often taken for granted. Due to poor salaries disbursed to the teachers', the profession cannot attract the best minds in some institutes[65]. Thus, the lack of teaching expertise reflects a lack of understanding among students who eventually lose in the job market. The question is not only about the quality imparted but also about the quality enrolled in these institutes.

6.3.4 Discussion: Assignment theory

The study answers if there is an existence of a relationship between educational mismatch and skill utilization. It also informs about real and formal mismatches. Through the correlation between over-education and horizontal mismatch with skills not being utilized to full capacity, the analysis represents that mismatches in education and job are accompanied by skills not being fully utilized. And the results indicate a relatively strong relationship between the two. There are a larger proportion of engineers who are reporting real mismatches in comparison to those reporting formal mismatches. Amongst those facing real mismatches, a larger proportion is

[65] Ranking of institutions display that funding and faculty are important. Those with higher funding have good faculty and higher ranking (Qamar, 2021).

from privately funded institutes, those with lower work experience, and those reporting earnings in the lower range.

Green and McIntosh's (2007) study argues that there is a positive but not perfect correlation between over-qualification and skills underutilized. They regard both qualification and skills as two different concepts. The study represented that those who reported underutilization of skills are working in jobs where these skills are viewed as less critical. This is primarily interpreted that it is these skills that they could be lacking and preventing them from working in jobs where their skills are more commensurate. Also, in a study by Green and Zhu (2010), a positive correlation between the two variables is illustrated, but their trends are different. The rise in over-qualification amongst British graduates is not accompanied by an increase in skill underutilization. Even though there is a rise in the number of graduates taking up jobs where qualification is not required, they are at least able to make use of their existing skills. Interestingly, the British data for males' and females' represent a larger proportion of those with formal and not real over-qualification. Allen and Velden (2001) in Netherland found a weak relationship between the over-educated and skill utilization variable. All these studies conducted in developed nations have argued for educational and skill mismatches as distinct types of mismatches. These findings are consistent with Allen and Weert's (2007) study, which found that the best match between education and job is in nations (Germany and the Netherlands) where higher education is focused on the labour market. Still, the relationship is weak between education and skill mismatches (*ibid*). These researches have mainly supported the premise that graduates with a more narrow concentration face fewer mismatches than graduates with a broad emphasis. According to Dolton and Vignole's (2000) study, arts, language, and social science graduates are more likely to be overeducated than engineering and technical graduates. Also, a study in the context of Canada argues that graduates completing discipline-specific majors like health science, computer and information science, engineering, education have a likelihood of education skill match (Boudarbat and Chernoff, 2009).

However, a study by Jonbekova (2015) in Tajikistan illustrates that the two mismatches are interrelated, and it is the educational mismatch that sometimes leads to skill mismatches. Skill mismatches were indeed reported for graduates from field-specific degrees, engineering, and natural sciences. The engineering and medical graduates are failing to depict even the basic understanding of their subject and cannot carry out the assignment independently. Excerpts from employers opine that university education was more concerned with qualification earning than an embodiment of knowledge and skills. It is the issue concerning the quality of graduates coming out from institutes and the quality of education provided in these institutes. Shortages of qualified teachers' and its linkages with low salaries, flawed curriculum, and outdated teaching methods are the more significant concerns. Interestingly, corruption in acquiring admission and degrees leads to haphazard field-of-study choices and a lack of enthusiasm in the subject matter, which has an impact on engineers' learning and skill acquisition. Thus, it is deciphered that in developing economies where the quality of education is a major concern, educational mismatches are more likely to indicate skill mismatches. The relationship seems to be very contextual.

The studies have argued that individual possessing lower ability is more prone to over-qualification (Chevalier and Lindley, 2009). This could imply that lack of cognitive skills is a key factor in over-qualification (Green *et al*., 1999; Quintini, 2011). Buchel and Schult (2001) examined disparities in the chance of being overqualified among people with equal levels of education in West Germany. He linked this to their academic performance and the type of training undertaken by them.

The issue of educational and skill mismatches are closely linked in assignment theory and Sattinger (1993) argues that educational mismatch implies skill mismatches, affecting productivity and wages. However, when workers are assigned top-down according to their skills, the most competent worker is assigned to the most complex job, and the least competent worker is assigned to the simplest job, the assignment is ideal. It goes on to say that individuals who are working below their educational level (over-educated) for the required job will see their capabilities not completely exploited because the job characteristics limit their abilities, lowering the over-educated worker's productivity and revenue. Working in a job that is above one's level, on the other hand, lifts the 'productivity ceiling,' allowing people to be more productive than they would be at their current level. However, in this case, the worker's abilities are the main factor limiting productivity.

6.4 Effects of Mismatches on Wages

This section analyses the differences in educational outcomes with respect to wages and how it has been impacted due to educational mismatches.

6.4.1 Specification of the Model

Y the dependent variable under consideration is wages, which is categorized as follows:-

CTC = 0 (<Rs.3 lakhs-6 lakh)

CTC = 1 (Rs. 6-10 lakh)

CTC = 2 (Rs. 10–35 lakh and above)

The dependent variable (CTC) took 3 ranges as outcomes, so maximum likelihood multinomial regression is used for the estimation process.

Table 6.4.a: Variables and measures

Sr. No.	Variable name	Nature of variable	Coding of variable	Type of variable
1	Wages	Dependent variable	0-(<Rs.3 lakhs-6 lakh) 1-(Rs.6-10 lakh) 2-(Rs.10–35 lakh and above)	Multiple
2	Gender	Independent variable	1-Male 0-Female	Binary
3	Age	Independent variable	0-age <25 1-25-29 2-29-32	Multiple
4	Institution ranking	Independent variable	0----Lower-tier 1-----21-40 2-----1-20	Multiple

5	Type of workplace	Independent variable	1-Private/Self employed 0-Government	Binary
6	Job-status	Independent variable	0-Part-time/contractual 1-Full time/permanent	Binary
7	Size of workplace	Independent variable	1-5000 and above employees 0-1-5000 employees	Binary
8	Work experience	Independent variable	0-if total work ex =less than 1 year, 1, 2 1-if total work ex =3,4, 5 2- if total work ex =6,7, 8	Multiple
9	Overeducated	Independent variable	1-Yes 0-No	Binary
10	Undereducated	Independent variable	1-Yes 0-No	Binary
11	Horizontal mismatch	Independent variable	1-Yes 0- No	Binary
12	Over skilled	Independent variable	1-Strongly Disagree/Disagree 0-Somewhat Agree/Agree/Strongly Agree	Binary
13	Under skilled	Independent variable	1-Strongly Agree/Agree/ Somewhat Agree 0- Disagree/Strongly Disagree	Binary

Y is the dependent variable under consideration (wages) X= vector of variables (gender, age, job status, type of workplace, size of the workplace, work experience), and then we add the mismatches

Y =a_0 + a_1X + a_2 under education +$a_3$over-education + a_4 horizontal mismatch + e .... Model 1

In the case of Model 2:-

We incorporate measures for two types of skill mismatch

Y =a_0 + a_1X + a_5 over-skilled + a_6 under-skilled+ e ……… Model 2

In the case of Model 3:-

We incorporate both educational and skill mismatches

Y =Model 1+ a_5 over-skilled + a_6 under-skilled + e……… Model 3

Table 6.4.b: Multinomial logit with base outcome Wages

	Model 1		**Model 2**		**Model 3**	
Determinants	**Wages 1**	**Wages 2**	**Wages 1**	**Wages 2**	**Wages 1**	**Wages 2**
Male	0.563 (.408)	2.11*** (.590)	0.512 (.390)	1.94*** (.594)	0.570 (.402)	2.11*** (.596)
Age > 25 & Age <=28	-0.189 (.430)	0.148 (.505)	-0.261 (.430)	0.190 (.483)	-0.210 (.436)	0.117 (.528)
28> 32	0.238 (.543)	1.341* (.700)	0.180 (.543)	1.34** (.658)	0.231 (.559)	1.471** (.708)
21-40 ranked institutions	-0.123 (.618)	0.011 (.653)	-0.138 (.587)	-0.286 (.682)	-0.13 (.61)	-0.185 (.659)
1-20 ranked institutions	1.08 (1.00)	3.14*** (1.01)	1.07 (1.06)	2.72*** (1.01)	1.05 (1.00)	3.19 *** (1.07)
Private job	0.740* (.406)	2.969*** (.646)	0.653 (.398)	2.99*** (.652)	0.718* (.415)	3.04*** (.694)
Permanent employees	0.909 (1.20)	14.671*** (.75)	0.951 (1.12)	15.11 *** (.641)	1.01 (1.25)	15.08*** (.84)
>5000 and above employees	1.19*** (.398)	0.020 (.461)	1.05*** (.393)	-0.285 (.429)	1.17 *** (.402)	0.007 (.471)
Work experience >2-5 years	1.32*** (.403)	0.991* (.537)	1.26*** (.406)	0.682 (.520)	1.31*** (.408)	0.980* (.551)
Work experience >5- 8 years	2.46*** (.902)	3.89*** (.992)	2.15* (.884)	3.22*** (.926)	2.41*** (.931)	3.94*** (1.04)

Overeducated	-0.246 (.379)	-1.22** (.542)	-	-	-0.148 (.384)	-1.05* (.548)
Under Educated	0.044 (.509)	1.205** (.545)	-	-	0.179 (.539)	1.95*** (.561)
Horizontal Mismatch	-0.631* (.347)	-0.120 (.464)	-	-	-0.612* (.3762)	-0.137 (.514)
Over skilled	-	-	-0.542 (.351)	-0.702* (.397)	-0.291 (.376)	-0.472 (.403)
Under skilled	-	-	-0.211 (.405)	-1.01** (.518)	-0.318 (.447)	-1.80*** (.521)
Constant	-2.78** (1.23)	-20.05*** (1.24)	-2.68** (1.12)	-19.66*** (1.15)	-2.71** (1.27)	-20.19*** (1.35)
Pseudo R^2	0.2922		0.2675		0.3107	
Prob>chi^2	0.0000		0.0000		0.0000	
Number of observations	264		264		264	
Source: Based on field survey						

p*<0.1; p**<0.05; p***<0.01 and the figures in parentheses indicate robust standard error.

6.4.2 An Analysis of the impact of mismatch on wages

In Model 1, the indicators of educational mismatch are added to the model. The adjusted R^2 is 0.29. There is a positive effect of under-education on wages, confirming that those in jobs where the educational requirement is higher than the individual possesses result in higher wages. This is because, according to their level, they are undereducated. Still, they have been appointed to the task, assuming that they are able and quick at learning, which would lead to higher productivity and results in getting one higher wage. Contrariwise, the data displays that the over-educated had a negative effect on wages and the results are significant for the highest wage category. These findings align with the conclusions of earlier research studies (Green and McIntosh, 2007; Green and Zhu, 2010). The wage difference amongst those working below their education level (over-educated) reflects individual differences in human capital. They are less productive than those experiencing under-education/matched in jobs as they possess lower ability and report lesser wages.

The impact of horizontal mismatch on income was similar to the results obtained in earlier studies. Workers who faced horizontal mismatch tended to have lower wages than those who did not face horizontal mismatches. This implies that those in jobs where one experiences horizontal mismatch faces difficulty in the application of knowledge and skills acquired at university and fail to register an increase in wages. Working in the private sector (because of higher competition) and working as a permanent employee is associated with increased wages than those working in public or contractual employees or those working in small-sized firms. This is because, in large-sized firms, the prestige associated with the company's brand name is reflected in higher wages and in terms of the allowances paid to their employees. Also, in large firms, since the cost to the company is distributed over a larger number of employees, they pay higher wages to their employees. Those from the top 20 institutes are the ones who report a positive effect on wages, and results are significant for the highest wage category. This implies that institutional reputation has a vital role to play in the determination of one's wages. The higher the work experience, the higher is the probability of falling into a better wage category. Male report higher salaries than their female counterparts and the likelihood of earning higher wages are higher amongst the old-aged workers. This is because, in females' case, they lag in their careers due to institutional rigidities. For men that as one's age and experience are increased, their probability of falling into the higher wage category rises.

In Model 2, skill mismatches are utilized instead of educational mismatches to explain the differences in wages. Skill not being used to full capacity, which is the 'skills counterpart' of over-education, negatively affect wages. This implies that they cannot apply basic knowledge acquired, and experience a problem related to practical applicability. This, in turn, affects their productivity, and they are reporting lower wages. Likewise, the under-skilled variable shows a negative influence on wages. This implies that a lack of skills in the job over and above the basic knowledge (i.e., communication, leadership skills, etc.) likely affects one's productivity, and they report lower wages. However, when comparing skill mismatches with educational mismatches to explain the influence on wages, the educational mismatches have a slightly higher wage variance than skill mismatches; the adjusted R^2 amounts to 0.29 compared to 0.26 in Model 2.

Nonetheless, the crucial piece of analysis undertaken is Model 3, wherein both educational and skill mismatches are combined to find their influence on wages. When the magnitude of the skilling variable is controlled for, what happens to wage penalties or premiums is explained by Model 3. If the over-educated are earning less because they cannot utilize their skills to the best of their capacity, then once this variable is controlled, the over-education coefficient should register a fall. The coefficient does not report a fall for over-education, and also, the results are statistically significant. Thus, controlling the skill utilization variable, the over-educated earn less than their counterparts, directing that the reason for the wage penalty is not necessarily skill not being utilized to full capacity. However, there are other reasons for over-educated earning lesser wages which are not addressed through this table. It is a possibility that due to limited availability of jobs, one experiences underutilization of skills in their job profiles. Nonetheless, educational mismatch seems to be much more significant than skill mismatches. The adjusted R^2 is a little higher than Model 1 but much higher than Model 2.

Impact of real and formal mismatches on Wages

In the case of Model 4:-

We incorporate formal and real horizontal mismatches

Y =a_0 + a_1X + a_7 Real horizontal mismatch+ a_8 Formal horizontal mismatch + e… Model 4

In the case of Model 5:-

We incorporate formal and real vertical mismatches

Y =a_0 + a_1X + a_9 Real vertical mismatch+ a_{10} Formal vertical mismatch + e… Model 5

Table 6.4.c: Multinomial logit with base outcome Wages

	Model 4		Model 5	
Determinants	**Wages 1**	**Wages 2**	**Wages 1**	**Wages 2**
Male	0.523 (.406)	1.969 (.579)***	0.537 (.391)	1.972 (.565)***
Age > 25 & Age <=28	-0.199 (.433)	0.236 (.498)	-0.232 (.424)	0.184 (.480)
28> 32	0.150 (.524)	1.21 (.649)*	0.234 (.545)	1.38 (.677)**
21-40 ranked institutions	-0.186 (.621)	-0.216 (.683)	-0.032 (.599)	-0.014 (.694)
1-20 ranked institutions	1.07 (1.05)	2.74 (.999)***	1.13 (1.06)	3.015 (1.08)***
Private job	0.727 (.405)*	3.02 (.637)***	0.713 (.397)*	2.909 (.642)***
Permanent employees	0.897 (1.15)	15.06 (.623)***	0.913 (1.10)	14.52 (.669)***
>5000 and above employees	1.15 (.400)***	-0.225 (.444)	1.10 (.403)***	-0.132 (.449)
Work experience >2-5 years	1.30 (.402)***	0.735 (.520)	1.29 (.414)***	0.937 (.537)*
Work experience >5- 8 years	2.36 (.862)***	3.44 (.894)***	2.34 (.897)***	3.55 (.977)***
Real Horizontal Mismatch	-0.649 (.359)*	-0.318 (.461)	-	-
Formal Horizontal Mismatch	-0.616 (.578)	-0.336 (.624)	-	-
Real Vertical Mismatch	-	-	-0.397 (.371)	-1.47 (.511)***
Formal Vertical Mismatch	-	-	-0.534 (.558)	-1.89 (1.21)
Constant	-2.75 (1.17)**	-20.03 (1.11)***	-2.917 (1.14)**	-19.31 (1.12)***

Pseudo R^2	0.2620	0.2739
Prob>chi^2	0.0000	0.0000
Number of observations	264	264
Source: Based on field survey		

p*<0.1; p**<0.05; p***<0.01 and the figures in parentheses indicate robust standard error.

Analysis of real and formal mismatches on wages

In the following table, both formal and real mismatches are included in the case of vertical and horizontal mismatches. Here, the impact of real and formal mismatches on wages is carried out. Both vertical and horizontal (real and formal) mismatches negatively influence wages compared to their counterparts who do not face mismatches. The wage penalty associated with a real mismatch (both vertical and horizontal) is statistically significant. However, in the case of horizontal mismatch, the penalty is significant for the lower range of wages. For vertical mismatches, the penalty is significant for the higher range of wages. This implies that in the case of horizontal mismatch, the person would pick up firm-specific skills. His probability of not falling into the negative influence of a higher range of wages is reduced. For those reporting vertical mismatch, the likelihood of them falling into the highest wage category is slim. This (vertical mismatch) represents more of a structural problem rather than a temporary one. In accordance, vertical mismatches account for a slightly higher wage variance than horizontal mismatches: the adjusted R^2amounts to 0.27 in the case of vertical mismatches in Model 5 compared to adjusted R^2 which amounts to 0.26 in Model 4. Among the control variables, all the factors have a statistically significant effect on wages and have the expected signs discussed in previous models.

6.5 Impact of Educational Mismatch on Job satisfaction

The impact of educational mismatches on job satisfaction is carried out. To carry out the effect of mismatches on job satisfaction, firstly, each of the 13 domains in the job satisfaction variable is recoded as follows:-

-2 = Very Dissatisfied/Dissatisfied

1 = Moderately Satisfied

2 = Very Satisfied/Satisfied

The compound job satisfaction scale is computed as the weighted average of the job satisfaction scale spread across thirteen domains. Promotion prospects, the prestige associated with the job, relation with the boss, job security, opportunity to use abilities, ability to use initiative, hours of work, amount of work, wages, work variety, the scope of learning and training, friendliness of colleagues, communications between management and employees are the different variables. The above compound measure then makes the job satisfaction scale a continuous variable.

Table 6.5.a: Variables and measures

Sr. No.	Variable name	Nature of the variable	Coding of the variable	Type of variable
1	Job satisfaction	Dependent variable	-	Continuous
2	Gender	Independent variable	1- Male 0 –Female	Binary
3	Age	Independent variable	0- Age <25 1-25-29 2- 29-32	Multiple
4	Type of workplace	Independent variable	1-Private/Self employed 0-Government	Binary
5	Job-status	Independent variable	0-Part-time/contractual 1-Full time/permanent	Binary
6	Size of workplace	Independent variable	1-5000 and above employees 0-1-5000 employees	Binary
7	Work experience	Independent variable	0-if total work ex =less than 1 year, 1, 2 years 1- if total work ex =3,4, 5 years 2- if total work ex =6,7, 8 years	Multiple
8	Overeducated	Independent variable	1-Yes 0-No	Binary
9	Undereducated	Independent	1-Yes	Binary

		variable	0-No	
10	Horizontal mismatch	Independent variable	1-Yes 0-No	Binary
11	Over skilled	Independent variable	1-Strongly Disagree/Disagree 0-Somewhat Agree/Agree/Strongly Agree	Binary
12	Under skilled	Independent variable	1-Strongly Agree/Agree/ Somewhat Agree 0-Disagree/Strongly Disagree	Binary
13	Real Vertical Mismatch	Independent variable	OE=1 and OS=1	Binary
14	Formal Vertical mismatch	Independent variable	OE=1 and OS=0	Binary
15	Real horizontal mismatch	Independent variable	HM= 1 and OS =1	Binary
16	Formal horizontal mismatch	Independent variable	HM=1 and OS =0	Binary

6.5.1 Specification of the Model

Y is the dependent variable under consideration (job satisfaction) X= vector of variables (gender, age, job status, type of workplace, size of the workplace, work experience), and then we add the mismatches

Y =a_0 + a_1X + a_2 under-education +$a_3$over-education + $a_4$horizontal mismatch + e .... Model 1

In the case of Model 2:-

We incorporate measures for two types of skill mismatch

Y =a_0 + a_1X + a_5 over-skilled + a_6 under-skilled+ e ……… Model 2

In the case of Model 3:-

We incorporate both educational and skill mismatches

Y =Model 1+ a_5 over skilled + a_6 under-skilled + e……… Model 3

In the case of Model 4:-

We incorporate formal and real vertical mismatches

Y =a_0 + a_1X + a_7 Real vertical mismatch+ a_8 Formal vertical mismatch + e… Model 4

In the case of Model 5:-

We incorporate formal and real horizontal mismatches

Y =a_0 + a_1X + a_9 Real horizontal mismatch+ a_{10} Formal horizontal mismatch + e.. Model 5

The dependent variable (job satisfaction) is a continuous variable, so linear likelihood regression is used for the estimation process.

Table 6.5.b: Linear regression for job satisfaction

Determinants	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Model 5**
Male	-0.0519 (.1184)	-0.0485 (.1205)	-0.0353 (.1179)	-0.0343 (.1223)	-0.0359 (.1194)
Age > 25 & Age <=28	0.0575 (.1308)	0.0217 (.1248)	0.0379 (.1252)	0.0163 (.1318)	0.0668 (.1269)
Age 28> 32	-0.0462 (.1494)	-0.0290 (.1483)	-0.0186 (.1464)	-0.0626 (.1520)	-0.1016 (.1465)
Private job	-0.0686 (.1098)	-0.0858 (.1107)	-0.0976 (.1099)	-0.0969 (.1115)	-0.0409 (.1099)
Permanent employee	0.5035* (.2676)	0.5961** (.2929)	0.4993* (.2679)	0.5487** (.2757)	0.6098** (.3015)
>5000 and above employees	0.0333 (.1038)	-0.0463 (.1002)	0.0184 (.10042)	0.0441 (.1044)	0.0127 (.1017)
Work experience >2-5 years	-0.2362* (.1207)	-0.3020** (.1200)	-2.386** (.1175)	-0.2464** (.1230)	-0.2858** (.1200)
Work experience >5- 8 years	0.0318 (.1567)	-0.0865 (.1703)	-0.0447 (.1604)	0.0026 (.1572)	0.0711 (.1549)

Overeducated	-0.479*** (.1163)	-	-0.388*** (.1181)	-	-
Undereducated	-0.0265 (.1383)	-	-0.03873 (.1340)	-	-
Horizontal Mismatch	-0.337*** (.0990)	-	-0.2145** (.0973)	-	-
Over skilled	-	-0.559*** (.1076)	-0.359*** (.1120)	-	-
Under skilled	-	-0.0437 (.1238)	-0.0243 (.1234)	-	-
Real vertical Mismatch	-	-	-	-0.6506*** (.1201)	-
Formal Vertical Mismatch	-	-	-	0.0110 (.1773)	-
Real Horizontal Mismatch	-	-	-	-	-0.5650*** (.1078)
Formal Horizontal Mismatch	-	-	-	-	0.0436 (.1417)
Constant	1.225*** (.2995)	1.14*** (.3233)	1.31*** (.3032)	1.04*** (.3056)	1.0095*** (.3222)
Psuedo R^2	0.1779	0.1561	0.2113	0.1647	0.1639
Prob $>chi^2$	0.0000	0.0000	0.0000	0.0000	0.00000
Number of observations	264	264	264	264	264
Source: Based on field survey					

p*<0.1; p**<0.05; p***<0.01 and the figures in parentheses indicate robust standard error.

6.5.2 An analysis of the effect of mismatch on job satisfaction

The following table shows the effect of educational mismatch on job satisfaction. The table depicts that mismatches have a negative influence on job satisfaction. Those having a permanent job have higher satisfaction in comparison to their counterparts. This is because stability outweighs other factors' roles. Those having lesser work experience have reported a negative influence on job satisfaction. This is associated with several factors. It is due to the work variety one is assigned to, hours or the amount of work, friendliness with colleagues, etc. Also, those with lesser work experience are dissatisfied because of a mismatch in terms of one's expectations and achievement. It is only when work experience increases and one becomes permanent the satisfaction is comparatively higher. Over-education and horizontally mismatched engineers reported a negative effect on job satisfaction.

In Model 2, skill mismatches are utilized instead of educational mismatches to explain the differences in the role of two mismatches on /job satisfaction. Over-skilled variables show a negative effect on job satisfaction, and the result is statistically significant. This implies that those reporting a lack of skills and facing difficulty in practical applicability are dissatisfied with their job. Even the under-skilled show a negative influence on job satisfaction. It is not only the basic skills, but lack of soft skills in leadership skills, communication skills, etc., also negatively influences one's satisfaction.

In Model 3, both skill and educational mismatches are combined to see the effect on job satisfaction. Suppose the over-educated are less satisfied because they are unable to utilize their skills to the best of their capacity compared to their counterpart with the same education level. In that case, once this variable is controlled, the over-education coefficient should register a fall. The coefficient, however, does not register a fall for over-education, and the results are statistically significant. Thus, controlling the skill utilization variable, the over-educated are more satisfied than their counterparts with the same level of education; however, the dissatisfaction is decreased when the skilling variable is added, which directs that the reason for dissatisfaction amongst engineers may not necessarily be skill not being utilized to full capacity. There are other reasons which outweigh the satisfaction amongst them. For an individual, it depicts that he is not dissatisfied because of lack of skills as this factor does not amount to considerable dissatisfaction amongst them. This implies that the pursuance of a degree is just a requisite and much more extrinsic. It points towards the accumulation of degrees rather than actual learning. The reason that over-educated are dissatisfied is not that they cannot utilize their skills to the best capacity. Still, factors that account for dissatisfaction amongst those over-educated are related to job characteristics, i.e., pay, promotion, working hours, etc. The R^2 in Model 3 is much higher than R^2 in Model 2 and a little higher than R^2 in Model 1.

In Model 4 and Model 5, those facing real vertical and real horizontal mismatch negatively influence job satisfaction. This implies that those who reported that they could not utilize basic skills in the job up to their best capacity face higher dissatisfaction than those who reported that they were able to utilize skills in the job. Instead, those facing formal mismatches in terms of vertical and horizontal positively influence job satisfaction, although the results are not significant. However, in the case of real mismatches, the results are significant. Likewise, the coefficient of real vertical mismatch being lower than that of real horizontal mismatch depicts that the effect of real vertical mismatch on job dissatisfaction is much more than the effect of real horizontal mismatch on job dissatisfaction. This implies that in the case of vertical mismatch where not only the job but institutional characteristics and individual ability have a significant impact. The dissatisfaction persists and emphasizes improving one’s existing knowledge and skills to increase their marketability. In contrast, for those experiencing horizontal mismatch, the dissatisfaction is lower because this mismatch is the outcome of career evolution and the types of jobs available, which is much beyond an individual’s control.

6.5.3 Discussion: Micro-Macro

The study analyses the impact of mismatches on wages and job satisfaction. Through different models, the impact of over-education, horizontal mismatches, skill underutilization, real and formal mismatches with respect to wages and job satisfaction is carried out. Based on the analysis those reporting over-education and horizontal mismatches in jobs had a negative effect on wages. Also, those experiencing issues with the utilization of skills faced a negative impact on their wages. However, the educational mismatches reported higher wage variance than skill mismatches and negatively affected the wages. When controlled for the effect of skill underutilization, the over-educated coefficient does not register a fall. It directs that the reason for the wage penalty does not necessarily imply skill not being utilized. Also, the ‘real over-education’ and ‘real horizontal mismatch’ have a negative impact on wages. The real over-education has a higher wage variance than real horizontal mismatch while determining their impact on wages.

Those reporting over-education and horizontal mismatches in jobs had a negative effect on their satisfaction. Also, those experiencing issues with the utilization of skills faced a negative impact on their wages. When controlled for the effect of skill underutilization, the over-educated coefficient does not register a fall. It directs that the reason for dissatisfaction in the job does not necessarily imply skill not being utilized. It could be related to other factors like pay, promotion, etc. Also, the 'real over-education' and 'real horizontal mismatch' have a negative impact on their job satisfaction. The coefficient of real vertical mismatch is lower than that of real horizontal mismatch depicts that the effect of real vertical mismatch on job dissatisfaction is much more than the effect of real horizontal mismatch on job dissatisfaction.

Those who reported over-qualification tend to earn less than their qualified peers (Green and McIntosh, 2007). Moreover, studies have also displayed that the penalty associated with real over qualification is higher than those with the formal mismatch. Also, the negative effect is reported for job satisfaction amongst those who were Real Overqualified (Green and Zhu, 2010). Further, Green *et al*. (2002) study illustrates that some over-qualification does have an association with lower ability.

Majumdar (1983) argues that there arise mismatches between micro and macro aspects of investment decision-making. Decisions based on micro considerations do not materialize at the macro level as the parameters for an individual varies when many individuals act together at the macro level. This can be explained below:-

The choice of major predominantly depends positively upon the expected rate of return to an investment in a college major.

Choice of major (M) $=$ f [expected (W_M)]

Expected (W_M) $=$ f (exp $d_{M\ t+\lambda}$, exp $S_{M\ t+\lambda}$);

where expected d_M is the demand of labour from industry and expected S_M is the supply of graduates to the labour market and $t+\lambda$ is the time lag that adds to the uncertainty as an individual does not know both the aggregate supply in a major and also the demand which is subject to change when he enters the job market.

Also, Keynes (1936) has argued that the demand for labour is a *derived demand*. The primary determinant for graduates appears to be the structure of the product demand by the industry. This product demand is constantly evolving due to *technological change*, leading to faster changes in the demand for skills acquired by the graduates. Similarly, an individual choice of major is constrained by the *eligibility in terms of merit and his/her financial capacity,* as discussed in chapter 4. Hence, the expected W_M varies due to one's *success/failure* in completing the major, depending on the availability of the job in the economy, one's relative position, and institutional profile. Hence, the wage one expects is W_M but the one realized is $W_{M\ t+\lambda}$.

6.6 Conclusion

To conclude, the chapter deliberates on the determinants that affect mismatches in the job market. Determinants vary from individual, to institutional and job related factors. It also discusses the relationship between educational and skill mismatches. Both the educational and skill mismatches depict a positive relationship between them. While analysing the impact of mismatches on wages and job satisfaction, those facing real mismatches face a significant wage penalty than those experiencing formal mismatches, Also, the wage variance for those experiencing real over-education is much higher than those facing real horizontal mismatches. The results obtained are discussed in the light of different theories that help in understanding the issues in a more comprehensive manner.

CHAPTER 7: CONCLUSION

7.1 Recapitulation of the undertaken study

A significant proportion of the meritorious students are making engineering choices to realize their dream. But the job market complications and irreversibility of choices hinder the realization of their expected outcome from pursuing engineering education. This study establishes a link between educational choices and the career progression which is mediated through the job market with particular reference to engineering education in India. This study seeks to address the gap by dealing with the educational decisions within a sequential framework ranging from the choice of field to selection of institution and choices in the job market. There is a dearth of literature that deals with the wide range of linkages between education and labour market. The present study is a significant contribution to develop an understanding of the relations between educational choices and their outcomes in the job market. The studies, however, independently deal with the status of engineering education in the country, the issue with the training of graduates, expenditure on engineering education, disadvantaged groups lagging in enrolment, employability concerns from the industry perspective, unattended privatization, shortages of competent faculty, outdated curriculum, low level of research and innovation, weak industry-academia linkages, a decline in public funding, poor teaching-learning outcome, etc. (Anandakrishnan, 2006; Banerjee and Muley, 2008; Gupta, 2008; Biswas *et al.*, 2010; Chopra and Sharma, 2010; Saha and Ghosh, 2011; Sarkar and Choudhury, 2014; Khare, 2014; Subramaniam, 2015; Choudhury, 2016; Sohoni, 2016; Tilak and Choudhury, 2021).

The primary concern of the study is regarding the quality of jobs that one secures upon graduating, which leads to worries, apprehensions, and anxiety with the outcome of the professional education pursued. With massification in higher education and a significant increase in engineering education enrolment, all graduating engineers do not necessarily end up with their expectations. For the majority who could not find access to these expected jobs in accordance with their training, there arises a concern for 'real' mismatches. Within this context, the study analyses the reasons for mismatch by interrogating the choices made around the courses and the institutions. The study sought to examine the choices of the students in a retrospective manner. The sample of working engineers formed the basis to better understand the nuances and complexities and uncertainties of decision-making. The study is an in-depth analysis of the three objectives concerning the alterations in choices made by the engineers during the course of their career trajectories. These alterations are generally understood in terms of choices of stream, university/institutions, and job. And within each of these three objectives, three research questions were posed to know the layering within which choices were made. Thus, the study comprises of the micro processes that involve the choice of engineering within a family structure, inclination of choice of different streams that have broader employment opportunities and which are often opted for at the cost of traditional streams. Not only are the choices contextual and endogenous but they are pragmatic and rational too. Also, with engineering education being a professional degree pursued in the interest of quick returns, which engineers are opting for Masters and not taking up jobs is an interesting question addressed in the study.

Studies undertaken in the realm of institutional choices have not addressed the disjointedness of the different sources of information accessed by the respondents to understand their final selection of institutions. The factors that affect institutional choice are understood through the prism of S-competition, which elucidates how the positional competition turns the market into a zero-sum game. Also, evaluation of institutions by students in retrospection is pertinent as graduates are in a better position now to gauge the institution's performance.

Further, with the changing job roles and the change in the structure of the market, and the 'industrialization of the service sector,' the study looks at an essential dimension of educational mismatch. None of the studies have been conducted with respect to changing job roles in the realm of educational mismatch with reference to Indian engineers. Also, the discussion on skill utilization and real and formal mismatches contribute to the nitty-gritty of the understanding of the roles of individuals, institutions, and the job market that affects the choices made in higher education. The impact of educational mismatch on outcomes is a reflection that decisions taken at the micro may not materialize for all when viewed at the macro level over a period of time. These outcomes (wages, job satisfaction) are subject to changes in the demand and supply of labour in the economy. Hence, the study is a map of a career trajectory in which individuals negotiate through various layers of choices made at the individual level, institutional level, and in the job market.

Thus, the objectives of the study add to the understanding because earlier contributors have not dealt with these questions. The study is conducted through a primary survey and the theoretical underpinnings derived from the economics of education have helped in throwing light on the concerned issues undertaken for the study.

7.2 Findings of the study

a) Choice of the field of study

In the empirical investigation to find out the factors which inform the choice making of the students, personal interest, marks scored in class Xth and XIIth and the subject being practical and analytical were found out to be the most important factors that guided the choice of engineering among those whose fathers' qualification was higher. Unlike those whose fathers' qualifications were lower, the parental desire was found to be very significant in choosing engineering as a discipline. For females pursuing engineering education, their father's high qualifications acted as a source of encouragement. At this stage, individuals are assumed to be passive choosers.

With regard to specific choice making regarding stream, the family decisions assume a less important role. The choice of the stream is guided by the availability of wider career choices and better employability options. This represents that higher streams of earnings become a key determinant of the choices of their stream.

Engineering education is argued to be pursued because of the prospect of early employability then who are those who pursue a Masters degree is subject to examination. The study illustrates that the majority from lower-tier institutes have pursued Masters. And even amongst those from lower-tier institutes, the graduates represent that the choice at this stage is an individual decision-making. The structural constraints cease to matter. It is more a role of individual agency that adds credentials to one's profile and secures one's relative position in the job market. The study further depicts that while making choices, male students are much more pragmatic in their approach. However, for females, this pragmatism is displayed at a later stage (Masters) when they decide independently and through one's agency. This depicts higher polarization between males and females, with males being identified as career-oriented and females suffering from structural issues[66] in their progress.

b) Choice of Institutions

Different sources of information were resorted to by the graduates' to make decision for entry into institutions. Institutional rankings, websites, and friends' recommendations are the three most important sources of information used by the respondents for searching the institutes to enrol in. For first-generation learners, parents' do not constitute an important source of information. Unlike those whose fathers' qualifications are higher, their reliability on teachers and parents is far greater. Because of information asymmetry and education argued to be an 'experience good' (Teixeria *et al.*, 2004), the role played by ranking and website is misleading in some instances. This is because rankings are not only global but are also measured at national and local levels, and most often, gullible students are taken for a ride in the name of such rankings. When it comes to determining the quality and value of an institution at the time of admission, it can be challenging, and graduates choices of courses and institutions can be skewed due to information asymmetry [67](Arrow, 1973; Dill and Soo, 2004; Massy, 2004:29-30). Students are a diverse bunch; while aptitude, ambition, and socioeconomic standing all influence decision-making, most "students do not possess perfect information about the stream of costs and benefits" of attending a particular institution over another (Brewer *et al.*, 2001).

Graduates' profile and institution credibility are the two factors that affect the choice of institutions amongst those enrolled in lower-tier institutes. Also, fees not being an important factor for a majority are a reflection that the expectation from professional education is based on higher returns from the job market. With a huge number of empty seats, and the engineering market turned into a buyer's market, there is an emphasis on the credibility of the institution while taking admission. However, with the AICTE in charge of approving the establishment of institutions, the easy grant policy and the role of intermediaries has had an impact on not just the quality of students entering the institutions, but also the quality of the institutions themselves

[66] These restrict their freedom of choice of a product (engineering).

[67] Graduates suffer from a failure to anticipate quality, and as a result, they are compelled to yield to growing prices and other unethical practises, resulting in a compromise with quality.

becomes questionable. It is not to deny that it is a two-way process. One, there is a demand for such institutions, and middlemen lure students into the process of admission, and two, there is no shortage of supply of such degree-granting institutions.

The quality of graduates churned out by the lower-tier institutions remain at unsatisfactory level. Most often, cost-minimization resorted to by the private institutions in appointing teachers' with questionable level of competence, poorly equipped labs, and subverting qualification criteria, thereby hampers the teaching-learning process. Quality of education is a social construction and depends on the stakeholders involved, both the teachers' and the students', and the students' agency[68], in turn, depends on their effort and their respective capacities to perform. Poor governance coupled with the students craze for engineering education are exacerbating the 'diploma disease' (Dore, 1997) and compounding the problems of mismatch. The evaluation of institutes adds to the criticism leveled over the quality of education imparted, which has brought forth the deficiency in inadequate curricula, quality of faculty, lack of basic understanding, and weak industry-academic linkages.

c) Educational Mismatch

The study reports the reasons for educational mismatches amongst engineers. Those enrolled in lower-tier institutes, their probability of facing over-education and horizontal mismatch is higher. Also, the data displayed that graduates joined overeducated jobs to avoid unemployment concerns. It is not only the role of institutions but also the changing structure in the job market that has resulted in engineers facing educational mismatches. In the case when the skilling variable is added, even those engineers from centrally funded institutes reported facing horizontal mismatches. Horizontal mismatches are more of a career evolution by responding to changes in occupational structure in the economy. With new roles emerging, one encounters an initial difficulty in the application of skills in the job market.

The study illustrates that educational and skill mismatches are strongly related. Based on the Green and Zhu (2010) classification of real and formal mismatches, the present

[68] In the terms of demanding quality education.

study represents a larger sample facing real than formal mismatches. And those reporting real mismatches, a more significant proportion are from privately funded institutes. However, studies in the context of developed nations regard the educational and skill mismatches as different concepts, and a weak relationship is depicted between the two variables. Studies (Green *et al*., 1999; Chevalier and Lindley, 2009; Quintini, 2011) have reported that lower ability and lack of cognitive skills are the determinants of over-qualification. A study by Jonbekova (2015) argues that both mismatches are related, and it is the quality of the stakeholders that hampers the teaching-learning process.

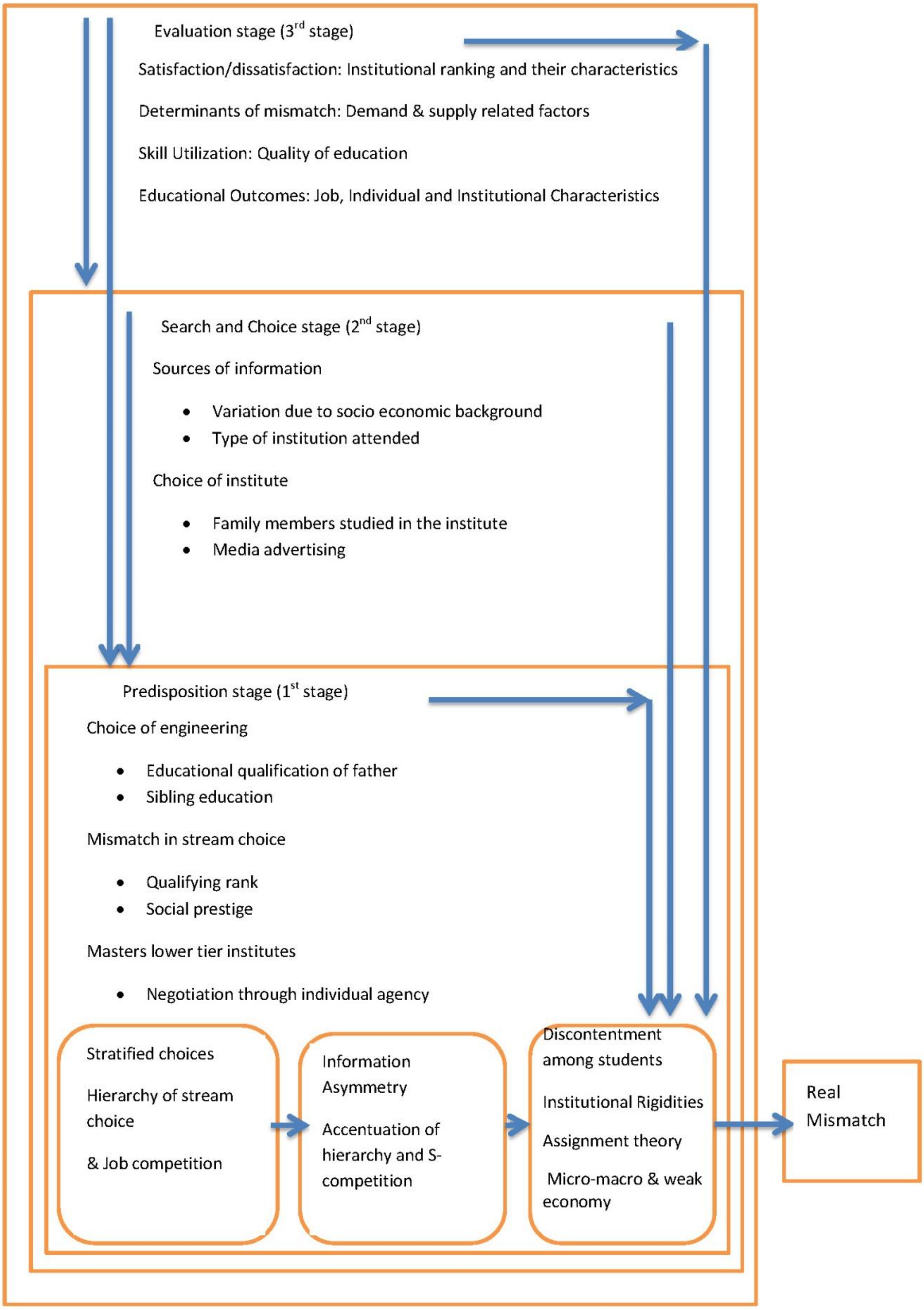
Lastly, the study aims to relate the choices made at tender ages in life with the outcomes in the job market in terms of wages and job satisfaction. Those reporting real over-education are more prone to a wage penalty and job dissatisfaction in comparison to those facing real horizontal mismatches. The study is a representation of how the choices and expectations made at the micro-level may fail to materialize at the macro level (change in the job structure, boom or depression in the economy, and changes in the demand for and supply of labour).

7.3 Schematic representation of the findings

Recapitulation of the findings within an integrative framework for understanding the choice behaviour in three different stages of a decision-making process is elaborated. The existing studies using this framework have explained college choices. Studies have argued that those wishing to attend college move through three phases emancipating from predisposition towards higher education to the final stage of selecting an institution. Litten (1982:387) proposed a three-phase model of college choice. The first stage comprises the desire and the decision to pursue higher education. This is followed by a search stage, culminating in the final stage of application for admission and enrolment. Jackson (1982:239) follows the same three-phase model with certain modifications. It begins with ‘preference’ towards enrolment, which deals with the interest related to attending college. The second stage is that of exclusion, wherein a choice set is formed. The prospective students search for an institution for which they want more details. The final is the evaluation stage. From the choice set, the student chooses the institution to attend. Further, Hossler and Gallagher’s (1987) work includes the stage called “a predisposition stage” followed by the second stage comprising information and search, which is then followed by factors influencing the choice of a university. Drawing on the works of Jackson (1982) and Litten (1982) and Hossler and Gallagher (1987), a three-stage choice model for explaining the mismatch is presented.

The present study depicts the three stages of predisposition, the search and choice stage and the evaluation stage. The first stage is the predisposition stage. It is a developmental phase where prospective students determine their decisions about pursuing an engineering education. There also exist choices with respect to stream choice and choice of opting in for Masters by those from lower-tier institutes. Distortions in choices are explained by the influence of the different significant factors. Thus, the first stage is identified as one with stratified choices, hierarchy while making stream choices, and job competition amongst employees, which emphasizes relative competition and an inclination to pursue Masters. This is followed by a search stage where prospective students gather information about higher education institutions. During this search process, the source of information varies according to the different socio-economic backgrounds of employees and the type of institution attended by them. This stage also leads to a formulation of what Jackson referred to as the “choice set” (1982:239). Choice creeps in when the different sets of institutions the prospective student applies to. On the interplay of the factors affecting the choice of institutions, the decision of college choice is made. And the role of family members studied in the institute, and media advertisement has been identified as the two most dominant factors influencing the selection of the institute. This is primarily explained with the help of information asymmetries, accentuation of hierarchies, and S-competition. The third is the evaluation stage. This stage of evaluation of outcomes is an addition to the study of the educational decision-making process. This not only involves the assessment of institution characteristics but also the determinants of mismatch and skill utilization along with the realized expectations. This stage deliberates upon the job characteristics, the quality of institution attended, individual elements in terms of background, and prevailing job conditions in the economy, taking into account unemployment, recession, boom, etc., which affects the expectations. Hence, there is a mismatch in expectations and achievements among engineers in terms of the role of education in employment prospects. The figure, therefore, portrays how through the predisposition to the evaluation stages, mismatches occur, resulting in real mismatches amongst the engineers in the job market.

Fig 7.3: Schematic representation of the findings



7.4 Limitations of the study

While studying the issue of mismatch, research-based on quantitative analysis may not do justice to the complexities of the problem, which involves tracing out the career paths over a period of time where the individual choices had to confront many factors. Since the study is sequenced in a retrospective manner, and given the broad objectives of the study, the questionnaire became lengthy. Additionally, with a questionnaire being circulated amongst employed engineers, it was challenging to get answers to open-ended questions. Nonetheless, open-ended questions would have revealed a critical dimension and would have been beneficial in understanding the nuances and complexities involved in mismatches. The researcher feels that all variables cannot be used quantitatively to find the relevant answers, and some of the variables, if probed deeper through a qualitative approach, would have helped to look at the problem more closely. For example, those engineers studying in lower-tier institutes, when opting for Masters, the study tries to understand the difference in orientations amongst the employees. If narratives had been carried out regarding their existing experiences and the reasons for pursuing Masters, the issue would have been better understood.

The study involved a sample of 264 employees but was restricted to two domains, i.e., IT and the Service sector. However, it was impossible to cover every sector within the two domains, and only specific sectors were identified for the study. Also, the study is sample-based and undertaken in Delhi-NCR. To facilitate the survey collection, an online link was generated and there is likelihood that some questions may have been misunderstood by the respondents. Further, the data collected is heterogeneous as the engineers surveyed for the study were spread across six months to 8 years' of work experience.

Also, the study is limited in terms of developing an understanding of the demand-side issues of the labour market. The demand side of the market in terms of employers has not been approached. The demand side concerns would have contributed to the understanding of the mismatches between the institution and the market in a more coherent manner.

Lastly, the measurement of over-education/under-education and horizontal mismatches is through employees' self-assessment, which may be subject to under or over-reporting. The other methods adopted for measuring mismatches under different studies conducted were, however, beyond the scope of this study.

7.5 Reflection on theory: Choices in Education

The human capital theory, which views education as an investment in human beings depicts a linear relationship between education, skills, productivity, and incomes (Schultz, 1960; Becker, 1964). The post-industrial economies are claimed to be more knowledge-driven and which is primarily located within the backdrop of human capital. Knowledge accumulation is the result of human resource investment in education and training. In a knowledge economy, education is a key enabler of economic growth and development (Bowles and Gintis, 1979). Investment in education and training at a higher level fosters general and cognitive skills, helping countries to adapt and innovate technologies faster. However, in reality, human capital may not always yield productive outcomes. The human capital theory proposed by Becker (1964) assumes a smooth transition from the institution to the job market. But the reality is much more complex. The decision-making process, entry to the institutions, and eventually entry to the job market follow choice-making during the entire phase.

The decisions concerning post-compulsory education are based upon positional values of education and are represented as instrumental rationality. There is an increased emphasis on the tangible outcomes of their choice of major. There is a prominence on the 'value for money' approach in the decision-making process. The approach that one views education as another market commodity has become normalized in policy discourse. With the application of market principles in higher education and the shift in funding from universities to individuals, students can evaluate what is desired out of their education. Thus, given the high cost of applying to engineering institutes, students are becoming *consumerist* in their approach towards their education. Their choice is being diverted to choosing those subjects that appear to provide them direct employment. In this context, Browne (2010) argued that high tuition fees are charged in turn for a degree that students choose to purchase a stake in their economic well-being. As a result, this rhetoric of choice might be viewed as a change in the higher education environment. The notion of treating higher education as a marketable commodity is gaining traction, with the students being treated as the customers (Taylor *et al*., 2008).

Bauman (2007:10) detects a culture of deregulation and privatisation in markets. The first is the ultimate destination of commodities offered for sale, which is customer consumption. Buyers, in turn, will purchase a commodity if it grants one the gratification of what one desired. Thirdly, the price charged for such gratification will depend on the credibility of the desire. Precisely, a degree becomes the commodity that will be bought if it gratifies one's desire. How much do consumers (students) believe that attaining a degree will fulfill their expectations and aspirations? Socioeconomic considerations and an assessment of one's abilities and employability influence one's degree decision. Thus, the student is expected to choose their program of study and institution after making an informed choice. Choices, however, are not informed, and they are primarily constructed and they remain deficiently formed. And students are investing in their future through their decisions which are not well-informed and constrained.

The analysis depicts that the quality of education has considerably declined, leading to the widening of the gap between the skills acquired and those required by the industry. Their skills are failing to meet the changing needs of the market. Thus, with the increase in the number of engineers, there is an increase in a mismatch in expectations rates amongst them, more accentuated by increasing competition. In the process, the study strengthens the concern that an engineering degree reflects the qualification earnings or earning for paper qualification (Dore, 1997). Given the shift in funding in education from the state to the individual, the choices have been modified, and professional education, more particularly engineering education, is viewed as a passport to easy entry to jobs, higher income, and a settled future which is instead not materializing.

Even with the emphasis on skills by the policymakers, there is an attempt to narrow down the role of education. Interestingly, the National Education Policy (GoI, 2020) visualizes a future in the backdrop of Education 4.0. This concerns the use of Robotics and Artificial Intelligence, which will take over most of the jobs. The multidisciplinary skills exhibited by the demographic dividend will allow India to become a global knowledge power. This brings to the forefront the difference in education and qualification. The policy may direct towards creating a workforce with the requisite qualification rather than developing one's knowledge and skills. Thus, by emphasizing skill-oriented qualification, the purpose of education for the child's holistic development and the progress of a nation get defeated. This narrow stratum of looking at skill-oriented education may be viewed as damaging society and may call for further deliberations. This may add to the economization of education. Education is mostly used as a 'positional good' with no inherent value, based on the number of other individuals who have it (Dore, 1997; Hirsch, 1977). This raises questions about whether students are thinking about continuing their education for 'learning for its own sake,' 'learning to do a job,' or 'learning to get a job' (Dore, 1997). This approach towards education undermines the wider rate of return to the economy in terms of social benefits. This, in turn, questions the purpose of education and university. Concurrently, the increase in demand for engineering and the supply of such degree-granting institutions has added to the craze for chasing degrees. A high degree of positional competition exists among the majority of engineers because of their perceived positional advantages accruing to engineering education in the labour market. However, the emphasis on instrumental rationality is essentially the prominence of educational outcomes initiated in the realm of markets in education and more emphasized by the National Education Policy (2020). These policy changes have internalized the discourse of employability amongst engineers. The study through the theoretical lens displays the limitations of human capital theory. It represents that the education and labour market linkages are much more complex than simply relying on certification of degrees.

7.6 Education and the Market

Despite the existence of regulation prices, 'management quota' seats are illegally offered to students for admission at a market-determined price (capitation fees).With no restriction on providers entry, there is a risk that educational quality may be compromised, as providers would crowd in taking full advantage of the situation in the absence of specification of quality and adequate monitoring by appropriate authority (Chattopadhyay, 2009). The producers would create an 'illusion of learning' (Pathak, 2009:153 cited in Chattopadhyay, 2013). Sadly, the bulk of private operators today are in this situation (Altbach, 2009; Ayyar, 2009). Thus, the setting of an overarching regulatory body is a testimony of the UGC and the AICTE to the failure of maintaining academic standards and giving licenses to operate. Compliance with regulatory authorities, on the other hand, is no guarantee of high-quality education. It is generally simple for the provider to unfairly manipulate the necessary conditions. The private sector has witnessed very high growth in professional courses (Tilak, 2008). Thus, charging capitation fees implies the tendency of private players to move away from regulation, and their true character gets revealed. This renders education a commercially exploitable commodity. Because higher education is a hierarchical market, the scope of competition is limited. The entry of providers in the absence of a strict regulatory authority is a stain on the country's educational quality. Private sector participation continues to increase, and quality remains elusive, defying the neoliberal rationale for the marketization of higher education. However, the rising GER would not imply much if the quality churned out is not good, and costs continue to rise. Inefficient resource mobilization, the suboptimal scale of operation, and regulatory restrictions have stifled the growth in public institutions and made them devoid of life and energy.

Markets provide flexibility for the institutions to decide and the students to make informed choices. But, with markets in education, efficiency concern overpowers the equity concerns (Chattopadhyay, 2009). Private funding would lead to suboptimal growth characterized by an exclusive society undermining the role of equity and merit. This is not to deny that there is no existence of quality private institutions; they are few in number. Competition may fail to produce the best results as information asymmetry may distort the student's choice, and they are unable to evaluate the programs offered by the institutions. Privately funded institutions have failed because of commercialization, as the National Education Policy 2020 pointed out. Most often, essential expenditure is reduced; this becomes detrimental to the quality of education as the choice of any input becomes achievable in the absence of a well-defined production function (Majumdar, 1983). Many low-quality private education providers have taken advantage of the lack of a well-defined production function, resulting in inferior[69] education and lowering the value of education to a simple paper

[69] There is a tendency to cut cost by employing substandard faculty in case of private players which in turn, adversely affect the quality.

qualification and a degree certificate (Chattopadhyay, 2009). Hence markets in education become problematic because students do not buy but earn degrees, and invocation of market principles will treat them as customers, and the consumerist approach will hamper the quality of both students and teachers' as they are the co-producers of knowledge.

The majority of government-funded institutions have failed to deliver quality education because of 'government failure'[70] (Chattopadhyay, 2012a). Hence, before adopting cost-recovery measures, good governance is essential. Since the publicly funded institutions are unable to meet the rising demand for professional courses, numerous low-quality private institutions that operate on a commercial basis, cut costs at the expense of quality. In turn, students get degrees and not quality education. This leads to low motivation, and employability concern rises. Such a system may be inimical to the teacher-student relationship and degrade it to a service provider–consumer relationship (Chattopadhyay, 2012b).

The instrumental rationality unfolded through the graduates' behaviour manifests in terms of high propensity to choose the path with minimum time costs, given the graduates' capabilities. In the market, an institution tends to function more like a factory, and education gets commodified. But there is difference between an educational institution and a factory. Quality is to be understood that goes well beyond curriculum and infrastructure. It is embedded in the human capital. Education is an 'experience good,' and experience cannot be replicated everywhere. Over time rigorous courses will be side-lined, and micro-courses will be offered with a focus on learning outcomes as desired with the changing outcomes in skill demanded by the economy. Consumerist behaviour, in turn, destroys the idea of a university. It limits socialization which is desirable for a diverse country like India through interaction with students. The idea of a university would suffer gradual erosion.

[70] This can be overcome through increased public funding to ensure level playing field, institutional autonomy and shared governance structure on trust and cooperation. If teachers' are liberated from workplace constraints they would be trustworthy is a belief by the opponents of neoliberals.

7.7 An Alternate Course

With more people entering into engineering education, the competition for jobs and credentials has gained momentum. However, the demand for high skilled workers resulted in credential inflation with the increase in the number of degrees granted. There is a massive increase in the number of people entering into engineering education with the expectation of higher earnings to be realized over a period of time. Concomitantly, there is a shortage of skilled workers in the economy. The orthodox human capital does not provide an answer for the existing paradox. The human capital theory as revisited (Brown *et al.*, 2020) addresses these challenges by rethinking demand, supply, and returns from education with a narrative on job scarcity[71] rather than labour shortages. It is a re-imagination of education, work, and the labour market. It talks about how people develop, mobilize and capitalize on their capabilities within highly competitive market structures.

It rejects that humans are capital[72] as they cannot be reduced to what they earn from learning but is a study of how people capitalize on their knowledge and skills within their socio-economic context. It understands that all human beings do not act rationally, and learning is not earning. It acknowledges that there are differences in how individuals utilize and seek to make a life from their knowledge and skills. In the new era, it is not about gaining secure employment, but individuals with capabilities are required to deal with complexities. With the change in the occupational structure and technological advancement, employees need to keep changing jobs throughout their careers and reinvent themselves in the process. This is because rote learning and allegiance with marks have not only affected graduates' but also the education system that has stifled innovation. A linear approach to training individuals for high-tech jobs is not a desirable output. In the race for credential inflation, acquisitive learning sidelined inquisitive learning, which led to a gradual pull of individuals from moving ahead.

[71] It rejects that labour market mismatch is only a supply side issue of matching workers to jobs but discusses of the possibility of jobs in short supply and a difference in the structure of occupation. Hence, a mismatch in occupational aspiration and labour market realities is evident.

[72] Humans cannot be bought and sold but hired as pointed by Thurow (1975). Also, human behaviour is not directed towards capitalization of the self.

The orthodox theory argues that there is a skill competition- and that individuals' compete with each other on marketable skills, which in turn depend on investment in human capital. The revisited Human Capital theory does not focus on only the 'job' in contrast to skill focus in the orthodox view. It emphasises the changes in the transformation in the supply of labour who is capitalizing on skills and knowledge. This job focus is very comprehensive, ranging from the difference in skill training to quality of economic and social life. It also lays emphasis on equality of opportunity. This is because differences in educational performance, translating life experiences, skills, and educational achievement not only depend on investment in education and training and innate abilities but on the market power.

It includes a broader range of capabilities, and the revisited theory breaks the link between *homo economicus* and human capital development. Dewey (2016) argues that the self is not ready-made but a continuous formation through choice of action. Self is not limited to what is rewarded in the labour market. UNESCO (2015) reverberates that individual decisions are not to respond to market signals[73], but it involves an "imaginative anticipation"[74] of the future self. It is the liberation that requires the development of capabilities not reduced to employability or narrowly defined skills. It is the development of dynamic capabilities in an individual's lifetime. It is a contextual approach that rejects Becker's claim that learning is earning.

In the human capital theory as revisited, labour supply involves a wider understanding of education and capabilities and rejects that individuals are passive consumers of knowledge. It consists of a shift from the 'job for life' model to non-standard employment and self-service careers. A rethinking of labour supply involves educating them for a lifelong journey and not just making them employable. It rejects the banking model[75] of education but emphasises individual growth based on skills for life and not the labour market. It involves strengthening the foundational skills[76],

[73] A rational human being.

[74] People make their own histories and they make educational and occupational choices within individual horizon of possibilities but not limited to individual background and biographies.

[75] Where learning is compartmentalized with limited interconnectedness and with the emphasis on improving standards and delivering employable workers has resulted in straightjacketing the teaching-learning process.

[76] individual flexibility, adaptability, problem based approach to learning, creativity, innovation, problem-solving are not skills that are taught but is a social construction.

which comprises solving unstructured problems and dealing with new information. It fosters a creative human being. The quality of labour cannot be improved by making them more or less skilled but giving opportunities to grow over a lifetime and which in turn depends on access to quality education.

7.8 Conclusion

The study depicts that the education system has arguably trained one to be employees who are taught to take orders rather than initiatives. They have prepared them well for subsequent careers. It is the virtues of punctuality, regularity, obedience, and compliance to regulation. What about creativity, imagination, curiosity, and determination to delve deeper into the things, the desire to do an excellent job for its own sake? This qualification-oriented learning breeds one to be a follower rather than an innovator. Also, it is likely that the quality imparted as well as enrolled, and the expectation in terms of fat salaries has concentrated many engineers to IT and service sector jobs, leading to a loss in manufacturing. The analysis thus emphasizes that quality has declined along with the change in the occupational structure, which has been a reason for many facing problems with employability.

Further, the problem of real over-education mismatch largely seems to be an extension of the plagued teaching-learning process. Hence, the more significant concern the study emphasizes is the teaching-learning process, which is afflicted by the quality of teachers appointed in the institutes. With the input in education being flawed in significant cases for teachers[77] and students,[78] the output is bound to be affected. Those engineers who have been the victim of this system face concerns with mismatches in the job market and eventually end up with lower wages and satisfaction. It brings forth the issue that it is indispensable to bring well-qualified engineers into the teaching profession. Simultaneously, the findings also indicate the existing gap in the training and skills and the knowledge, with the number only showing an increase in the desire to obtain degrees and failing to demonstrate the applicability in jobs and basic understanding of their field of study. However, it is not always the role of poor skills that graduates possess. Still, in certain circumstances, it

[77] Flouting eligibility criterion and sometimes being subject to an unregulated structure, the quality is compromised.
[78] Tampering with the entrance examinations.

is the weak economy and one's socio-economic concerns that one accepts the job where they experience mismatch.

Nonetheless, the problem of educational mismatch is prevalent in any economy, but it is alarming in the engineers' context in India. This has raised questions about whether engineers are equipped with the necessary knowledge and skills or whether degrees are acquired without actual learning and skill acquisition and for mere qualification. Although some studies have argued that education and skill mismatches are identified as two different types of mismatches, the present study shows that they are interrelated with educational mismatches, sometimes leading to skill mismatches. The study contradicts other research findings and suggests that educational mismatch is very contextual and can be observed in field-specific fields. Where quality of education, along with work and labour market, calls for a re-imagination and is under scrutiny, the study field fails to be an accurate measure of mismatch determinants. Additionally, the study argues that engineers are the most common sufferers of educational mismatch, attributed to the poor teaching-learning process and changing job structure in the economy. The findings further question the ineffective regulatory powers attributed to the AICTE to curb corruption within the country's engineering education system, mainly contributing to the poor quality of institutes and poor employability amongst engineers. The study further represents that where the quality of education is a more significant concern in the case of developing economies, educational mismatches implies skill mismatches, and making skill education a different entity does not serve the purpose instead treating education and skill in collaboration and not in isolation would strengthen the purpose of education as skills are argued to be socially constructed.

The final argument rests not on eliminating educational mismatch; it is inevitable in certain circumstances. The study points bridging the mismatch requires a revamp of the country's engineering education system and rethinking on demand and supply and returns from education. Unless these issues are addressed, the engineering institutes will be bearing the brunt of victimization.

Nevertheless, the study does not claim that the university's primary role is preparing students for employment. Notwithstanding the discrepancy in the mismatch, the slightest expectation is in engineers' possessing a broad knowledge of their subject and independently performing the task. The study suggests that despite the need to meet the market demand, policy makers' proclamations of making the supply of education responsive to the market demands, engineers' skills are deficient. It does argue that there are engineers who possess a firm understanding of the knowledge and skills, but they are limited in number. The saturation is mainly of those who have the degree but fail to demonstrate an understanding of their subject knowledge.

To conclude, the study is an attempt to understand the decision-making process of individuals and how the choices are shaped during different stages of one's career transition. The study has brought forth that due to change in the policies of funding from institution to individual, the choice of individuals is more prone to professional education, which gratifies one with something tangible in return from their investment. In the process, choices are not primarily governed by where the individual's interest lies in instead what is demanded by the market. It is depicted through the study that decision making is a multi-stage process and how at different stages, the influence of various factors becomes prominent. It is the significant role of these factors identified at different stages of choice-making that leads to mismatches in the job market. The onus of mismatch is not only on individuals (lower educational outcomes) but also on parents' (expectations not being met), institutions (lower rankings), and the larger society (lower output, productivity, and growth).

ANNEXURE 1

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ANNEXURE 2

APPENDIX

Table A.1: Results of correlation between educational qualification of father and family income

```
. pwcorr  Eqf Faminc,sig star (0.5) obs
```

	Eqf	Faminc
Eqf	1.0000	
	264	
Faminc	0.3147*	1.0000
	0.0000	
	264	264

Table A.2: Results of t-test of gender across educational qualification of father

```
. ttest  Eqf, by (Gender_M)
```

Two-sample t test with equal variances

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
0	48	3.895833	.1690597	1.17128	3.555729	4.235938
1	216	3.481481	.0964403	1.417377	3.291392	3.671571
combined	264	3.556818	.0851271	1.383152	3.389201	3.724436
diff		.4143519	.2196453		-.0181429	.8468466

```
    diff = mean(0) - mean(1)                                      t =   1.8865
Ho: diff = 0                                     degrees of freedom =      262

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.9698         Pr(|T| > |t|) = 0.0603          Pr(T > t) = 0.0302
```

Table A.3: Results of t-test of gender across family income

```
. ttest   Faminc, by (Gender_M)
```

Two-sample t test with equal variances

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
0	48	1.708333	.1996414	1.383156	1.306707	2.10996
1	216	1.152778	.0887707	1.304658	.9778055	1.32775
combined	264	1.253788	.0820997	1.333961	1.092132	1.415444
diff		.5555556	.2104877		.1410927	.9700184

```
    diff = mean(0) - mean(1)                                      t =   2.6394
Ho: diff = 0                                     degrees of freedom =      262

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.9956         Pr(|T| > |t|) = 0.0088          Pr(T > t) = 0.0044
```

Table A.4: Results of t-test of gender across social prestige

```
. ttest    Spres, by (Gender_M)

Two-sample t test with equal variances
```

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
0	48	2	.2126329	1.473164	1.572238	2.427762
1	216	1.62037	.0951981	1.39912	1.432729	1.808011
combined	264	1.689394	.0872479	1.417611	1.517601	1.861187
diff		.3796296	.2254244		-.0642444	.8235036

```
    diff = mean(0) - mean(1)                                      t =   1.6841
Ho: diff = 0                                     degrees of freedom =      262

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.9533         Pr(|T| > |t|) = 0.0934          Pr(T > t) = 0.0467
```

Table A.5: Results of t-test of gender across teacher's advice

```
. ttest    TAdv, by (Gender_M)

Two-sample t test with equal variances
```

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
0	48	1.8125	.201185	1.39385	1.407768	2.217232
1	216	2.194444	.0911494	1.339617	2.014784	2.374105
combined	264	2.125	.0833945	1.355001	1.960794	2.289206
diff		-.3819444	.2153423		-.8059663	.0420774

```
    diff = mean(0) - mean(1)                                      t =  -1.7737
Ho: diff = 0                                     degrees of freedom =      262

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0386         Pr(|T| > |t|) = 0.0773          Pr(T > t) = 0.9614
```

Table A.6: Results of t-test of gender across post marriage family constraints

```
. ttest  PM_score,  by (Gender_M)

Two-sample t test with equal variances
```

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
0	48	.2291667	.0613066	.4247444	.1058338	.3524996
1	216	.1111111	.021433	.3149997	.0688654	.1533568
combined	264	.1325758	.0209108	.3397597	.0914019	.1737496
diff		.1180556	.0538274		.0120663	.2240448

```
    diff = mean(0) - mean(1)                                      t =   2.1932
Ho: diff = 0                                     degrees of freedom =      262

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.9854         Pr(|T| > |t|) = 0.0292          Pr(T > t) = 0.0146
```

Table A.7: Results of t-test of category across educational qualification of father

```
. ttest  Eqf, by (  Cgory_score)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      54    3.074074    .2193502    1.611888    2.634113    3.514035
       1 |     210    3.680952    .0892519    1.293384    3.505003    3.856902
---------+--------------------------------------------------------------------
combined |     264    3.556818    .0851271    1.383152    3.389201    3.724436
---------+--------------------------------------------------------------------
    diff |           -.6068783    .2080919               -1.016624   -.1971329
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =  -2.9164
Ho: diff = 0                                     degrees of freedom =      262

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0019         Pr(|T| > |t|) = 0.0038          Pr(T > t) = 0.9981
```

Table A.8: Results of t-test of category across family income

```
. ttest   Faminc, by (  Cgory_score)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      54    .7222222    .1528135    1.122945    .4157171    1.028727
       1 |     210    1.390476    .0932906     1.35191    1.206565    1.574387
---------+--------------------------------------------------------------------
combined |     264    1.253788    .0820997    1.333961    1.092132    1.415444
---------+--------------------------------------------------------------------
    diff |            -.668254       .1997               -1.061475   -.2750327
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =  -3.3463
Ho: diff = 0                                     degrees of freedom =      262

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0005         Pr(|T| > |t|) = 0.0009          Pr(T > t) = 0.9995
```

Table A.9: Results of t-test of educational qualification of father across family income

```
. ttest  Faminc, by (fatheredu)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      83    .7108434    .1254204    1.142634    .4613423    .9603445
       1 |     181    1.502762    .0999153    1.344223    1.305606    1.699918
---------+--------------------------------------------------------------------
combined |     264    1.253788    .0820997    1.333961    1.092132    1.415444
---------+--------------------------------------------------------------------
    diff |           -.7919191    .1702825               -1.127215   -.4566226
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =  -4.6506
Ho: diff = 0                                     degrees of freedom =      262

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0000         Pr(|T| > |t|) = 0.0000          Pr(T > t) = 1.0000
```

Table A.10: Results of t-test of educational qualification of father across social prestige

```
. ttest   Spres, by (fatheredu)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      83    1.445783    .1573482     1.43351    1.132767    1.758799
       1 |     181    1.801105     .104067    1.400079    1.595757    2.006453
---------+--------------------------------------------------------------------
combined |     264    1.689394    .0872479    1.417611    1.517601    1.861187
---------+--------------------------------------------------------------------
    diff |           -.3553218    .1869976               -.7235312    .0128875
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =  -1.9001
Ho: diff = 0                                     degrees of freedom =      262

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0293         Pr(|T| > |t|) = 0.0585          Pr(T > t) = 0.9707
```

Table A.11: Results of t-test of educational qualification of father across early employability

```
. ttest    Eemp, by (fatheredu)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      83    1.192771    .1365563    1.244087    .9211172    1.464425
       1 |     181    .9447514       .0882    1.186609    .7707125     1.11879
---------+--------------------------------------------------------------------
combined |     264    1.022727    .0743547    1.208121    .8763209    1.169134
---------+--------------------------------------------------------------------
    diff |            .2480197    .1597247               -.0664879    .5625273
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =   1.5528
Ho: diff = 0                                     degrees of freedom =      262

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.9392         Pr(|T| > |t|) = 0.1217          Pr(T > t) = 0.0608
```

Table A.12: Results of t-test of educational qualification of father across peer effect

```
. ttest   Pefft, by (fatheredu)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      83    1.337349    .1319813    1.202407    1.074796    1.599902
       1 |     181    1.635359    .0916953    1.233634    1.454423    1.816295
---------+--------------------------------------------------------------------
combined |     264    1.541667    .0756679    1.229457    1.392675    1.690659
---------+--------------------------------------------------------------------
    diff |           -.2980097    .1622505               -.6174907    .0214713
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =  -1.8367
Ho: diff = 0                                     degrees of freedom =      262

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0337         Pr(|T| > |t|) = 0.0674          Pr(T > t) = 0.9663
```

Table A.13: Results of t-test of educational qualification of father across post marriage family constraints

```
. ttest  PM_score, by  (eqf_score)

Two-sample t test with equal variances
```

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
0	181	.1049724	.0228465	.3073681	.059891	.1500538
1	83	.1927711	.0435625	.3968729	.1061115	.2794307
combined	264	.1325758	.0209108	.3397597	.0914019	.1737496
diff		-.0877987	.0447984		-.1760094	.000412

```
    diff = mean(0) - mean(1)                                      t =  -1.9599
Ho: diff = 0                                     degrees of freedom =      262

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0255         Pr(|T| > |t|) = 0.0511          Pr(T > t) = 0.9745
```

Table A.14: Results of the regression for mismatch in stream choice (Model 1)

```
. logit mismatch_score  eqf_score Srstc_score Wcar_score Bemp_score brnch_score,vce (robust)

Iteration 0:   log pseudolikelihood = -165.12972
Iteration 1:   log pseudolikelihood = -29.308039
Iteration 2:   log pseudolikelihood = -23.615281
Iteration 3:   log pseudolikelihood = -20.749588
Iteration 4:   log pseudolikelihood = -20.598479
Iteration 5:   log pseudolikelihood = -20.596831
Iteration 6:   log pseudolikelihood = -20.596831

Logistic regression                               Number of obs   =        264
                                                  Wald chi2(5)    =      53.03
                                                  Prob > chi2     =     0.0000
Log pseudolikelihood = -20.596831                 Pseudo R2       =     0.8753
```

mismatch_score	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
eqf_score	-.9377224	1.019991	-0.92	0.358	-2.936868	1.061423
Srstc_score	9.773735	2.370334	4.12	0.000	5.127965	14.4195
Wcar_score	1.113095	.6689443	1.66	0.096	-.198012	2.424201
Bemp_score	2.35526	.9650524	2.44	0.015	.4637922	4.246728
brnch_score	1.734658	1.294117	1.34	0.180	-.8017649	4.271081
_cons	-9.184041	2.567951	-3.58	0.000	-14.21713	-4.15095

.

Table A.15: Results of the regression for mismatch in stream choice (Model 2)

```
. logit mismatch_score  eqf_score Srstc_score Wcar_score Bemp_score brnch_score  Spres_score,vce (robust)

Iteration 0:   log pseudolikelihood = -165.12972
Iteration 1:   log pseudolikelihood = -29.006038
Iteration 2:   log pseudolikelihood = -22.718714
Iteration 3:   log pseudolikelihood = -18.949878
Iteration 4:   log pseudolikelihood = -18.527396
Iteration 5:   log pseudolikelihood =  -18.52023
Iteration 6:   log pseudolikelihood = -18.520207
Iteration 7:   log pseudolikelihood = -18.520207

Logistic regression                               Number of obs   =        264
                                                  Wald chi2(6)    =      53.88
                                                  Prob > chi2     =     0.0000
Log pseudolikelihood = -18.520207                 Pseudo R2       =     0.8878
```

mismatch_score	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
eqf_score	-1.755737	1.189613	-1.48	0.140	-4.087335	.5758621
Srstc_score	11.14854	2.450997	4.55	0.000	6.344677	15.95241
Wcar_score	1.863428	.9620515	1.94	0.053	-.0221582	3.749015
Bemp_score	1.949673	.8757581	2.23	0.026	.2332185	3.666127
brnch_score	1.407243	1.181883	1.19	0.234	-.9092056	3.723692
Spres_score	2.571786	.8126553	3.16	0.002	.9790104	4.164561
_cons	-11.3012	2.76385	-4.09	0.000	-16.71825	-5.884156

.

Table A.16: Results of the regression for mismatch in stream choice (Model 3)

```
. logit mismatch_score  eqf_score Srstc_score Wcar_score Bemp_score brnch_score i. Instrank,vce (robust)

Iteration 0:   log pseudolikelihood = -165.12972
Iteration 1:   log pseudolikelihood = -29.110948
Iteration 2:   log pseudolikelihood = -23.091526
Iteration 3:   log pseudolikelihood = -20.252728
Iteration 4:   log pseudolikelihood = -20.123038
Iteration 5:   log pseudolikelihood =  -20.12195
Iteration 6:   log pseudolikelihood =  -20.12195

Logistic regression                               Number of obs   =        264
                                                  Wald chi2(7)    =      54.75
                                                  Prob > chi2     =     0.0000
Log pseudolikelihood =  -20.12195                 Pseudo R2       =     0.8781
```

mismatch_score	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
eqf_score	-.8183787	.9217904	-0.89	0.375	-2.625055	.9882973
Srstc_score	9.774464	2.284254	4.28	0.000	5.297408	14.25152
Wcar_score	1.400541	.7661254	1.83	0.068	-.1010367	2.90212
Bemp_score	2.463275	.9290572	2.65	0.008	.6423567	4.284194
brnch_score	1.592175	1.27435	1.25	0.212	-.9055041	4.089855
Instrank						
1	-.2823494	.9173747	-0.31	0.758	-2.080371	1.515672
2	1.680929	.7927317	2.12	0.034	.1272039	3.234655
_cons	-9.510348	2.552259	-3.73	0.000	-14.51268	-4.508012

.

Table A.17: Results of the regression for mismatch in stream choice (Model 4)

```
. logit mismatch_score  eqf_score Srstc_score Wcar_score Bemp_score brnch_score  Spres_score i. Instrank,vce (robust)

Iteration 0:   log pseudolikelihood = -165.12972
Iteration 1:   log pseudolikelihood = -28.823401
Iteration 2:   log pseudolikelihood =  -22.35594
Iteration 3:   log pseudolikelihood = -18.884847
Iteration 4:   log pseudolikelihood = -18.459442
Iteration 5:   log pseudolikelihood = -18.452374
Iteration 6:   log pseudolikelihood = -18.452365
Iteration 7:   log pseudolikelihood = -18.452365

Logistic regression                               Number of obs   =        264
                                                  Wald chi2(8)    =      61.40
                                                  Prob > chi2     =     0.0000
Log pseudolikelihood = -18.452365                 Pseudo R2       =     0.8883
```

mismatch_score	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
eqf_score	-1.695209	1.102547	-1.54	0.124	-3.856161	.4657429
Srstc_score	11.00334	2.354651	4.67	0.000	6.388307	15.61837
Wcar_score	1.878157	1.045798	1.80	0.073	-.1715703	3.927884
Bemp_score	2.028217	.8153069	2.49	0.013	.4302443	3.626189
brnch_score	1.298127	1.254801	1.03	0.301	-1.161237	3.757491
Spres_score	2.424686	.820247	2.96	0.003	.8170317	4.032341
Instrank						
1	.0855932	.9367401	0.09	0.927	-1.750384	1.92157
2	.8155083	.9112786	0.89	0.371	-.9705649	2.601582
_cons	-11.1989	2.636633	-4.25	0.000	-16.36661	-6.031197

Table A.18: Regression results of engineering with Master (Model 1)

```
. logit  Mstr  Cgory_score  EQF_score  SA_score mismatch_score  QFCTY_score IA_score OWNSHP Ne_score i. WORKEXP,vce (robust
> )

Iteration 0:   log pseudolikelihood = -122.42095
Iteration 1:   log pseudolikelihood = -111.84281
Iteration 2:   log pseudolikelihood =  -111.2809
Iteration 3:   log pseudolikelihood = -111.27995
Iteration 4:   log pseudolikelihood = -111.27995

Logistic regression                               Number of obs   =        228
                                                  Wald chi2(10)   =      21.26
                                                  Prob > chi2     =     0.0194
Log pseudolikelihood = -111.27995                 Pseudo R2       =     0.0910
```

Mstr	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
Cgory_score	-.7125131	.4374436	-1.63	0.103	-1.569887	.1448606
EQF_score	-.6635636	.3961486	-1.68	0.094	-1.440001	.1128733
SA_score	.6032273	.3808519	1.58	0.113	-.1432287	1.349683
mismatch_score	-.8595891	.3894721	-2.21	0.027	-1.62294	-.0962379
QFCTY_score	.5267721	.4149497	1.27	0.204	-.2865144	1.340059
IA_score	-.6868667	.4451464	-1.54	0.123	-1.559338	.1856042
OWNSHP	.4081026	.4139208	0.99	0.324	-.4031672	1.219372
Ne_score	-.620947	.3622182	-1.71	0.086	-1.330882	.0889876
WORKEXP						
1	.1208084	.4056198	0.30	0.766	-.6741918	.9158086
2	.9002471	.4609338	1.95	0.051	-.0031665	1.803661
_cons	-.7189545	.6334537	-1.13	0.256	-1.960501	.522592

.

Table A.19: Regression results of engineering with Master (Model 2)

```
. logit  Mstr  Cgory_score  EQF_score  SA_score mismatch_score  QFCTY_score IA_score OWNSHP Ne_score i. WORKEXP  Gender_M,v
> ce (robust)

Iteration 0:   log pseudolikelihood = -122.42095
Iteration 1:   log pseudolikelihood = -111.78937
Iteration 2:   log pseudolikelihood = -111.21966
Iteration 3:   log pseudolikelihood = -111.21872
Iteration 4:   log pseudolikelihood = -111.21872

Logistic regression                               Number of obs   =        228
                                                  Wald chi2(11)   =      21.86
                                                  Prob > chi2     =     0.0255
Log pseudolikelihood = -111.21872                 Pseudo R2       =     0.0915
```

Mstr	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
Cgory_score	-.7067865	.4350572	-1.62	0.104	-1.559483	.14591
EQF_score	-.6754402	.3918598	-1.72	0.085	-1.443471	.0925909
SA_score	.6050429	.382275	1.58	0.113	-.1442024	1.354288
mismatch_score	-.8668819	.3857236	-2.25	0.025	-1.622886	-.1108775
QFCTY_score	.5448367	.4155234	1.31	0.190	-.2695742	1.359248
IA_score	-.7145461	.458682	-1.56	0.119	-1.613546	.1844542
OWNSHP	.4095254	.4145241	0.99	0.323	-.4029269	1.221978
Ne_score	-.6160394	.3611247	-1.71	0.088	-1.323831	.091752
WORKEXP						
1	.1051752	.4038777	0.26	0.795	-.6864105	.8967609
2	.8802191	.4634945	1.90	0.058	-.0282135	1.788652
Gender_M	.1569783	.4606559	0.34	0.733	-.7458907	1.059847
_cons	-.8436366	.7512885	-1.12	0.261	-2.316135	.6288618

.

Table A.20: Cross tabulation media advertising

	Media advertisement		
Type of institution	Not Important	Important	Total
Lower-tier	78.51	21.49	228
21-40	65.22	34.78	23
1-20	100	0.00	13
Total	207 (78.41)	57 (21.59)	264
Source: Based on field survey			

Table A.21: Cross tabulation family members studied in the institute

	Family members studied in the institute		
Type of institution	Not Important	Important	Total
Lower-tier	77.19	22.81	228
21-40	78.26	21.74	23
1-20	76.92	23.08	13
Total	77.27	22.73	264
Source: Based on field survey			

Table A.22: Results of t-test of gender across distance from hometown

```
. ttest   Dtnc, by ( Gender_M)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      48    1.479167    .2041015    1.414057    1.068567    1.889766
       1 |     216    2.032407    .1050791    1.544342     1.82529    2.239525
---------+--------------------------------------------------------------------
combined |     264    1.931818     .094403    1.533867    1.745936      2.1177
---------+--------------------------------------------------------------------
    diff |           -.5532407     .242834               -1.031395    -.075086
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =  -2.2783
Ho: diff = 0                                     degrees of freedom =      262

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0118         Pr(|T| > |t|) = 0.0235          Pr(T > t) = 0.9882
```

Table A.23: Results of ANOVA of Institutional ranking across graduate profile

```
. anova   Gp  Instrank

                           Number of obs =     264     R-squared     =  0.0146
                           Root MSE      = 1.26278     Adj R-squared =  0.0071

                  Source | Partial SS    df       MS           F     Prob > F
              -----------+----------------------------------------------------
                   Model | 6.16880231     2  3.08440115       1.93     0.1466
                         |
                Instrank | 6.16880231     2  3.08440115       1.93     0.1466
                         |
                Residual | 416.191046   261  1.59460171
              -----------+----------------------------------------------------
                   Total | 422.359848   263  1.60593098

. tabulate  Instrank, summarize ( Gp)

            |         Summary of Gp
   Instrank |        Mean   Std. Dev.       Freq.
------------+------------------------------------
          0 |   1.1929825   1.2964009         228
          1 |    .7826087    1.126399          23
          2 |   .69230769   .75106762          13
------------+------------------------------------
      Total |   1.1325758   1.2672533         264
```

Table A.24: Results of ANOVA of Institutional ranking across institution credibility

```
. anova crdty Instrank

                           Number of obs =     264     R-squared     =  0.0180
                           Root MSE      = .909407     Adj R-squared =  0.0105

                  Source | Partial SS    df       MS           F     Prob > F
              -----------+----------------------------------------------------
                   Model | 3.96177116     2  1.98088558       2.40     0.0932
                         |
                Instrank | 3.96177116     2  1.98088558       2.40     0.0932
                         |
                Residual | 215.852623   261  .827021543
              -----------+----------------------------------------------------
                   Total | 219.814394   263  .835796175


. tabulate  Instrank, summarize ( crdty)

            |       Summary of crdty
   Instrank |        Mean   Std. Dev.       Freq.
------------+------------------------------------
          0 |   .56578947   .94801708         228
          1 |   .13043478   .34435022          23
          2 |   .53846154   .87705802          13
------------+------------------------------------
      Total |   .52651515   .91421889         264
```

Table A.25: Results of t-test of family income across graduate profile

```
. ttest    Gp_score, by ( AIFam)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      92    .7934783    .0424355    .4070274    .7091853    .8777712
       1 |     172    .6860465    .0354904    .4654528    .6159907    .7561023
---------+--------------------------------------------------------------------
combined |     264    .7234848    .0275801    .4481241    .6691789    .7777908
---------+--------------------------------------------------------------------
    diff |            .1074317    .0576111               -.006008    .2208715
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =   1.8648
Ho: diff = 0                                     degrees of freedom =      262

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.9683         Pr(|T| > |t|) = 0.0633          Pr(T > t) = 0.0317
```

Table A.26: Results of t-test of family income across family members studied in the institute

```
. ttest  famc_score, by ( AIFam)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      92    .2934783    .0477342    .4578508    .1986601    .3882965
       1 |     172    .1918605    .0301119    .3949136    .1324216    .2512993
---------+--------------------------------------------------------------------
combined |     264    .2272727     .025841    .4198662    .1763912    .2781543
---------+--------------------------------------------------------------------
    diff |            .1016178    .0539714              -.0046551    .2078907
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =   1.8828
Ho: diff = 0                                     degrees of freedom =      262

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.9696         Pr(|T| > |t|) = 0.0608          Pr(T > t) = 0.0304
```

Table A.27: Results of t-test of family income across living cost

```
. ttest   lcst_score, by ( AIFam)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |      92    .5108696    .0524019    .5026209    .4067797    .6149594
       1 |     172    .6395349    .0367169    .4815373    .5670582    .7120116
---------+--------------------------------------------------------------------
combined |     264     .594697    .0302733    .4918831    .5350881    .6543059
---------+--------------------------------------------------------------------
    diff |           -.1286653    .0631568              -.2530248   -.0043058
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =  -2.0372
Ho: diff = 0                                     degrees of freedom =      262

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0213         Pr(|T| > |t|) = 0.0426          Pr(T > t) = 0.9787
```

Table A.28: Results of ANOVA of Institutional ranking across curriculum updation

```
. anova  Cu_score Instrank

                           Number of obs =     264     R-squared     =  0.0229
                           Root MSE      = .483176     Adj R-squared =  0.0154

                  Source |  Partial SS    df       MS           F     Prob > F
              -----------+----------------------------------------------------
                   Model |  1.42713417     2  .713567087       3.06     0.0487
                         |
                Instrank |  1.42713417     2  .713567087       3.06     0.0487
                         |
                Residual |  60.9327143   261  .233458676
              -----------+----------------------------------------------------
                   Total |  62.3598485   263   .23710969

. tabulate  Instrank,summarize ( Cu_score)

            |         Summary of Cu_score
   Instrank |        Mean   Std. Dev.       Freq.
------------+------------------------------------
          0 |   .35526316     .479646         228
          1 |   .60869565   .49901088          23
          2 |   .46153846   .51887452          13
------------+------------------------------------
      Total |   .38257576    .4869391         264

.
```

Table A.29: Results of ANOVA of Institutional ranking across quality faculty

```
. anova   QFCTY_score Instrank

                           Number of obs =     264     R-squared     =  0.0681
                           Root MSE      = .479849     Adj R-squared =  0.0609

                  Source |  Partial SS    df       MS           F     Prob > F
              -----------+----------------------------------------------------
                   Model |  4.38832792     2  2.19416396       9.53     0.0001
                         |
                Instrank |  4.38832792     2  2.19416396       9.53     0.0001
                         |
                Residual |  60.0965206   261  .230254868
              -----------+----------------------------------------------------
                   Total |  64.4848485   263  .245189538

. tabulate  Instrank,summarize ( QFCTY_score)

            |       Summary of QFCTY_score
   Instrank |        Mean   Std. Dev.       Freq.
------------+------------------------------------
          0 |   .37719298   .48575026         228
          1 |   .82608696   .38755339          23
          2 |   .53846154   .51887452          13
------------+------------------------------------
      Total |   .42424242   .49516617         264

.
```

Table A.30: Results of ANOVA of Institutional ranking across industry academia linkages

```
. anova    IA_score Instrank

                           Number of obs =      264     R-squared     =  0.0336
                           Root MSE      = .475604     Adj R-squared =  0.0262

                  Source | Partial SS    df       MS           F     Prob > F
              -----------+----------------------------------------------------
                   Model |  2.05293162     2  1.02646581       4.54     0.0116
                         |
                Instrank |  2.05293162     2  1.02646581       4.54     0.0116
                         |
                Residual |  59.0379775   261  .226199147
              -----------+----------------------------------------------------
                   Total |  61.0909091   263  .232284825

. tabulate  Instrank,summarize (  IA_score)

            |        Summary of IA_score
   Instrank |        Mean   Std. Dev.       Freq.
------------+------------------------------------
          0 |   .32894737   .47086455         228
          1 |   .60869565   .49901088          23
          2 |   .53846154   .51887452          13
------------+------------------------------------
      Total |   .36363636   .48195936         264

.
```

Table A.31: Results of ANOVA of Institutional ranking across student professor interaction

```
. anova     SPI_score Instrank

                           Number of obs =      264     R-squared     =  0.0221
                           Root MSE      = .496118     Adj R-squared =  0.0146

                  Source | Partial SS    df       MS           F     Prob > F
              -----------+----------------------------------------------------
                   Model |  1.45249649     2  .726248246       2.95     0.0541
                         |
                Instrank |  1.45249649     2  .726248246       2.95     0.0541
                         |
                Residual |  64.2406853   261  .246132894
              -----------+----------------------------------------------------
                   Total |  65.6931818   263  .249783961

. tabulate  Instrank,summarize (   SPI_score)

            |        Summary of SPI_score
   Instrank |        Mean   Std. Dev.       Freq.
------------+------------------------------------
          0 |   .43859649   .49730707         228
          1 |   .69565217   .47047197          23
          2 |   .53846154   .51887452          13
------------+------------------------------------
      Total |   .46590909   .49978391         264

.
```

Table A.32: Results of ANOVA of Institutional ranking across engineering education equipped one to perform in the job market

```
. anova   EEDU Instrank

                           Number of obs =      264     R-squared     =  0.0666
                           Root MSE      = .481304     Adj R-squared =  0.0594

                  Source | Partial SS    df       MS           F     Prob > F
              -----------+----------------------------------------------------
                   Model |  4.31113014     2  2.15556507       9.31     0.0001
                         |
                Instrank |  4.31113014     2  2.15556507       9.31     0.0001
                         |
                Residual |  60.4615971   261  .231653629
              -----------+----------------------------------------------------
                   Total |  64.7727273   263  .246284134

. tabulate  Instrank,summarize (  EEDU)

            |         Summary of EEDU
   Instrank |        Mean   Std. Dev.       Freq.
------------+------------------------------------
          0 |   .51754386   .50079155         228
          1 |   .86956522   .34435022          23
          2 |   .92307692    .2773501          13
------------+------------------------------------
      Total |   .56818182   .49627022         264

.
```

Table A.33: Results of ANOVA of Institutional ranking across quality of training

```
. anova   qt_score Instrank

                           Number of obs =      264     R-squared     =  0.0230
                           Root MSE      =  .48653     Adj R-squared =  0.0156

                  Source | Partial SS    df       MS           F     Prob > F
              -----------+----------------------------------------------------
                   Model |  1.45690779     2  .728453897       3.08     0.0478
                         |
                Instrank |  1.45690779     2  .728453897       3.08     0.0478
                         |
                Residual |  61.7817286   261  .236711604
              -----------+----------------------------------------------------
                   Total |  63.2386364   263  .240451089

. tabulate  Instrank,summarize (   qt_score)

            |       Summary of qt_score
   Instrank |        Mean   Std. Dev.       Freq.
------------+------------------------------------
          0 |   .36842105   .48343772         228
          1 |   .56521739    .5068698          23
          2 |   .61538462   .50636968          13
------------+------------------------------------
      Total |   .39772727   .49035812         264

.
```

Table A.34: Results of ANOVA of Institutional ranking across usage of acquired knowledge in practice

```
. anova  KP_score Instrank

                           Number of obs =      264     R-squared     =  0.0394
                           Root MSE      = .488744     Adj R-squared =  0.0321
```

Source	Partial SS	df	MS	F	Prob > F
Model	2.55992663	2	1.27996331	5.36	0.0052
Instrank	2.55992663	2	1.27996331	5.36	0.0052
Residual	62.3453764	261	.238871174		
Total	64.905303	263	.246788224		

```
. tabulate  Instrank,summarize ( KP_score)
```

Instrank	Summary of KP_score Mean	Std. Dev.	Freq.
0	.39912281	.49079556	228
1	.73913043	.44897776	23
2	.53846154	.51887452	13
Total	.43560606	.49677784	264

Table A.35: Results of t-test of overeducation across usage of acquired knowledge in practice

```
. ttest KP_score, by ( M0)

Two-sample t test with equal variances
```

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
0	178	.505618	.0375799	.5013788	.4314556	.5797804
1	86	.2906977	.0492524	.4567476	.1927708	.3886246
combined	264	.4356061	.0305746	.4967778	.375404	.4958081
diff		.2149203	.0640002		.0889001	.3409405

```
    diff = mean(0) - mean(1)                                      t =   3.3581
Ho: diff = 0                                     degrees of freedom =      262

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.9995         Pr(|T| > |t|) = 0.0009          Pr(T > t) = 0.0005
```

Table A.36: Results of t-test of overeducation across curriculum updation

. ttest Cu_score, by (M0)

Two-sample t test with equal variances

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
0	178	.4550562	.0374302	.4993807	.3811894	.528923
1	86	.2325581	.0458225	.4249406	.1414507	.3236656
combined	264	.3825758	.029969	.4869391	.323566	.4415855
diff		.222498	.0625765		.0992811	.345715

diff = mean(0) - mean(1) t = 3.5556
Ho: diff = 0 degrees of freedom = 262

Ha: diff < 0 Ha: diff != 0 Ha: diff > 0
Pr(T < t) = 0.9998 Pr(|T| > |t|) = 0.0004 Pr(T > t) = 0.0002

Table A.37: Results of t-test of overeducation across quality faculty

. ttest QFCTY_score, by (M0)

Two-sample t test with equal variances

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
0	178	.4719101	.0375229	.5006185	.3978602	.54596
1	86	.3255814	.0508259	.47134	.2245259	.4266369
combined	264	.4242424	.0304754	.4951662	.3642357	.4842492
diff		.1463287	.0645207		.0192836	.2733739

diff = mean(0) - mean(1) t = 2.2679
Ho: diff = 0 degrees of freedom = 262

Ha: diff < 0 Ha: diff != 0 Ha: diff > 0
Pr(T < t) = 0.9879 Pr(|T| > |t|) = 0.0241 Pr(T > t) = 0.0121

Table A.38: Results of t-test of overeducation across industry academia linkages

. ttest IA_score, by (M0)

Two-sample t test with equal variances

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
0	178	.4044944	.0368903	.4921784	.3316929	.4772959
1	86	.2790698	.0486512	.4511727	.1823381	.3758014
combined	264	.3636364	.0296625	.4819594	.3052301	.4220427
diff		.1254246	.0629381		.0014957	.2493535

diff = mean(0) - mean(1) t = 1.9928
Ho: diff = 0 degrees of freedom = 262

Ha: diff < 0 Ha: diff != 0 Ha: diff > 0
Pr(T < t) = 0.9763 Pr(|T| > |t|) = 0.0473 Pr(T > t) = 0.0237

Table A.39: Results of t-test of overeducation across student professor interaction

```
. ttest     SPI_score, by ( M0)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |     178    .5393258    .0374659    .4998571    .4653885    .6132631
       1 |      86    .3139535    .0503385    .4668197    .2138671    .4140398
---------+--------------------------------------------------------------------
combined |     264    .4659091    .0307596    .4997839    .4053427    .5264755
---------+--------------------------------------------------------------------
    diff |            .2253724    .0642676                .0988257    .3519191
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =   3.5068
Ho: diff = 0                                     degrees of freedom =      262

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.9997         Pr(|T| > |t|) = 0.0005          Pr(T > t) = 0.0003
```

Table A.40: Results of t-test of overeducation across emphasis on passing exams rather than acquiring skills

```
. ttest    En_score, by ( M0)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |     178    .4719101    .0375229    .5006185    .3978602      .54596
       1 |      86    .3604651     .052078    .4829515    .2569201    .4640101
---------+--------------------------------------------------------------------
combined |     264    .4356061    .0305746    .4967778     .375404    .4958081
---------+--------------------------------------------------------------------
    diff |             .111445    .0649994               -.0165427    .2394327
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =   1.7146
Ho: diff = 0                                     degrees of freedom =      262

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.9562         Pr(|T| > |t|) = 0.0876          Pr(T > t) = 0.0438
```

Table A.41: Results of t-test of overeducation across development of engineering training and skills in meeting job requirements

```
. ttest  Train_score, by ( M0)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |     178    .7640449    .0319145     .425792    .7010631    .8270268
       1 |      86    .4418605    .0538647     .499521    .3347629     .548958
---------+--------------------------------------------------------------------
combined |     264    .6590909     .029229    .4749152    .6015383    .7166436
---------+--------------------------------------------------------------------
    diff |            .3221845    .0592315                .2055542    .4388147
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =   5.4394
Ho: diff = 0                                     degrees of freedom =      262

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 1.0000         Pr(|T| > |t|) = 0.0000          Pr(T > t) = 0.0000
```

Table A.42: Results of t-test of overeducation across quality training

```
. ttest   qt_score, by ( MO)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |     178    .4606742    .0374659    .4998571    .3867369    .5346115
       1 |      86    .2674419    .0480094    .4452209    .1719863    .3628974
---------+--------------------------------------------------------------------
combined |     264    .3977273    .0301795    .4903581    .3383032    .4571514
---------+--------------------------------------------------------------------
    diff |            .1932323    .0634043                .0683854    .3180791
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =   3.0476
Ho: diff = 0                                     degrees of freedom =      262

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.9987         Pr(|T| > |t|) = 0.0025          Pr(T > t) = 0.0013
```

Table A.43: Results of t-test of horizontal mismatch across usage of acquired knowledge in practice

```
. ttest KP_score, by (  HM)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |     125         .64    .0431053    .4819316    .5546826    .7253174
       1 |     139    .2517986    .0369485    .4356159    .1787402    .3248569
---------+--------------------------------------------------------------------
combined |     264    .4356061    .0305746    .4967778     .375404    .4958081
---------+--------------------------------------------------------------------
    diff |            .3882014    .0564702                .2770083    .4993946
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =   6.8745
Ho: diff = 0                                     degrees of freedom =      262

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 1.0000         Pr(|T| > |t|) = 0.0000          Pr(T > t) = 0.0000
```

Table A.44: Results of t-test of horizontal mismatch across curriculum updation

```
. ttest  Cu_score, by (HM)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |     125         .56    .0445769    .4983845    .4717699    .6482301
       1 |     139    .2230216    .0354355    .4177782    .1529549    .2930883
---------+--------------------------------------------------------------------
combined |     264    .3825758     .029969    .4869391     .323566    .4415855
---------+--------------------------------------------------------------------
    diff |            .3369784    .0564184                .2258872    .4480697
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =   5.9728
Ho: diff = 0                                     degrees of freedom =      262

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 1.0000         Pr(|T| > |t|) = 0.0000          Pr(T > t) = 0.0000
```

Table A.45: Results of t-test of horizontal mismatch across quality faculty

```
. ttest   QFCTY_score, by (  HM)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |     125        .584    .0442631     .494877    .4963908    .6716092
       1 |     139    .2805755    .0382453    .4509053     .204953    .3561981
---------+--------------------------------------------------------------------
combined |     264    .4242424    .0304754    .4951662    .3642357    .4842492
---------+--------------------------------------------------------------------
    diff |            .3034245     .058209                .1888074    .4180415
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =   5.2127
Ho: diff = 0                                     degrees of freedom =      262

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 1.0000         Pr(|T| > |t|) = 0.0000          Pr(T > t) = 0.0000
```

Table A.46: Results of t-test of horizontal mismatch across industry academia linkages

```
. ttest    IA_score, by ( HM)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |     125        .504    .0448999     .501996    .4151305    .5928695
       1 |     139    .2374101    .0362206    .4270345     .165791    .3090292
---------+--------------------------------------------------------------------
combined |     264    .3636364    .0296625    .4819594    .3052301    .4220427
---------+--------------------------------------------------------------------
    diff |            .2665899    .0571979                .1539638    .3792161
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =   4.6608
Ho: diff = 0                                     degrees of freedom =      262

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 1.0000         Pr(|T| > |t|) = 0.0000          Pr(T > t) = 0.0000
```

Table A.47: Results of t-test of horizontal mismatch across student professor interaction

```
. ttest     SPI_score, by (  HM)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |     125        .608    .0438414    .4901613    .5212257    .6947743
       1 |     139    .3381295    .0402706    .4747838    .2585022    .4177568
---------+--------------------------------------------------------------------
combined |     264    .4659091    .0307596    .4997839    .4053427    .5264755
---------+--------------------------------------------------------------------
    diff |            .2698705    .0594288                .1528516    .3868894
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =   4.5411
Ho: diff = 0                                     degrees of freedom =      262

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 1.0000         Pr(|T| > |t|) = 0.0000          Pr(T > t) = 0.0000
```

Table A.48: Results of t-test of horizontal mismatch across emphasis on passing exams rather than utilizing skills

```
. ttest    En_score, by (  HM)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |     125        .488    .0448884    .5018675    .3991533    .5768467
       1 |     139    .3884892    .0414908    .4891695    .3064493    .4705292
---------+--------------------------------------------------------------------
combined |     264    .4356061    .0305746    .4967778     .375404    .4958081
---------+--------------------------------------------------------------------
    diff |            .0995108    .0610432               -.020687    .2197086
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =   1.6302
Ho: diff = 0                                     degrees of freedom =      262

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.9479         Pr(|T| > |t|) = 0.1043          Pr(T > t) = 0.0521
```

Table A.49: Results of t-test of horizontal mismatch across engineering education equipped one to perform in the job market

```
. ttest  EEDU, by (  HM)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |     125        .696    .0413077    .4618337    .6142406    .7777594
       1 |     139    .4532374    .0423763    .4996089    .3694467    .5370282
---------+--------------------------------------------------------------------
combined |     264    .5681818    .0305433    .4962702    .5080413    .6283224
---------+--------------------------------------------------------------------
    diff |            .2427626     .059426                .1257493    .3597759
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =   4.0851
Ho: diff = 0                                     degrees of freedom =      262

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 1.0000         Pr(|T| > |t|) = 0.0001          Pr(T > t) = 0.0000
```

Table A.50: Results of t-test of horizontal mismatch across development of engineering training and skills in meeting job requirements

```
. ttest  Train_score, by (  HM)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |     125         .88    .0291824    .3262692    .8222398    .9377602
       1 |     139    .4604317    .0424293    .5002345     .376536    .5443273
---------+--------------------------------------------------------------------
combined |     264    .6590909     .029229    .4749152    .6015383    .7166436
---------+--------------------------------------------------------------------
    diff |            .4195683    .0526133                .3159696     .523167
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =   7.9746
Ho: diff = 0                                     degrees of freedom =      262

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 1.0000         Pr(|T| > |t|) = 0.0000          Pr(T > t) = 0.0000
```

Table A.51: Results of t-test of horizontal mismatch across quality of training

```
. ttest   qt_score, by ( HM)

Two-sample t test with equal variances
------------------------------------------------------------------------------
   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
       0 |     125        .544    .0447271    .5000645    .4554725    .6325275
       1 |     139    .2661871    .0376224    .4435617    .1917961     .340578
---------+--------------------------------------------------------------------
combined |     264    .3977273    .0301795    .4903581    .3383032    .4571514
---------+--------------------------------------------------------------------
    diff |            .2778129    .0580761                .1634576    .3921683
------------------------------------------------------------------------------
    diff = mean(0) - mean(1)                                      t =   4.7836
Ho: diff = 0                                     degrees of freedom =      262

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 1.0000         Pr(|T| > |t|) = 0.0000          Pr(T > t) = 0.0000
```

Table A.52: Results of t-test of overeducation across interesting work

t-Test: Two-Sample Assuming Unequal Variances

	Intwk_OE	*Intwk_M*
Mean	0.837209	0.929134
Variance	0.137893	0.066367
Observations	86	127
Hypothesized Mean Difference	0	
Df	139	
t Stat	-1.99366	
P(T<=t) one-tail	0.024073	
t Critical one-tail	1.65589	
P(T<=t) two-tail	0.048146	
t Critical two-tail	1.977178	

Table A.53: Results of t-test of overeducation across salary

t-Test: Two-Sample Assuming Unequal Variances

	SAL_score OE	*SAL_score M*
Mean	0.837209	0.96063
Variance	0.137893	0.03812
Observations	86	127
Hypothesized Mean Difference	0	
Df	117	
t Stat	-2.82881	
P(T<=t) one-tail	0.00275	
t Critical one-tail	1.657982	
P(T<=t) two-tail	0.005499	
t Critical two-tail	1.980448	

Table A.54: Results of t-test of overeducation across career development

t-Test: Two-Sample Assuming Unequal Variances

	Cdev_score OE	*Cdev_scoreM*
Mean	0.88372093	0.976377953
Variance	0.103967168	0.023247094
Observations	86	127
Hypothesized Mean Difference	0	
Df	111	
t Stat	-2.483496941	
P(T<=t) one-tail	0.007252411	
t Critical one-tail	1.658697265	
P(T<=t) two-tail	0.014504822	
t Critical two-tail	1.981566757	

Table A.55: Results of t-test of overeducation across technological changes

t-Test: Two-Sample Assuming Unequal Variances

	Tchng_score OE	*Tchng_score M*
Mean	0.790697674	0.889764
Variance	0.16744186	0.098863
Observations	86	127
Hypothesized Mean Difference	0	
Df	150	
t Stat	-1.897607669	
P(T<=t) one-tail	0.029834617	
t Critical one-tail	0	
P(T<=t) two-tail	0.059669233	
t Critical two-tail	0.676128848	

Table A.56: Results of t-test of overeducation across job security

t-Test: Two-Sample Assuming Unequal Variances

	JobS_score OE	*JobS_score M*
Mean	0.837209	0.944882
Variance	0.137893	0.052493
Observations	86	127
Hypothesized Mean Difference	0	
Df	129	
t Stat	-2.39762	
P(T<=t) one-tail	0.008968	
t Critical one-tail	0	
P(T<=t) two-tail	0.017935	
t Critical two-tail	0.676396	

Table A.57: Results of t-test of overeducation across management decision

t-Test: Two-Sample Assuming Unequal Variances

	MgmtD_score OE	*MgmtD_score M*
Mean	0.523255814	0.700787
Variance	0.252393981	0.211349
Observations	86	127
Hypothesized Mean Difference	0	
Df	172	
t Stat	-2.61785191	
P(T<=t) one-tail	0.004818756	
t Critical one-tail	0	
P(T<=t) two-tail	0.009637513	
t Critical two-tail	0.675918802	

Table A.58: Results of ANOVA of undereducation across work experience

```
. anova  M2 WORKEXP

                          Number of obs =      264     R-squared     =  0.0223
                          Root MSE      = .392596     Adj R-squared =  0.0148

                  Source   Partial SS    df       MS           F     Prob > F

                   Model    .91930622     2   .45965311       2.98     0.0524

                 WORKEXP    .91930622     2   .45965311       2.98     0.0524

                Residual   40.2284211   261  .154131881

                   Total   41.1477273   263  .156455237

. tabulate  WORKEXP, summarize ( M2)

                       Summary of M2
     WORKEXP        Mean   Std. Dev.       Freq.

           0         .24    .4285139         150
           1   .15789474   .36706517          76
           2   .07894737   .27327631          38

       Total   .19318182   .39554423         264

.
```

Table A.59: Results of t-test of horizontal mismatch across interesting work

```
. ttest  Intwk, by ( HM) unequal

Two-sample t test with unequal variances
```

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
0	125	.936	.0219795	.2457379	.8924965	.9795035
1	139	.8705036	.0285808	.3369628	.8139907	.9270165
combined	264	.9015152	.0183736	.298535	.8653371	.9376932
diff		.0654964	.036055		-.0055116	.1365044

```
    diff = mean(0) - mean(1)                                      t =   1.8166
Ho: diff = 0                     Satterthwaite's degrees of freedom =  251.571

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.9648         Pr(|T| > |t|) = 0.0705          Pr(T > t) = 0.0352
```

Table A.60: Results of t-test of horizontal mismatch across job benefits

```
. ttest    BJob_score, by ( HM) unequal

Two-sample t test with unequal variances
```

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
0	125	.928	.0232129	.2595281	.8820552	.9739448
1	139	.8561151	.0298768	.3522423	.7970396	.9151906
combined	264	.8901515	.019282	.3132947	.8521849	.9281182
diff		.0718849	.0378347		-.0026268	.1463966

```
    diff = mean(0) - mean(1)                                      t =   1.9000
Ho: diff = 0                     Satterthwaite's degrees of freedom =  252.498

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.9707         Pr(|T| > |t|) = 0.0586          Pr(T > t) = 0.0293
```

Table A.61: Results of t-test of horizontal mismatch across technological changes

```
. ttest  Tchng_score, by ( HM) unequal

Two-sample t test with unequal variances
```

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
0	125	.888	.0283207	.3166355	.8319453	.9440547
1	139	.8057554	.0336772	.3970489	.7391653	.8723455
combined	264	.844697	.0223338	.3628812	.8007212	.8886728
diff		.0822446	.0440025		-.0044046	.1688938

```
    diff = mean(0) - mean(1)                                      t =   1.8691
Ho: diff = 0                     Satterthwaite's degrees of freedom =  258.387

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.9686         Pr(|T| > |t|) = 0.0627          Pr(T > t) = 0.0314
```

Table A.62: Results of regression analysis of determinants of overeducation (Model 1)

```
. logit  M0  Gender_M i.Ageb_Score Marital_1 i. Instrank  Onshp_score EmpT_score Ne_score i.WORKEXP  Cdev_score buemp_score
>   BJob_score JobS_score MgmtD_score  Train_score  IT, vce (robust)

Iteration 0:   log pseudolikelihood = -166.61922
Iteration 1:   log pseudolikelihood = -135.34892
Iteration 2:   log pseudolikelihood = -134.53642
Iteration 3:   log pseudolikelihood =  -134.5334
Iteration 4:   log pseudolikelihood =  -134.5334

Logistic regression                             Number of obs   =        264
                                                Wald chi2(18)   =      53.72
                                                Prob > chi2     =     0.0000
Log pseudolikelihood =  -134.5334               Pseudo R2       =     0.1926
```

M0	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
Gender_M	.0867841	.4077951	0.21	0.831	-.7124795	.8860477
Ageb_Score						
1	-.1134208	.4250424	-0.27	0.790	-.9464886	.719647
2	.4206955	.4865055	0.86	0.387	-.5328377	1.374229
Marital_1	.1745245	.3793037	0.46	0.645	-.5688972	.9179462
Instrank						
1	1.089308	.5050232	2.16	0.031	.0994809	2.079135
2	-.214046	.6631097	-0.32	0.747	-1.513717	1.085625
Onshp_score	-.1686232	.4029345	-0.42	0.676	-.9583603	.6211138
EmpT_score	-.5712704	.7717825	-0.74	0.459	-2.083936	.9413956
Ne_score	.9211121	.3566694	2.58	0.010	.2220529	1.620171
WORKEXP						
1	.1243644	.3789716	0.33	0.743	-.6184062	.867135
2	-.2873061	.5407902	-0.53	0.595	-1.347235	.7726231
Cdev_score	-1.406967	.6686583	-2.10	0.035	-2.717514	-.096421
buemp_score	.5782786	.3714384	1.56	0.120	-.1497273	1.306285
BJob_score	1.352296	.6200022	2.18	0.029	.137114	2.567478
JobS_score	-.9956625	.5931134	-1.68	0.093	-2.158144	.1668185
MgmtD_score	-.7925802	.3511279	-2.26	0.024	-1.480778	-.1043821
Train_score	-1.504597	.3196943	-4.71	0.000	-2.131186	-.8780071
IT	-.5924978	.3548321	-1.67	0.095	-1.287956	.1029603
_cons	1.404972	1.160369	1.21	0.226	-.8693095	3.679254

.

Table A.63: Results of regression analysis of determinants of overeducation (Model 2)

```
. logit  M0  Gender_M i.Ageb_Score Marital_1 i. Instrank  Onshp_score EmpT_score Ne_score i.WORKEXP  Cdev_score buemp_score
>   BJob_score JobS_score MgmtD_score  Train_score  IT  OSk, vce (robust)

Iteration 0:   log pseudolikelihood = -166.61922
Iteration 1:   log pseudolikelihood = -129.53611
Iteration 2:   log pseudolikelihood = -128.15604
Iteration 3:   log pseudolikelihood = -128.15254
Iteration 4:   log pseudolikelihood = -128.15254

Logistic regression                             Number of obs   =        264
                                                Wald chi2(19)   =      56.45
                                                Prob > chi2     =     0.0000
Log pseudolikelihood = -128.15254               Pseudo R2       =     0.2309
```

M0	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
Gender_M	.0036195	.422522	0.01	0.993	-.8245085	.8317474
Ageb_Score						
1	-.1140201	.4215859	-0.27	0.787	-.9403133	.7122731
2	.3967175	.4935376	0.80	0.421	-.5705985	1.364033
Marital_1	.0675619	.3893726	0.17	0.862	-.6955943	.8307181
Instrank						
1	1.131242	.5510528	2.05	0.040	.051198	2.211285
2	-.211517	.7032178	-0.30	0.764	-1.589798	1.166765
Onshp_score	-.167172	.4068361	-0.41	0.681	-.9645562	.6302121
EmpT_score	-.6540209	.8084402	-0.81	0.419	-2.238535	.9304928
Ne_score	.9248648	.3760637	2.46	0.014	.1877936	1.661936
WORKEXP						
1	.2533286	.3797818	0.67	0.505	-.4910302	.9976873
2	.0050951	.560139	0.01	0.993	-1.092757	1.102947
Cdev_score	-.9984403	.6831788	-1.46	0.144	-2.337446	.3405655
buemp_score	.6508359	.3947205	1.65	0.099	-.1228021	1.424474
BJob_score	1.24172	.6352617	1.95	0.051	-.0033701	2.48681
JobS_score	-.8563918	.6718555	-1.27	0.202	-2.173204	.4604208
MgmtD_score	-.8384919	.3680292	-2.28	0.023	-1.559816	-.117168
Train_score	-1.290536	.3361452	-3.84	0.000	-1.949369	-.6317036
IT	-.4653615	.3779748	-1.23	0.218	-1.206178	.2754554
OSk	1.141688	.3242403	3.52	0.000	.5061888	1.777188
_cons	.3195595	1.227942	0.26	0.795	-2.087163	2.726282

.

Table A.64: Results of regression analysis of determinants of overeducation (Model 3)

```
. logit M0 Gender_M  i.Ageb_Score Marital_1 i.Instrank Onshp_score EmpT_score Ne_score i. WORKEXP Cdev_score buemp_score  B
> Job_score JobS_score MgmtD_score Train_score  IT OSk  US, vce (robust)

Iteration 0:   log pseudolikelihood = -166.61922
Iteration 1:   log pseudolikelihood = -129.53628
Iteration 2:   log pseudolikelihood = -128.15537
Iteration 3:   log pseudolikelihood = -128.15176
Iteration 4:   log pseudolikelihood = -128.15176

Logistic regression                             Number of obs   =        264
                                                Wald chi2(20)   =      57.31
                                                Prob > chi2     =     0.0000
Log pseudolikelihood = -128.15176               Pseudo R2       =     0.2309

------------------------------------------------------------------------------
             |               Robust
          M0 |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    Gender_M |   .0034823   .4220242     0.01   0.993      -.82367    .8306346
             |
  Ageb_Score |
          1  |  -.1135542   .4203331    -0.27   0.787     -.937392    .7102835
          2  |   .3973954   .4943586     0.80   0.421    -.5715297     1.36632
             |
   Marital_1 |   .0648469   .3942714     0.16   0.869    -.7079108    .8376046
             |
    Instrank |
          1  |   1.132463   .5482369     2.07   0.039      .057938    2.206987
          2  |   -.209765   .7080691    -0.30   0.767    -1.597555    1.178025
             |
 Onshp_score |  -.1674215   .4074047    -0.41   0.681      -.96592     .631077
  EmpT_score |  -.6570214   .8110324    -0.81   0.418    -2.246616    .9325729
    Ne_score |   .9256199   .3712889     2.49   0.013      .197907    1.653333
             |
     WORKEXP |
          1  |   .2555614   .3819278     0.67   0.503    -.4930033    1.004126
          2  |   .0067475    .562935     0.01   0.990    -1.096585     1.11008
             |
  Cdev_score |  -.9965285   .6886893    -1.45   0.148    -2.346335    .3532778
 buemp_score |   .6503014   .3951381     1.65   0.100    -.1241551    1.424758
  BJob_score |   1.240729   .6362045     1.95   0.051    -.0062085    2.487667
  JobS_score |  -.8578723   .6696439    -1.28   0.200     -2.17035    .4546057
 MgmtD_score |  -.8411368   .3749073    -2.24   0.025    -1.575942   -.1063321
 Train_score |  -1.288347   .3416549    -3.77   0.000    -1.957978   -.6187154
          IT |  -.4649884   .3781159    -1.23   0.219    -1.206082    .2761051
         OSk |    1.14501   .3344448     3.42   0.001     .4895106     1.80051
          US |   .0165269   .4426795     0.04   0.970     -.851109    .8841627
       _cons |   .3174559   1.228891     0.26   0.796    -2.091127    2.726038
------------------------------------------------------------------------------

.
```

Table A.65: Results of regression analysis of determinants of horizontal mismatch (Model 1)

```
. logit  HM  Marital_1 i.Ageb_Score i. Fund_score   ownshp EmpT_score Ne_score i.WORKEXP  Train_score EEDU  Srun_score Wgns
> _score  Tchng_score  IT, vce (robust)

Iteration 0:   log pseudolikelihood = -182.61947
Iteration 1:   log pseudolikelihood = -138.83619
Iteration 2:   log pseudolikelihood = -138.29265
Iteration 3:   log pseudolikelihood = -138.29191
Iteration 4:   log pseudolikelihood = -138.29191

Logistic regression                               Number of obs   =        264
                                                  Wald chi2(16)   =      66.91
                                                  Prob > chi2     =     0.0000
Log pseudolikelihood = -138.29191                 Pseudo R2       =     0.2427
```

HM	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
Marital_1	-.6132018	.440755	-1.39	0.164	-1.477066	.2506621
Ageb_Score						
1	.6639847	.4188445	1.59	0.113	-.1569354	1.484905
2	.3489212	.515266	0.68	0.498	-.6609817	1.358824
Fund_score						
1	.5322357	.5181342	1.03	0.304	-.4832886	1.54776
2	.956559	.417753	2.29	0.022	.1377781	1.77534
ownshp	.8237842	.4900852	1.68	0.093	-.1367652	1.784334
EmpT_score	.2097044	.7646837	0.27	0.784	-1.289048	1.708457
Ne_score	.8641753	.348576	2.48	0.013	.1809789	1.547372
WORKEXP						
1	.1388797	.4020618	0.35	0.730	-.6491469	.9269062
2	.4328344	.5269798	0.82	0.411	-.6000271	1.465696
Train_score	-2.404235	.3679117	-6.53	0.000	-3.125329	-1.683141
EEDU	-.721746	.3196013	-2.26	0.024	-1.348153	-.0953389
Srun_score	-.3561642	.3483165	-1.02	0.307	-1.038852	.3265236
Wgns_score	.3127444	.3511967	0.89	0.373	-.3755886	1.001077
Tchng_score	-.3929633	.4312269	-0.91	0.362	-1.238153	.4522259
IT	-.8340912	.407418	-2.05	0.041	-1.632616	-.0355665
_cons	.7877151	1.020079	0.77	0.440	-1.211604	2.787034

Table A.66: Results of regression analysis of determinants of horizontal mismatch (Model 2)

```
. logit HM  Marital_1  i.Ageb_Score i. Fund_score Onshp_score EmpT_score Ne_score i. WORKEXP Train_score EEDU  Srun_score W
> gns_score Tchng_score IT  Srstc_score , vce (robust)

Iteration 0:   log pseudolikelihood = -182.61947
Iteration 1:   log pseudolikelihood = -137.20619
Iteration 2:   log pseudolikelihood = -136.73508
Iteration 3:   log pseudolikelihood = -136.73458
Iteration 4:   log pseudolikelihood = -136.73458

Logistic regression                             Number of obs   =        264
                                                Wald chi2(17)   =      65.84
                                                Prob > chi2     =     0.0000
Log pseudolikelihood = -136.73458               Pseudo R2       =     0.2513
```

HM	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
Marital_1	-.6227112	.4257749	-1.46	0.144	-1.457215	.2117922
Ageb_Score						
1	.5527747	.4170762	1.33	0.185	-.2646796	1.370229
2	.2221747	.521864	0.43	0.670	-.80066	1.245009
Fund_score						
1	.5615119	.526248	1.07	0.286	-.4699154	1.592939
2	1.1708	.4280797	2.74	0.006	.3317796	2.009821
Onshp_score	.5502653	.4972726	1.11	0.268	-.424371	1.524902
EmpT_score	.1101723	.8282362	0.13	0.894	-1.513141	1.733485
Ne_score	.7357848	.3523997	2.09	0.037	.045094	1.426476
WORKEXP						
1	.1483074	.4016997	0.37	0.712	-.6390095	.9356244
2	.5073548	.5274674	0.96	0.336	-.5264624	1.541172
Train_score	-2.381755	.3764347	-6.33	0.000	-3.119553	-1.643956
EEDU	-.7342395	.3313878	-2.22	0.027	-1.383748	-.0847313
Srun_score	-.3590017	.3497807	-1.03	0.305	-1.044559	.3265558
Wgns_score	.2913907	.3457611	0.84	0.399	-.3862886	.96907
Tchng_score	-.3589412	.4219585	-0.85	0.395	-1.185965	.4680823
IT	-.606675	.4103984	-1.48	0.139	-1.411041	.1976911
Srstc_score	.7274373	.3385023	2.15	0.032	.063985	1.39089
_cons	.6902706	1.046829	0.66	0.510	-1.361477	2.742018

.

Table A.67: Results of regression analysis of determinants of horizontal mismatch (Model 3)

```
. logit HM  Marital_1  i.Ageb_Score i. Fund_score Onshp_score EmpT_score Ne_score i. WORKEXP Train_score EEDU  Srun_score W
> gns_score Tchng_score IT  Srstc_score OSk  , vce (robust)

Iteration 0:   log pseudolikelihood = -182.61947
Iteration 1:   log pseudolikelihood = -123.46169
Iteration 2:   log pseudolikelihood = -122.53369
Iteration 3:   log pseudolikelihood = -122.53161
Iteration 4:   log pseudolikelihood = -122.53161

Logistic regression                             Number of obs   =        264
                                                Wald chi2(18)   =      72.23
                                                Prob > chi2     =     0.0000
Log pseudolikelihood = -122.53161               Pseudo R2       =     0.3290
```

HM	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
Marital_1	-.6701962	.4153635	-1.61	0.107	-1.484294	.1439013
Ageb_Score						
1	.7218835	.4329923	1.67	0.095	-.1267658	1.570533
2	.0481536	.5481833	0.09	0.930	-1.026266	1.122573
Fund_score						
1	.8373865	.5587999	1.50	0.134	-.2578413	1.932614
2	1.535669	.4468739	3.44	0.001	.6598123	2.411526
Onshp_score	.7448456	.556569	1.34	0.181	-.3460097	1.835701
EmpT_score	.3660664	.7538019	0.49	0.627	-1.111358	1.843491
Ne_score	.7787104	.385704	2.02	0.043	.0227444	1.534676
WORKEXP						
1	.2114461	.4002828	0.53	0.597	-.5730937	.9959859
2	1.114465	.5522673	2.02	0.044	.0320406	2.196888
Train_score	-2.228984	.4071583	-5.47	0.000	-3.027	-1.430969
EEDU	-.8203737	.370048	-2.22	0.027	-1.545654	-.0950929
Srun_score	-.1707586	.3800773	-0.45	0.653	-.9156965	.5741793
Wgns_score	.3035904	.3862576	0.79	0.432	-.4534606	1.060641
Tchng_score	-.1485679	.4790429	-0.31	0.756	-1.087475	.790339
IT	-.5558367	.4551339	-1.22	0.222	-1.447883	.3362093
Srstc_score	.7159131	.3377647	2.12	0.034	.0539065	1.37792
OSk	1.816706	.3530347	5.15	0.000	1.12477	2.508641
_cons	-1.198208	1.017532	-1.18	0.239	-3.192535	.796119

Table A.68 : Results of ANOVA of marriage across CTC.

```
. anova    Marital_1 Ctc_score

                           Number of obs =      264     R-squared     =  0.0446
                           Root MSE      = .443346     Adj R-squared =  0.0372

              Source |  Partial SS    df       MS           F     Prob > F
          -----------+----------------------------------------------------
               Model |  2.39217058     2  1.19608529       6.09     0.0026
                     |
           Ctc_score |  2.39217058     2  1.19608529       6.09     0.0026
                     |
            Residual |  51.3010112   261  .196555599
          -----------+----------------------------------------------------
               Total |  53.6931818   263  .204156585
```

```
. tabulate Ctc_score, summarize (Marital_1)

            |        Summary of Marital_1
  Ctc_score |        Mean   Std. Dev.       Freq.
------------+------------------------------------
          0 |         .17   .37752517         100
          1 |   .31460674   .46699001          89
          2 |          .4   .49319696          75
------------+------------------------------------
      Total |   .28409091    .4518369         264
```

Table A.69: Correlation results of skill utilization and overeducation

```
           |          M0
       Osc |         0          1 |     Total
-----------+----------------------+----------
         0 |        94         13 |       107
           |     87.85      12.15 |    100.00
           |     52.81      15.12 |     40.53
-----------+----------------------+----------
         1 |        84         73 |       157
           |     53.50      46.50 |    100.00
           |     47.19      84.88 |     59.47
-----------+----------------------+----------
     Total |       178         86 |       264
           |     67.42      32.58 |    100.00
           |    100.00     100.00 |    100.00

          Pearson chi2(1) =  34.1786   Pr = 0.000
               Cramér's V =   0.3598
```

Table A.70: Correlation results of skill utilization and undereducation

```
           |          M2
       Osc |         0          1 |     Total
-----------+----------------------+----------
         0 |        79         28 |       107
           |     73.83      26.17 |    100.00
           |     37.09      54.90 |     40.53
-----------+----------------------+----------
         1 |       134         23 |       157
           |     85.35      14.65 |    100.00
           |     62.91      45.10 |     59.47
-----------+----------------------+----------
     Total |       213         51 |       264
           |     80.68      19.32 |    100.00
           |    100.00     100.00 |    100.00

          Pearson chi2(1) =   5.4167   Pr = 0.020
               Cramér's V =  -0.1432
```

Table A.71: Correlation results of skill utilization and horizontal mismatch

Osc	HM 0	HM 1	Total
0	75	32	107
	70.09	29.91	100.00
	60.00	23.02	40.53
1	50	107	157
	31.85	68.15	100.00
	40.00	76.98	59.47
Total	125	139	264
	47.35	52.65	100.00
	100.00	100.00	100.00

```
Pearson chi2(1) =  37.3372   Pr = 0.000
     Cramér's V =   0.3761
```

Table A.72: Results of multinomial regression of wages (Model 1)

```
. mlogit  Ctc_score  Gender_M  i.Instrank i. Ageb_Score  Onshp_score EmpT_score Ne_score i. WORKEXP  M0 M2 HM, vce (robust)

Iteration 0:   log pseudolikelihood =  -288.2333
Iteration 1:   log pseudolikelihood = -210.89243
Iteration 2:   log pseudolikelihood = -204.44868
Iteration 3:   log pseudolikelihood = -204.07232
Iteration 4:   log pseudolikelihood = -204.02999
Iteration 5:   log pseudolikelihood = -204.02545
Iteration 6:   log pseudolikelihood = -204.02473
Iteration 7:   log pseudolikelihood = -204.02461
Iteration 8:   log pseudolikelihood = -204.02458
Iteration 9:   log pseudolikelihood = -204.02458

Multinomial logistic regression                 Number of obs   =        264
                                                Wald chi2(26)   =     699.33
                                                Prob > chi2     =     0.0000
Log pseudolikelihood = -204.02458               Pseudo R2       =     0.2922
```

Ctc_score	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
0	(base outcome)					
1						
Gender_M	.5631292	.4081175	1.38	0.168	-.2367663	1.363025
Instrank						
1	-.1234057	.6181942	-0.20	0.842	-1.335044	1.088233
2	1.085174	1.001463	1.08	0.279	-.8776568	3.048004
Ageb_Score						
1	-.189125	.4300121	-0.44	0.660	-1.031933	.6536832
2	.238357	.5436747	0.44	0.661	-.8272259	1.30394
Onshp_score	.7401094	.4060155	1.82	0.068	-.0556663	1.535885
EmpT_score	.9098565	1.20623	0.75	0.451	-1.454312	3.274025
Ne_score	1.195652	.3985892	3.00	0.003	.414432	1.976873
WORKEXP						
1	1.321422	.4036684	3.27	0.001	.5302467	2.112598
2	2.462099	.9027941	2.73	0.006	.6926554	4.231543
M0	-.2462725	.3790534	-0.65	0.516	-.9892035	.4966585
M2	.0446303	.5093436	0.09	0.930	-.9536647	1.042925
HM	-.6317789	.3473178	-1.82	0.069	-1.312509	.0489515
_cons	-2.784606	1.239305	-2.25	0.025	-5.213599	-.3556123
2						
Gender_M	2.111533	.5905312	3.58	0.000	.9541133	3.268953
Instrank						
1	.0111336	.6537242	0.02	0.986	-1.270142	1.292409
2	3.146964	1.011995	3.11	0.002	1.163491	5.130437
Ageb_Score						
1	.148187	.5052513	0.29	0.769	-.8420874	1.138461
2	1.341014	.700357	1.91	0.056	-.0316604	2.713688
Onshp_score	2.969725	.6460835	4.60	0.000	1.703425	4.236026
EmpT_score	14.67168	.7528347	19.49	0.000	13.19615	16.1472
Ne_score	.0202344	.4611744	0.04	0.965	-.8836508	.9241197
WORKEXP						
1	.9915844	.5375126	1.84	0.065	-.0619209	2.04509
2	3.895218	.9928647	3.92	0.000	1.949239	5.841197
M0	-1.229122	.5424331	-2.27	0.023	-2.292272	-.1659728
M2	1.205305	.5457948	2.21	0.027	.1355666	2.275043
HM	-.1202802	.4644059	-0.26	0.796	-1.030499	.7899387
_cons	-20.05532	1.248601	-16.06	0.000	-22.50253	-17.60811

.

Table A.73: Results of multinomial regression of wages (Model 2)

```
. mlogit  Ctc_score  Gender_M  i.Instrank i. Ageb_Score  Onshp_score EmpT_score Ne_score i. WORKEXP   OSk US , vce (robust)

Iteration 0:   log pseudolikelihood =  -288.2333
Iteration 1:   log pseudolikelihood = -217.46729
Iteration 2:   log pseudolikelihood = -211.56949
Iteration 3:   log pseudolikelihood = -211.17942
Iteration 4:   log pseudolikelihood = -211.14076
Iteration 5:   log pseudolikelihood = -211.13558
Iteration 6:   log pseudolikelihood =  -211.1349
Iteration 7:   log pseudolikelihood = -211.13478
Iteration 8:   log pseudolikelihood = -211.13475
Iteration 9:   log pseudolikelihood = -211.13474

Multinomial logistic regression                 Number of obs   =        264
                                                Wald chi2(24)   =    1143.10
                                                Prob > chi2     =     0.0000
Log pseudolikelihood = -211.13474               Pseudo R2       =     0.2675

------------------------------------------------------------------------------
             |               Robust
   Ctc_score |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
0            |  (base outcome)
-------------+----------------------------------------------------------------
1            |
    Gender_M |   .5126517   .3901016     1.31   0.189    -.2519334    1.277237
             |
    Instrank |
          1  |  -.1380753   .5879438    -0.23   0.814    -1.290424    1.014273
          2  |   1.074455   1.066547     1.01   0.314    -1.015938    3.164849
             |
  Ageb_Score |
          1  |  -.2616994   .4303275    -0.61   0.543    -1.105126    .5817269
          2  |   .1808889   .5438494     0.33   0.739    -.8850363    1.246814
             |
 Onshp_score |    .653704   .3989304     1.64   0.101    -.1281851    1.435593
  EmpT_score |   .9510633   1.123427     0.85   0.397    -1.250813     3.15294
    Ne_score |   1.055982   .3933179     2.68   0.007     .2850928    1.826871
             |
     WORKEXP |
          1  |   1.261855   .4066115     3.10   0.002     .4649108    2.058799
          2  |   2.155224   .8844298     2.44   0.015     .4217735    3.888674
             |
         OSk |  -.5420417   .3510264    -1.54   0.123    -1.230041    .1459574
          US |  -.2115303   .4057137    -0.52   0.602    -1.006714    .5836539
       _cons |  -2.685456   1.126919    -2.38   0.017    -4.894176   -.4767362
-------------+----------------------------------------------------------------
2            |
    Gender_M |   1.946265   .5946515     3.27   0.001     .7807699    3.111761
             |
    Instrank |
          1  |  -.2864007   .6821941    -0.42   0.675    -1.623477    1.050675
          2  |   2.729873   1.012851     2.70   0.007     .7447211    4.715025
             |
  Ageb_Score |
          1  |   .1901895   .4833557     0.39   0.694    -.7571702    1.137549
          2  |   1.342332   .6580768     2.04   0.041     .0525249    2.632138
             |
 Onshp_score |   2.996232   .6521201     4.59   0.000       1.7181    4.274364
  EmpT_score |   15.11594   .6416389    23.56   0.000     13.85835    16.37353
    Ne_score |  -.2856997   .4292382    -0.67   0.506    -1.126991    .5555918
             |
     WORKEXP |
          1  |   .6827299   .5209336     1.31   0.190    -.3382811    1.703741
          2  |   3.228547   .9266855     3.48   0.000     1.412277    5.044817
             |
         OSk |  -.7022091    .397609    -1.77   0.077    -1.481508    .0770901
          US |  -1.018528    .518551    -1.96   0.050    -2.034869   -.0021864
       _cons |  -19.66905   1.152069   -17.07   0.000    -21.92706   -17.41103
------------------------------------------------------------------------------

.
```

Table A.74: Results of multinomial regression of wages (Model 3)

```
. mlogit  Ctc_score  Gender_M  i.Instrank i. Ageb_Score  Onshp_score EmpT_score Ne_score i. WORKEXP   M0 M2 HM OSk US , vce
>  (robust)

Iteration 0:   log pseudolikelihood =  -288.2333
Iteration 1:   log pseudolikelihood = -206.26454
Iteration 2:   log pseudolikelihood =  -199.2211
Iteration 3:   log pseudolikelihood = -198.74568
Iteration 4:   log pseudolikelihood =   -198.699
Iteration 5:   log pseudolikelihood = -198.69435
Iteration 6:   log pseudolikelihood = -198.69358
Iteration 7:   log pseudolikelihood = -198.69345
Iteration 8:   log pseudolikelihood = -198.69342
Iteration 9:   log pseudolikelihood = -198.69341

Multinomial logistic regression                 Number of obs   =        264
                                                Wald chi2(30)   =     563.90
                                                Prob > chi2     =     0.0000
Log pseudolikelihood = -198.69341               Pseudo R2       =     0.3107
```

Ctc_score	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
0	(base outcome)					
1						
Gender_M	.5701139	.4024243	1.42	0.157	-.2186232	1.358851
Instrank						
1	-.133016	.6149956	-0.22	0.829	-1.338385	1.072353
2	1.051596	1.001167	1.05	0.294	-.9106547	3.013846
Ageb_Score						
1	-.210379	.4361576	-0.48	0.630	-1.065232	.6444741
2	.2315757	.5592692	0.41	0.679	-.8645718	1.327723
Onshp_score	.7181159	.4154814	1.73	0.084	-.0962126	1.532444
EmpT_score	1.011722	1.258829	0.80	0.422	-1.455538	3.478983
Ne_score	1.177767	.4029697	2.92	0.003	.3879612	1.967574
WORKEXP						
1	1.314864	.4083354	3.22	0.001	.5145415	2.115187
2	2.411196	.9316536	2.59	0.010	.5851887	4.237204
M0	-.1487748	.3841492	-0.39	0.699	-.9016935	.6041439
M2	.1795645	.5390345	0.33	0.739	-.8769236	1.236053
HM	-.6125669	.362347	-1.69	0.091	-1.322754	.0976202
OSk	-.2911553	.3767524	-0.77	0.440	-1.029576	.4472659
US	-.3186258	.4470757	-0.71	0.476	-1.194878	.5576264
_cons	-2.712682	1.270187	-2.14	0.033	-5.202203	-.2231619
2						
Gender_M	2.118055	.5969332	3.55	0.000	.9480873	3.288023
Instrank						
1	-.1854422	.65978	-0.28	0.779	-1.478587	1.107703
2	3.192256	1.07699	2.96	0.003	1.081395	5.303117
Ageb_Score						
1	.1176634	.5286096	0.22	0.824	-.9183925	1.153719
2	1.47135	.7087399	2.08	0.038	.0822455	2.860455
Onshp_score	3.046837	.6941147	4.39	0.000	1.686397	4.407277
EmpT_score	15.08003	.8473029	17.80	0.000	13.41934	16.74071
Ne_score	.0075425	.4714517	0.02	0.987	-.9164858	.9315708
WORKEXP						
1	.9805346	.551362	1.78	0.075	-.1001151	2.061184
2	3.943004	1.043678	3.78	0.000	1.897434	5.988575
M0	-1.05735	.5485006	-1.93	0.054	-2.132391	.0176918
M2	1.953016	.5618341	3.48	0.001	.8518412	3.054191
HM	-.1370776	.5141444	-0.27	0.790	-1.144782	.8706269
OSk	-.4722948	.4034034	-1.17	0.242	-1.262951	.3183615
US	-1.801115	.521176	-3.46	0.001	-2.822601	-.779629
_cons	-20.19059	1.354203	-14.91	0.000	-22.84478	-17.5364

.

Table A.75: Results of multinomial regression of wages (Model 4)

```
. mlogit  Ctc_score  Gender_M  i.Instrank i. Ageb_Score  Onshp_score EmpT_score Ne_score i. WORKEXP   realh formalh , vce (
> robust)

Iteration 0:   log pseudolikelihood =  -288.2333
Iteration 1:   log pseudolikelihood = -218.95205
Iteration 2:   log pseudolikelihood = -213.15463
Iteration 3:   log pseudolikelihood = -212.77698
Iteration 4:   log pseudolikelihood = -212.73479
Iteration 5:   log pseudolikelihood = -212.72949
Iteration 6:   log pseudolikelihood = -212.72875
Iteration 7:   log pseudolikelihood = -212.72862
Iteration 8:   log pseudolikelihood = -212.72859
Iteration 9:   log pseudolikelihood = -212.72859

Multinomial logistic regression                 Number of obs   =        264
                                                Wald chi2(24)   =    1180.32
                                                Prob > chi2     =     0.0000
Log pseudolikelihood = -212.72859               Pseudo R2       =     0.2620
```

Ctc_score	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
0	(base outcome)					
1						
Gender_M	.5238258	.4067556	1.29	0.198	-.2734005	1.321052
Instrank						
1	-.1865959	.6210545	-0.30	0.764	-1.40384	1.030648
2	1.074254	1.059248	1.01	0.311	-1.001835	3.150343
Ageb_Score						
1	-.199258	.4334945	-0.46	0.646	-1.048892	.6503756
2	.1505156	.5247525	0.29	0.774	-.8779803	1.179011
Onshp_score	.7271763	.405615	1.79	0.073	-.0678145	1.522167
EmpT_score	.8976191	1.151278	0.78	0.436	-1.358844	3.154082
Ne_score	1.158156	.4000511	2.90	0.004	.3740705	1.942242
WORKEXP						
1	1.30974	.4012142	3.26	0.001	.5233745	2.096105
2	2.366066	.8622871	2.74	0.006	.6760141	4.056117
realh	-.6490356	.3594035	-1.81	0.071	-1.353453	.0553823
formalh	-.6164593	.5788471	-1.06	0.287	-1.750979	.5180601
_cons	-2.759175	1.175753	-2.35	0.019	-5.063609	-.4547406
2						
Gender_M	1.9692	.5793828	3.40	0.001	.8336308	3.10477
Instrank						
1	-.2166658	.6839647	-0.32	0.751	-1.557212	1.12388
2	2.748997	.9996811	2.75	0.006	.7896579	4.708336
Ageb_Score						
1	.2362206	.4982636	0.47	0.635	-.7403581	1.212799
2	1.213809	.6495212	1.87	0.062	-.0592293	2.486847
Onshp_score	3.029398	.6372427	4.75	0.000	1.780426	4.278371
EmpT_score	15.06085	.6235061	24.16	0.000	13.8388	16.2829
Ne_score	-.2252557	.4448764	-0.51	0.613	-1.097197	.6466861
WORKEXP						
1	.7358368	.5204889	1.41	0.157	-.2843028	1.755976
2	3.441693	.8940876	3.85	0.000	1.689313	5.194072
realh	-.3186829	.4612668	-0.69	0.490	-1.222749	.5853834
formalh	-.336644	.6249407	-0.54	0.590	-1.561505	.8882172
_cons	-20.03081	1.110665	-18.03	0.000	-22.20767	-17.85394

.

Table A.76: Results of multinomial regression of wages (Model 5)

```
. mlogit  Ctc_score  Gender_M  i.Instrank i. Ageb_Score  Onshp_score EmpT_score Ne_score i. WORKEXP    formalv realv , vce
> (robust)

Iteration 0:   log pseudolikelihood =  -288.2333
Iteration 1:   log pseudolikelihood = -215.79709
Iteration 2:   log pseudolikelihood = -209.72591
Iteration 3:   log pseudolikelihood = -209.33948
Iteration 4:   log pseudolikelihood = -209.29927
Iteration 5:   log pseudolikelihood = -209.29502
Iteration 6:   log pseudolikelihood = -209.29434
Iteration 7:   log pseudolikelihood = -209.29422
Iteration 8:   log pseudolikelihood = -209.29419
Iteration 9:   log pseudolikelihood = -209.29419

Multinomial logistic regression                 Number of obs   =        264
                                                Wald chi2(24)   =     880.08
                                                Prob > chi2     =     0.0000
Log pseudolikelihood = -209.29419               Pseudo R2       =     0.2739
```

Ctc_score	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
0	(base outcome)					
1						
Gender_M	.5379264	.3914582	1.37	0.169	-.2293175	1.30517
Instrank						
1	-.0327542	.5992709	-0.05	0.956	-1.207304	1.141795
2	1.139688	1.061885	1.07	0.283	-.9415688	3.220945
Ageb_Score						
1	-.2327861	.4242868	-0.55	0.583	-1.064373	.5988007
2	.2348221	.5454751	0.43	0.667	-.8342894	1.303934
Onshp_score	.7131867	.3974342	1.79	0.073	-.06577	1.492143
EmpT_score	.9134286	1.105067	0.83	0.408	-1.252463	3.07932
Ne_score	1.106566	.4031918	2.74	0.006	.3163247	1.896807
WORKEXP						
1	1.290843	.4144737	3.11	0.002	.4784897	2.103197
2	2.343237	.8970327	2.61	0.009	.5850857	4.101389
formalv	-.5349333	.5580306	-0.96	0.338	-1.628653	.5587865
realv	-.3979974	.3716719	-1.07	0.284	-1.126461	.3304661
_cons	-2.917318	1.142804	-2.55	0.011	-5.157173	-.6774625
2						
Gender_M	1.972414	.5652272	3.49	0.000	.8645888	3.080239
Instrank						
1	-.0144823	.6947337	-0.02	0.983	-1.376135	1.347171
2	3.015241	1.080379	2.79	0.005	.897736	5.132746
Ageb_Score						
1	.1848266	.4801821	0.38	0.700	-.756313	1.125966
2	1.384498	.6772054	2.04	0.041	.0571998	2.711796
Onshp_score	2.909772	.6427792	4.53	0.000	1.649947	4.169596
EmpT_score	14.52509	.6693164	21.70	0.000	13.21325	15.83692
Ne_score	-.1326357	.4499252	-0.29	0.768	-1.014473	.7492015
WORKEXP						
1	.9379761	.5371605	1.75	0.081	-.1148391	1.990791
2	3.552374	.9773582	3.63	0.000	1.636787	5.467961
formalv	-1.89593	1.211323	-1.57	0.118	-4.270081	.4782197
realv	-1.470825	.5119916	-2.87	0.004	-2.47431	-.4673396
_cons	-19.31573	1.128764	-17.11	0.000	-21.52807	-17.1034

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Table A.77: Regression results of effect of mismatches on job satisfaction (Model 1)

```
. regress  job_satfn   Gender_M i. Ageb_Score  Onshp_score EmpT_score Ne_score i.WORKEXP  M0 M2 HM, vce (robust)

Linear regression                                      Number of obs =     264
                                                       F( 11,   252) =    5.30
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.1779
                                                       Root MSE      =  .76973

------------------------------------------------------------------------------
             |               Robust
   job_satfn |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    Gender_M |  -.0519444   .1184297    -0.44   0.661    -.2851825    .1812937
             |
  Ageb_Score |
          1  |   .0575283   .1308047     0.44   0.660    -.2000814    .3151379
          2  |  -.0462087   .1494274    -0.31   0.757    -.3404943    .2480769
             |
 Onshp_score |  -.0686332   .1098148    -0.62   0.533    -.2849049    .1476385
  EmpT_score |   .5035348   .2676476     1.88   0.061    -.0235763    1.030646
    Ne_score |   .0333073   .1038552     0.32   0.749    -.1712275     .237842
             |
     WORKEXP |
          1  |  -.2362159   .1207979    -1.96   0.052     -.474118    .0016862
          2  |   .0318723   .1567854     0.20   0.839    -.2769043    .3406489
             |
          M0 |  -.4794836   .1163457    -4.12   0.000    -.7086173   -.2503498
          M2 |  -.0265294   .1383803    -0.19   0.848    -.2990586    .2459999
          HM |  -.3377974   .0990149    -3.41   0.001    -.5327996   -.1427952
       _cons |   1.225762   .2995202     4.09   0.000     .6358807    1.815644
------------------------------------------------------------------------------

.
```

Table A.78: Regression results of effect of mismatches on job satisfaction (Model 2)

```
. regress  job_satfn   Gender_M i. Ageb_Score  Onshp_score EmpT_score Ne_score i.WORKEXP   OSk US, vce (robust)

Linear regression                                      Number of obs =     264
                                                       F( 10,   253) =    4.85
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.1561
                                                       Root MSE      =  .77833

------------------------------------------------------------------------------
             |               Robust
   job_satfn |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    Gender_M |  -.0485015   .1205107    -0.40   0.688    -.2858335    .1888304
             |
  Ageb_Score |
          1  |   .0217699   .1248438     0.17   0.862    -.2240957    .2676355
          2  |  -.0290924   .1483187    -0.20   0.845    -.3211891    .2630042
             |
 Onshp_score |  -.0858627   .1107302    -0.78   0.439     -.303933    .1322076
  EmpT_score |   .5961412   .2929838     2.03   0.043     .0191433    1.173139
    Ne_score |  -.0463141   .1002023    -0.46   0.644    -.2436509    .1510227
             |
     WORKEXP |
          1  |  -.3020054    .120019    -2.52   0.012    -.5383689   -.0656419
          2  |  -.0865356   .1703694    -0.51   0.612    -.4220584    .2489872
             |
         OSk |  -.5595677   .1076791    -5.20   0.000    -.7716294   -.3475061
          US |  -.0437771   .1238089    -0.35   0.724    -.2876044    .2000503
       _cons |   1.143705   .3233558     3.54   0.000     .5068932    1.780517
------------------------------------------------------------------------------

.
```

Table A.79: Regression results of effect of mismatches on job satisfaction (Model 3)

```
. regress  job_satfn   Gender_M i. Ageb_Score  Onshp_score EmpT_score Ne_score i.WORKEXP  M0 M2 HM  OSk US, vce (robust)

Linear regression                                      Number of obs =     264
                                                       F( 13,   250) =    5.23
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.2113
                                                       Root MSE      =  .75695
```

job_satfn	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
Gender_M	-.0353713	.1179135	-0.30	0.764	-.2676018	.1968591
Ageb_Score						
1	.0379863	.125243	0.30	0.762	-.2086795	.2846522
2	-.0186417	.1464544	-0.13	0.899	-.3070834	.2698
Onshp_score	-.0976251	.1099175	-0.89	0.375	-.3141073	.1188572
EmpT_score	.4993943	.2679943	1.86	0.064	-.0284201	1.027209
Ne_score	.0184234	.1004231	0.18	0.855	-.1793597	.2162064
WORKEXP						
1	-.2386288	.1173587	-2.03	0.043	-.4697665	-.007491
2	-.0447642	.1604995	-0.28	0.781	-.3608677	.2713394
M0	-.3880011	.1181772	-3.28	0.001	-.6207508	-.1552513
M2	-.0387372	.1340733	-0.29	0.773	-.3027943	.2253199
HM	-.2145938	.0973852	-2.20	0.028	-.4063939	-.0227938
OSk	-.3591907	.1120257	-3.21	0.002	-.5798251	-.1385563
US	-.0243189	.1234937	-0.20	0.844	-.2675395	.2189017
_cons	1.318705	.3032832	4.35	0.000	.7213897	1.916021

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Table A.80: Regression results of effect of mismatches on job satisfaction (Model 4)

```
. regress  job_satfn   Gender_M i. Ageb_Score  Onshp_score EmpT_score Ne_score i.WORKEXP   realv formalv, vce (robust)

Linear regression                                      Number of obs =     264
                                                       F( 10,   253) =    4.82
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.1647
                                                       Root MSE      =  .77435
```

job_satfn	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
Gender_M	-.034338	.1223279	-0.28	0.779	-.2752486	.2065727
Ageb_Score						
1	.0163738	.1318339	0.12	0.901	-.2432578	.2760055
2	-.0626436	.1520795	-0.41	0.681	-.3621467	.2368594
Onshp_score	-.0969434	.1115159	-0.87	0.385	-.316561	.1226743
EmpT_score	.5487918	.275734	1.99	0.048	.0057655	1.091818
Ne_score	.0441201	.1044618	0.42	0.673	-.1616054	.2498456
WORKEXP						
1	-.2464667	.1230515	-2.00	0.046	-.4888026	-.0041309
2	.0026791	.1572666	0.02	0.986	-.3070394	.3123976
realv	-.6506444	.120188	-5.41	0.000	-.8873408	-.4139481
formalv	.0110023	.1773891	0.06	0.951	-.338345	.3603496
_cons	1.047043	.3056866	3.43	0.001	.4450288	1.649058

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Table A.81: Regression results of effect of mismatches on job satisfaction (Model 5)

```
. regress  job_satfn   Gender_M i. Ageb_Score  Onshp_score EmpT_score Ne_score i.WORKEXP    realh formalh, vce (robust)

Linear regression                                      Number of obs =     264
                                                       F( 10,   253) =    5.16
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.1639
                                                       Root MSE      =  .77473
```

job_satfn	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
Gender_M	-.0359385	.1194855	-0.30	0.764	-.2712515	.1993745
Ageb_Score						
1	.0668952	.1269304	0.53	0.599	-.1830796	.31687
2	-.1016142	.1465018	-0.69	0.489	-.3901327	.1869043
Onshp_score	-.040942	.1099536	-0.37	0.710	-.257483	.175599
EmpT_score	.6098844	.3015102	2.02	0.044	.0160947	1.203674
Ne_score	.0127763	.1017032	0.13	0.900	-.1875165	.2130691
WORKEXP						
1	-.285885	.1200215	-2.38	0.018	-.5222536	-.0495165
2	.0711277	.1549591	0.46	0.647	-.2340464	.3763019
realh	-.5650443	.1078377	-5.24	0.000	-.7774183	-.3526704
formalh	.0436405	.141776	0.31	0.758	-.235571	.3228521
_cons	1.009586	.32222	3.13	0.002	.3750107	1.644161

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