

# EXPLAINING GENDER DIFFERENTIALS IN THE EMPLOYMENT OF ENGINEERING GRADUATES IN INDIA\*

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*In many developing countries, including India, the gender differences in employment and earnings is felt as a serious policy issue. The employers positive discrimination towards male candidates, keeps many talented and highly qualified females out of the workforce. In India, the female labour force participation (FLFP) has remained lower than male participation and in the recent years it has fell down further. According to the International Labour Organization's (ILO's) Global Employment Trends 2013 report, India's FLFP rate fell from just over 37 % in 2004-05 to 29 % in 2009-10. analyzes the factors responsible for gender differences in the employment of engineering graduates based on data collected through a student survey in Delhi, India, in 2009-10. The author finds, among other things, that the share of women engineering graduates are less than that of men to get a job offer and the iinstitutional factors explain a major part of it. However, there is no significant difference in the employment of students by department of study. Some other important factors responsible for the gender differences in employment of engineering graduates include the academic background, contact with the alumni, educational level of the mother and social category.*

*Keywords:* Engineering Education; Employment; Gender; Difference; India.

## 1. Introduction

Out of 131 countries, India ranks 11th from the bottom in female labour force participation. The most recent figure of World Bank shows a FLFP rate of 28.7 in India, as compared to the world average of 50.4. Further, the ratio of female to male labour force participation rate in India is 35.6 than that of 68.5 for the world (World Bank Indicators for Social Development, 2012). Some of the potential causes of the discrimination against women in the Indian labour market lie with the established argument that employers expect on average lower performance from women than from men. This is due to the possibility that female labour is immobile, the interruption of the work by women because of uneven pressure of family responsibilities etc. Other things being equal, employers prefer male to female candidate. They might feel that male employees tend to work for longer hours, while females have family obligations. Further, the problem of gender discrimination in the job market is predominantly visible in the engineering sector, where male candidates are strongly preferred than females. It is often argued that engineering and technical education is a masculine domain and hence, out of reach for women. Those who advocate this line of argument point to the persistence of certain social myths such as “women are emotional while technology is strictly logical and hence both do not go together” (Rao 2007: 187). Furthermore, recruiting a male candidate will help the companies to transfer employees to different place of their establishments. Considering these popular observations, one can expect that, other things being equal, companies coming for on-campus recruitment prefer to hire male graduates compared to women. in case of India, also true to some extent in rest of the world,

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everything else remaining same, men are preferred than women in the jobs related science and engineering.

What are the factors those determine the gender differences in employment among engineering graduates? Economist Paula Stephan (1996) has observed that the extent science and engineering jobs value measurable skills and knowledge over less tangible traits such as personality or appearance (which are more important in some non-science and engineering jobs such as management, sales and service), then a small set of human capital variables might be expected to capture a large portion of the gender variation in employment opportunities. However, by contrast, sociologist Laurie Morgan (1998) offers an alternative view and argues that since science and engineering jobs have been traditionally male-dominated, women find themselves at a disadvantage in terms entry, pay and promotions<sup>1</sup>. Combining these two schools of thought, one can suggest that both human capital and other factors are likely to account for much of the gender differential in getting a job. Thus, in this paper both human capital and other socio-economic factors are included in the analysis to understand the gender differences in employment of engineering graduates.

The importance of carrying out this study lies with the widely argued fact that certain personal factors like choice of the location of the job, rigid job preferences (for example, preference for the public sector jobs over private jobs) etc. may influence the gender differences in employment of the engineering graduates, which perhaps no studies have highlighted in their analysis, and the present is an attempt in this direction. The data collected from the survey on “whether engineering graduates have got job offer or not” is taken as their employment. At the time of survey (in 2009-10), students were in fourth-year of their study and they will join in their offered job after completion of the course. They have not entered into the job market yet. Graduates who have got job offer are considered here as employed and who have not got job offer (till the survey time) are taken as unemployed<sup>2</sup>. A detailed analysis on the gender differences in engineering labour market would have been done using the information of graduates who are employed, but the survey did not cover this. However, some important aspects of gender discrimination in the engineering labour market are analysed here using the available data from the survey.

## **2. Data and Methodology**

Issues raised in the paper are examined focusing on Delhi, based on the primary data collected by National University of Educational Planning and Administration (NUEPA) in the context of a larger research project titled as “Potential Economic and Social Impact of Rapid Expansion of Higher Education in the World’s Largest Developing Economies” in 2009-10. This international comparative study was conducted in collaboration with Stanford University, United States of America (USA) covering Brazil, Russia, India and China. The survey in India provides both quantitative and qualitative information on the status of engineering education in four major states namely Delhi, Maharashtra, Karnataka and Tamil Nadu. However, the present study is based on the data collected from Delhi only.

The total number of students surveyed was 1,178 out of which 15 % were from central government institutions, 26 % from state government institutions and 59 % were from private institutions.<sup>3</sup> The student questionnaire was administered to collect the socio-economic profile of the students (caste, religion, family income, educational level of the parents, occupation of the parents, number of siblings

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<sup>1</sup> See Graham and Smith (2005) for the detail argument.

<sup>2</sup> The employment status of engineering graduates is as on 2009-10, but some more may be employed in a year or so after completion of the final year of engineering.

<sup>3</sup> The sample students of both central and state government institutions were grouped into “government” for the analysis due to the less sample size in central government institutions.

etc.) and labour market aspects of engineering education. Besides this, an institutional questionnaire was also administered on the head of the institution (principal/director or his/her representative) to collect information on general, academic, financial and governance aspects of the institutions. This paper has used a part of the information collected from the survey (using both student and institutional questionnaire) for the analysis.

Of the total students covered in the study, 85 % were male, their share being 90 % in government institutions and 79 % in private institutions. It is important to note here that in spite of random nature of the survey, the representation of female students in the data set is less. This is due the fact that the representation of women in the discipline of engineering education in national level is only 11 % in 2011-12 and it was further less (7,7 %) in the year 2009-10, year in which the primary survey was undertaken (Annual reports, UGC).

The econometric tools used in the analysis include:

- *Logit Model*: This is used to find out the factors determining the gender differences in employment probability of engineering graduates.

Keeping in view the possible determinants of gender differences in employment of engineering graduates in the labour market in India, the major hypothesis of the study is: the probability of getting employment in the labour market differs significantly between male and female engineering students. Further, the factors responsible for gender differences in employment may include individual characteristics, household factors, academic background of the students, factors related to current education of the students, and job characteristics. It is pertinent to note here that the study has examined only the demand-side factors of determining the gender differences in employment of engineering graduates. It has not considered the supply-side factors of labour market mainly due the nature of data used in the study. The summary statistics of explanatory variables used in the analysis is presented in Table A1 in appendix.

### **3. Gender Differences in Employment in Engineering Labour Market**

Generally, in India, on-campus recruitment of engineering graduates takes place when they are in the third/fourth year of their programme through placement cell of the institution. Different companies or organizations visit institutions for on-campus recruitment and select graduates as per their requirements with the help of interviews or group discussions or any other selection criterion developed by the employers<sup>4</sup>. The survey data reveals that only 32 % of the graduates got employment in the year 2009-10. The probable factors responsible for the low employment may include: (a) companies might have come for the recruitment of specific department of study; (b) it may be the case that companies have less requirement of manpower and hence, employed less number of graduates; and (c) it is quite possible that graduates might not have liked the jobs they have been offered, may be due to the mismatch of expectations between graduates and companies on earnings, location of the job, and other such employment factors<sup>5</sup>.

The issue of gender discrimination in the job market is predominately visible in the engineering sector, where male candidates are strongly preferred than female students. Similar picture is also visible in case of Delhi. Around 40 % of male engineering students have got job offer upon their graduation

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<sup>4</sup> Major companies visited different engineering institutions in Delhi for the campus placement in 2009-10 academic year as mentioned in the mandatory disclosure of the institutions include: Microsoft, Mckinsey, International Business Machines, Tata Consultancy Service, Computer Science Corporation, Maruti, Tata Motors, Samsung, Bharat Heavy Electrical Limited, National Thermal Power Corporation, and Defence Research and Development Organisation, Accenture, Birlasoft, Convergys, I-Flex, Hindustan Computer Limited, Infosys, Sapient, Syntel, Tata Tele Services etc.

<sup>5</sup> Besides these, some institutions might have banned on-campus recruitment for their students with the feeling that students become money minded and do not get interest in studies after getting a job offer prior to the completion of their programme of study.

whereas the share is 25 % for females. In the primary survey, the students who have got job offer were asked to provide the information on type of job (occupation), place of the posting in the job (city/state), type of the company, annual salary offered for the job. An effort is made in this section to understand the gender differences in these aspects of engineering labour market in India and the results are given in Table 1.

Companies came for the campus recruitment to engineering institutions in Delhi offers the students both engineering and non-engineering related jobs, as per their requirement. The occupation in the engineering category includes engineers, information technology related jobs etc. whereas non-engineering category includes human resource executives, marketing related jobs etc. Engineering graduates, who are not able to get a suitable job in their parent discipline, go for different kind of management and marketing related jobs. Out of total students got job offer upon their graduation, 78 % have taken jobs related to engineering and rest have gone for non-engineering jobs. Comparatively greater share of male students have taken engineering related jobs than female students (e.g. see Table 1). It appears that the companies coming for the campus recruitment prefer the male students in engineering jobs and female students in non-engineering jobs. This may be one of the macro reasons for less participation of women in the discipline of engineering education in India.

Table 1. Gender Differences in Employment of Engineering Students in Delhi

Job Detail	Male	Female	Total
<b>OCCUPATION</b>			
Engineering	79.10	74.42	78.91
Non-Engineering	20.90	25.58	21.09
<b>PLACEMENT REGION</b>			
Delhi and around	42.08	32.35	39.30
Other states	57.92	67.65	60.70
<b>TYPE OF COMPANY</b>			
Foreign	46.30	37.78	44.80
Joint venture	13.62	15.56	14.10
Domestic	40.08	46.67	41.10

Source: Author's Calculation from the survey data

Place of posting of the job is an important aspect of the engineering labour market. In some cases students deny the job offer if the place of work is in remote places or in less developed cities. This is more prominent among women candidates. However, in some cases students negotiate it with earnings. For example, they may take a job with less earnings in their native city or state than a job with higher earnings in faraway places. Considering this, the information on locations of the job collected from the graduates are grouped into "Delhi and neighbouring states" (students from Delhi, Himachal Pradesh, Uttar Pradesh, Punjab and Haryana) and "other states" (states other than "Delhi and neighbouring states"). In the survey, students belonging to "Delhi and neighbouring states" constitute 80 % of the total students and rest 20 % have come from "other states". The recruiters also come from different parts of the country (in some cases from abroad as well) for the campus placements in different engineering institutions in Delhi. Thus, it is interesting to analyse the region of placement by gender in engineering labour market in India. Interestingly, the results reported in Table 1 shows that predominantly engineering students have got their job offer in "other states". This shows that though the students have taken their education from Delhi, majority of them go back to their native place for job. Though the enrolment of male students from "other states" is less in the total students, their share of job offer in that region is higher. On the other hand, share of female students who have got their job offer in "other states" is more or less same with their enrolment share. In some sense it shows the unwillingness of female students to do their job outside of their native place, as expected.

Domestic, joint venture and foreign companies had come for the campus placement in different engineering institutions in Delhi. Delhi being the capital city of India, it is expected that large share of students might have got their job offer in foreign companies. This holds good in the present study. Around half of the students have got job offer in foreign companies followed by domestic companies (41 %) and least in joint venture companies (14 %). The same pattern also holds good among male students who have received jobs. But in case of female students, highest share of students have obtained jobs in domestic companies (47 %) followed by foreign companies (38 %) and lowest in joint venture companies (15 %). Restricting largely to domestic companies limits the employment scope of female engineering graduates.

#### 4. Determinants of Gender Discrimination in Employment

In the recruitment process companies primarily look at the academic and current educational backgrounds, individual characteristics and household factors, besides some other specific information such as willingness to work in a particular place, expected salary etc. from the engineering graduates. Academic and current educational background here includes past academic information and present educational background of graduates. Information related to senior secondary level of education such as medium of instruction followed in the teaching, percentage of marks scored in the senior secondary examination are considered as academic background of graduates. Current educational background comprises the factors related to present programme of study such as type of institution and department of study the graduates are enrolled with, whether any formal mechanism is set up by the institution for graduates to keep in touch with their alumni, and whether they have availed educational loan or not from commercial banks. An attempt is made in this section to find out how the effect of these factors on employment probabilities of engineering graduates differ by gender, using binary logistic regression. Three separate logit equations (male, female and total) are estimated for this and take the following form:

$$\begin{aligned} \text{Employment} = & \alpha + \beta_1 \text{Gender\_Male} + \beta_2 \text{Mngt\_Pvt} + \beta_3 \text{Dept\_IT} + \beta_4 \text{Sec\_Marks} + \beta_5 \text{Secmed\_English} \\ & + \beta_6 \text{Edu\_Loan} + \beta_7 \text{Almuni} + \beta_8 \text{SC} + \beta_9 \text{ST} + \beta_{10} \text{OBC} + \beta_{11} \text{Fathocp\_Proff} + \beta_{12} \text{Fathocp\_Busn} + \\ & \beta_{13} \text{Fath\_Schooling} + \beta_{14} \text{Moth\_Schooling} + \varepsilon \end{aligned} \quad (\text{Eqn. 1})$$

where,

*Employment* = whether graduates have employed or not, which is a dummy variable and defined as

1, if the graduates have employed and 0, otherwise, i.e., if the graduates have not employed

$\alpha$  = constant

$\beta_i$  = respective coefficient of the explanatory variables

$\varepsilon$  = error term

#### Explanatory Variables

*Gender*<sup>6</sup>: It is generally observed that, other things being equal, employers coming for the on-campus recruitment prefer male to female candidate. They might feel that male employees tend to work for longer hours, while females have family obligations. Further, the problem of gender discrimination in the job market is predominantly visible in the engineering sector, where male candidates are strongly preferred than females. Furthermore, recruiting a male candidate will help the companies to transfer employees to different place of their establishments. Considering these popular observations, one can expect that, other things being equal, companies coming for on-campus recruitment prefer to hire male graduates compared to females.

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<sup>6</sup> GENDER is used as an explanatory variable only in the equation 3, where male and female taken together.

*Gender\_Male* = 1, if the students are male  
= 0, otherwise i.e. if the students are female

*Type of Institution:* Companies generally prefer employing graduates of government to private institutions. This may be due to the quality and brand name (if any) differences between these two type of institutions. Very often it is stated that graduates of government institutions are better trained than the private institutions due to the availability of experienced faculty and other physical infrastructure. As a result, one can expect that the graduates of government institutions may have higher chances of getting employment through on-campus recruitment than the graduates of private institutions. Further, it is interesting to analyse how the type of institution matter in gender differences in employment probabilities. Does it go in line of the argument that the employers prefer female candidates of private institutions than that of government institutions?

*Mngt\_Pvt* = 1, if the students have enrolled in private institutions  
= 0, otherwise, i.e., i.e., if the students have enrolled in government institutions

*Department of Study:* Another important factor that may determine the employment graduates is the choice of department of study. Due to a large scale expansion of IT sector in India in recent years, one can expect that the graduates from IT-related courses have higher probability to get employment than the students of traditional courses. However, the recent slowdown of the IT sector in global level and its consequences in India may have an adverse impact on the graduates of these courses. Thus, in this juncture, it is important to analyse the influence of the choice of departments on employment probabilities. In addition to this, analysing the gender differences in employment of graduates by department of study is an important concern to examine. Men are much more likely than women to study traditional courses in engineering; a factor which greatly increases their chances of getting a job offer in the labour market. It is expected that the employers may prefer female graduates from IT-related courses and male graduates from traditional courses, mainly due to the nature of job they are expected to perform.

*Dept\_IT* = 1, if the students have enrolled in IT-related departments  
= 0, otherwise, i.e., if the students have enrolled in traditional departments

It is commonly felt that the academic background of the graduates has a significant effect on getting a job in the labour market due to the fact that they can perform well in the selection process and have higher chances to get employment than the graduates with poor academic backgrounds. Considering this, two factors on academic background (percentage of marks scored and medium of instruction in the senior secondary level of education) are included in the analysis. The common understanding here is that with more or less same academic background employers treat male and female separately in the recruitment process. For example, a male is preferred to female with weak academic performance if the job is in a remote area or needs frequent travelling.

*Percentage of Marks Scored in Senior Secondary Level*<sup>7</sup>: Graduates scoring higher percentage of marks in senior secondary examination may have better chance to be employed than the students scoring comparatively less. This is because most of the companies coming for campus recruitment also take note of the previous academic background of the graduates in their selection process. Further, it is important to find out its effect on employment by gender.

*Medium of Instruction in Senior Secondary Level:* It is widely felt that graduates with English as a medium of instruction will be able to perform better in the selection process and have a fair chance to

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<sup>7</sup> Percentage of marks scored by the students in the first three years of their engineering course would have been a better indicator to measure the quality of graduates than the percentage of marks scored in senior secondary examination, as considered in the present analysis. However, this information was not collected in the survey.

get employment vis-à-vis the graduates with Hindi or regional language as their medium of study in senior secondary level. The effect of this on gender wise variation in employment is also discussed.

*Secmed\_English* = 1, if the students have taught in English medium  
= 0, otherwise, i.e., if the students have taught other than English medium

*Alumni of the Institutions:* Engineering institutions usually develop formal mechanisms to keep present students in touch with their fellow graduates via group mails, organising annual alumni meeting etc. This helps current graduates to discuss the employment perspectives after completion of their programme of study. Fellow graduates share their job experiences and give guidelines to the current graduates which help them to get a better job. Thus, one can expect that the students enrolled in the institutions having a formal mechanism to keep in touch with their fellow graduates/alumni have higher likelihood of getting employment in the labour market than the students enrolled in the institutions where no formal mechanism has set up for alumni contact. It is expected that the impact of alumni contacts on employment probabilities work more effectively among males as compared to females. This for the obvious reason that in the institutions having a formal and common mechanism to interact with their alumni, male students take advantages of it by talking to their seniors whereas female graduates hesitate to some extent for this.

*Alumni* = 1, if there is any formal mechanism by the institutions to be in touch with their alumni  
= 0, otherwise, i.e., if there is no formal mechanism by the institutions to be in touch with their alumni

*Educational Loan:* Graduates availed educational loan from commercial banks is expected to have higher probabilities to get employment in the labour market. It may be due to the fact that they have financial responsibility and would be ready to take any job after completion of their programme of study. Male graduates with educational loan will be more ready to take the job than that of females. This is due to the fact that the educational loan taken by female graduates are usually born by the parents whereas in most of the cases of male graduates, they take the responsibility to pay.

*Edu\_Loan* = 1, if the students have availed educational loan from commercial banks  
= 0, otherwise, i.e. if the students have not availed educational loan from commercial banks

*Caste:* It is included as an explanatory variable to see how the social category matters for getting a job in the engineering labour market. It is generally observed that majority of the companies coming for on-campus recruitment belong to private sector who do not provide reservation to the students belonging to Scheduled Castes (SCs), Scheduled Tribes (STs) and Other Backward Classes (OBCs). This may lead to higher chances of getting employment by general category students than the students belonging to SCs, STs and OBCs. Similar picture is also expected for both male and female engineering graduates in the labour market. The effect is likely to be higher among females than males i.e. the female graduates from SC, ST and OBC will have less chance to get a job offer than males belonging to similar social category as they face double disadvantage, female and belonging to lower social strata.

*SC* = 1, if the students belong to Scheduled Castes  
= 0, otherwise  
*ST* = 1, if the students belong to Scheduled Tribes  
= 0, otherwise  
*OBC* = 1, if the students belong to Other Backward Classes  
= 0, otherwise

*General* (reference category)

= 1, if the students belong to non-Scheduled Castes, non-Scheduled Tribes and non-Other Backward Classes  
= 0, otherwise

*Occupation of the Father:* Generally it is felt that parents' occupation influences the probability of getting employment of their wards. For example, a student whose father is engaged in engineering field helps his/her child to get a job easily. Information on occupation of the parents was collected from sixteen occupation categories which are re-classified here into three: (a) professional or technical worker; (b) businessmen; and (c) others. The reclassification was done mainly due to less number of observations in many of the occupation categories such as clerical and related workers, service workers, farmers, fishermen and related workers, skilled workers (foreman, craftsman etc.), unskilled workers (ordinary labourer), retired, and workers not classified by occupation (athlete, actor, musician, unemployed, partially unemployed). All these occupation categories were included in the category of "others". The "professional or technical worker" includes both junior and senior professional workers like doctor, professor, lawyer, architect, engineer, nurse, teacher, editor, photographer and bank employees. As there is a common understanding that sons follow the occupation pattern of their fathers more than daughters the effect of father's occupation on employment will be greater for male graduates compared to the females. It is pertinent to note here that mother occupation may be an important factor in determining the employment probabilities, however not included in the analysis. This is because out of the total mothers three-fourth are housewives, thus may not make much sense in the analysis.

*Fathocp\_Proff* = 1, if father occupation is professional work  
= 0, otherwise

*Fathocp\_Busn* = 1, if father occupation is business  
= 0, otherwise

*Fathocp\_Others* (Reference Category) = 1, if father occupation is others (occupation other than professional work and business)  
= 0, otherwise

*Educational Level of the Parents:* A positive association between father's year of schooling and the employment of graduates is expected. More educated parents are well informed about the job market and give tips to their children to get a job without much difficulty than the students whose fathers have not gone for higher level of education. To examine this fact, students were asked to report the highest level of education attained by each of their parents, In the analysis the levels of education were converted to years of schooling (*Fath\_Schooling*, *Moth\_Schooling*), as it is considered as a better indicator and has been extensively used in the literature than that of the level of education. It is possible that the probability of employment among male graduates will increase more (compared to the female graduates) with the increase in the parents level of education. Though the education of both father and mother is expected to influence the employment probabilities, the impact of mother's education is likely to be higher for females than males and similarly, the impact of father's education may influence the job options more for male candidates. This goes with the familiar observation that fathers are more worried to provide a job to their son than that of their daughters. However, the case is different if the father is having only daughters.

## **Results and Discussion**

In our sample, 40 % of males and 25 % of females have got job offer in 2009-10. Similarly, results show that all else equal, male students are more likely by 5 % than females to be employed in the job

market (column 2, Table 2). The descriptive as well as logit results provide strong and robust evidence of gender discrimination in the employment of engineering graduates. The concern here is how much of such differential in the job offer between men and women can be explained by taking account of the different individual, human capital and institutional factors.

The logit estimates reported in Table 1 show that the type of institution the graduates have enrolled (*Mgmt\_Pvt*) has the strongest influence on their employment probabilities. As revealed from the marginal effect, graduates of private institutions had 36 % less chance of getting employment compared to the graduates of government institutions. This may be attributed to the quality and brand name (if any) differences between these two types of institutions<sup>8</sup>. In a sense, the government institutions provide better quality education to students which increase their employability in the labour market. Further, both male and female graduates from government institutions are more likely to have jobs compared to private institutions. However, surprisingly, the effect of the type of institution on employment is higher among females than males. All else equal, women (men) students from the private engineering institutions are 51 (34) % less likely to get job offer than the students who are from government engineering institutions (column 7 and 10, Table 2). This does not support the hypothesis that the female students from private institutions will be preferred by employers than male students.

Students availing educational loan or not from commercial banks came out to be the second most important factor in determining the employment probability of graduates. The results show that students who availed educational loan were less likely to get employment than the students who have not availed loan. More clearly, as shown in the marginal effect, students taking educational loan had 22 % less chance to get employment than the students who have not taken educational loan. As expected, the effect of availing educational loan on employment is higher for females compared to males. The values of the marginal effect show that male students who have availed educational loan are less likely to get job offer by 20 % whereas it is 30 % for females. This does not go with the general observation that the students availing loans have financial obligations and hence have higher chance of joining in the job market. It is worthwhile to mention here that, of the total students availed educational loan from commercial banks, around 35 % have planned to go for further studies and may not have given importance to the employment. But it supports the argument that the educational loan taken by female graduates are usually born by the parents whereas in most of the cases of male graduates, they take the responsibility to pay by engaging themselves in the labour market.

(1)	Coeff (2)	S.E. (3)	M.E. (4) ( <i>dy/dx*</i> )	Coeff (5)	S.E. (6)	M.E. (7) ( <i>dy/dx*</i> )	Coeff (8)	S.E. (9)	M.E. (10) ( <i>dy/dx*</i> )
<i>Variable</i>	<i>Total</i>			<i>Male</i>			<i>Female</i>		
Mgmt_Pvt	-1.65***	0.22	-0.36	-1.56***	0.23	-0.34	2.51***	0.83	-0.51
Dept_IT	0.14	0.22	0.03	0.23	0.23	0.05	-1.19*	0.81	-0.24
Sec_Marks	0.03**	0.01	0.01	0.02*	0.01	0.00	0.07*	0.05	0.01
Secmed_English	0.27	0.31	0.06	0.20	0.32	0.04	0.56	1.51	0.08
Almuni	0.25*	0.19	0.05	0.41**	0.21	0.09	-0.79	0.63	-0.13
Edu_Loan	-1.16***	0.24	-0.22	-1.01***	0.25	-0.20	-2.81**	1.18	-0.30
Gender_Male	0.22*	0.26	0.05	...	...	...	...	...	...
SC	0.09	0.36	0.02	-0.02	0.39	0.00	2.48*	1.48	0.55

<sup>8</sup> See Rao (2006), and Biswas et al. (2010) for a detailed discussion on quality related aspects of technical education in India.

ST	-0.68*	0.42	-0.13	-0.91**	0.46	-0.17	1.43	1.53	0.31
OBC	-0.58*	0.47	-0.11	-0.68	0.51	-0.13	1.46	1.48	0.32
Fathocp_Proff	0.02	0.28	0.00	-0.10	0.29	-0.02	1.02	1.28	0.15
Fathocp_Busn	0.19	0.32	0.04	0.25	0.33	0.06	-0.41	1.46	-0.07
Fath_Schooling	-0.05	0.06	-0.01	-0.02	0.07	0.00	-0.75**	0.32	-0.13
Moth_Schooling	0.09**	0.04	0.02	0.11**	0.04	0.02	0.29*	0.20	0.05
Constant	-2.54**	1.25		-2.62**	1.23		2.35	5.63	
Log-Likelihood	-357.69			-304.24			-41.68		
Pseudo R <sup>2</sup>	0.16			0.15			0.35		
Observations	657			552			105		

Table 2. Gender Differences in the Employment of Engineering Graduates: Logit Estimate

Source: Author's self computation

Note:

(a) \*\*\*significant at 1 % level of significance; \*\* significant at 5 % level of significance; \*significant at 10 % level of significance

(b) (\*)  $dy/dx$  is for discrete change of dummy variable from 0 to 1

The third most important factor determining the employment probabilities of graduates is their social category. As expected, graduates of STs and OBCs are less likely to get employment compared to the graduates belonging to "general" category. Employers may not prefer the graduates belonging to these social category in recruitment. Approximately 33 % of graduates from general category got employment, whereas it is 26 % for OBCs, 19 % for STs. The effect of social category on gender differences in the employment of graduates gives some interesting findings. The male graduates belonging to SCs, STs and OBCs are less likely to get job offer than the general category students whereas it gives opposite result for females i.e. students belonging to SC, ST and OBC are more likely to get job compared to general. It is interesting to note that SC female students are 55 % more likely to be employed compared to general category students and statistically significant at 5 % level of significance. This encourages for larger participation of women from socially disadvantaged sections of the society in engineering education.

The logit estimates show that the graduates from the institutions having formal mechanism to keep in touch with their fellow graduates (*Alumni*) have higher chance by 5 % to get employment than the students of the institutions having no provision of alumni association. It is perhaps due to the fact that institutions having alumni association put effort to organise talks and group discussions between the graduates and alumni on job market details, which helps them to get employment. For male only, having alumni association in the institute increases the likelihood of getting placement in the job market. However, having or not having any alumni association in the institution does not matter for the job offer of female graduates as the coefficient is statistically not significant (column 8, Table 2). This goes with the common understanding that male students take advantages of the existence of alumni contact in the institute by interacting with their seniors, whereas female graduates hesitate to some extent for this.

Among the two explanatory variables included under students' academic background, percentage of marks scored in the senior secondary examination (*Sec\_Marks*) is stastically significant in determining the probability of getting employment (the result is significant at five % level). It appears that the companies coming for on-campus recruitment take into account the performance of the graduates at higher secondary level besides looking into their knowledge and skill acquired in the engineering course. Similar picture is found from the analysis of both male and female graduates, except the fact that it's effect is marginally higher for females than males. The medium of instruction followed in the senior secondary level of education turned out to be statistically not significant. General impression

that the teaching in English medium compared to non-English medium helps graduates to get a job easily is not supported in the study.

As expected, education of the mother is positively related with the employment probabilities of engineering graduates. With the increase in the mother's years of schooling by one year the probability of getting employed in the job market will go up by 2 %. Between male and female, the effect of mothers' education on job offer is higher among females as compared to males. Having an educated mother in the family raises the likelihood of employment by 2 percentage points for males and 5 percentage points for female graduates. It is found that for all the three equations, the effects of other two related factors (father's occupation and educational attainment) are statistically not significant.

It is important to mention here that the department of study turned out to be statistically not significant in the determination of employment probabilities of graduates, though gives expected signs, except the female equation. The evidence does not support the hypothesis that higher proportionate of graduates in the courses such as electronics and communication engineering, computer science and engineering, information technology etc. get employment than the graduates of courses like electrical engineering, mechanical engineering and civil engineering. The difference seemed to be very less between the students of traditional and IT-related courses in getting employment, i.e., 33 % of graduates in traditional departments and 30 % in IT-related courses got employment in 2009-10. Hence, the general opinion that the demand for IT-related courses mainly due to its employment providing capacity is not supported in the present case.

## 5. Conclusions

In this paper an attempt is made to study the gender difference in the employment opportunities of engineering graduates in India. The author finds that the share of women engineering graduates are less than that of men to get a job offer. This may be attributed to two important factors: (a) the lack of adequate and suitable employment opportunities for women, and (b) deliberate discrimination in the job market against women which may be based on the false notion of women productivity or simply the prejudice against women. From policy view point, providing better quality of education to women especially by investing on them, changing the mindset of the employers, and also creating a women friendly work environment are some of the important ways to increase the scope of employment of female engineering graduates. Particularly, effort should be made to increase the access of females belonging to socially deprived groups as they have better employment scope in the labour market.

As expected, the institutional factors (particularly, type of institution and department of study) are strongly related with the gender differences in employment of graduates. The logit results show that the effect of the type of institution on employment is higher among females than males. Some other important factors responsible for the gender differences in employment of engineering graduates include the academic background, contact with the alumni, educational level of the mother and social category. The lower level of participation among women in the discipline of engineering may be partly explained due to the gender discrimination in the labour market. More clearly, unfavourable labour market conditions and unattractive educational returns in the form of low wages reduce the women participation in this discipline. In case of women it works as a vicious circle. In a sense, the labour market discrimination reduces the women participation in engineering and the less participation further reduces their scope to work. Using a household survey data of Andhra Pradesh on employment and wages, Tilak (1980) has also given similar argument, i.e., in the case of the weaker sections, education and labour market results a vicious cycle – less amount of education bleak employment opportunities, unattractive educational returns in the form of low wages and hence less investment in education in the future (p. 112). Thus, to increase the women participation in the discipline of engineering, among other steps, the gender discrimination in the labour market need to be minimised.

Even though occupational concentration and segregation cannot be completely wiped out, attempt should be made to identify areas where women can work with equal efficiency, and positive discrimination policies may be followed in the job market to promote women employment.

Although tentative, these findings have a few policy implications. It is important to note here that even though the graduates of private institutions are investing comparatively more than the graduates of government institutions, their probability of employment through on-campus recruitment is less and it is more so in case of females. Furthermore, the graduates of private institutions who have got employment earn less than the graduates got employment from government institutions. The higher employment opportunities of the graduates belonging to government institutions may be one of the important reasons for its higher demand. Thus, the private engineering institutions need to improve their quality to increase the employability of its outturn in the labour market.

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