Logistic Modeling of University Choice among Student Migrants to Karnataka for Higher Education

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Abstract

Universities often study the broad characteristics of students who have migrated to their state for educational purposes. This provides them with opportunities to collaborate with the state government in order to introduce educational policies which can influence the students' migration decisions. While there already exist studies that focus on the determinants of student migration, this paper uses the logistic regression model to assess the probability of choice of private universities while using primary data collected from students who migrated to Karnataka. This paper also tests various hypotheses and finds that the admission quota has no significant effect on the choice of private university among migrant students.

Key Words: *Migration for education, Choice of university, Higher Education, Logit Model*

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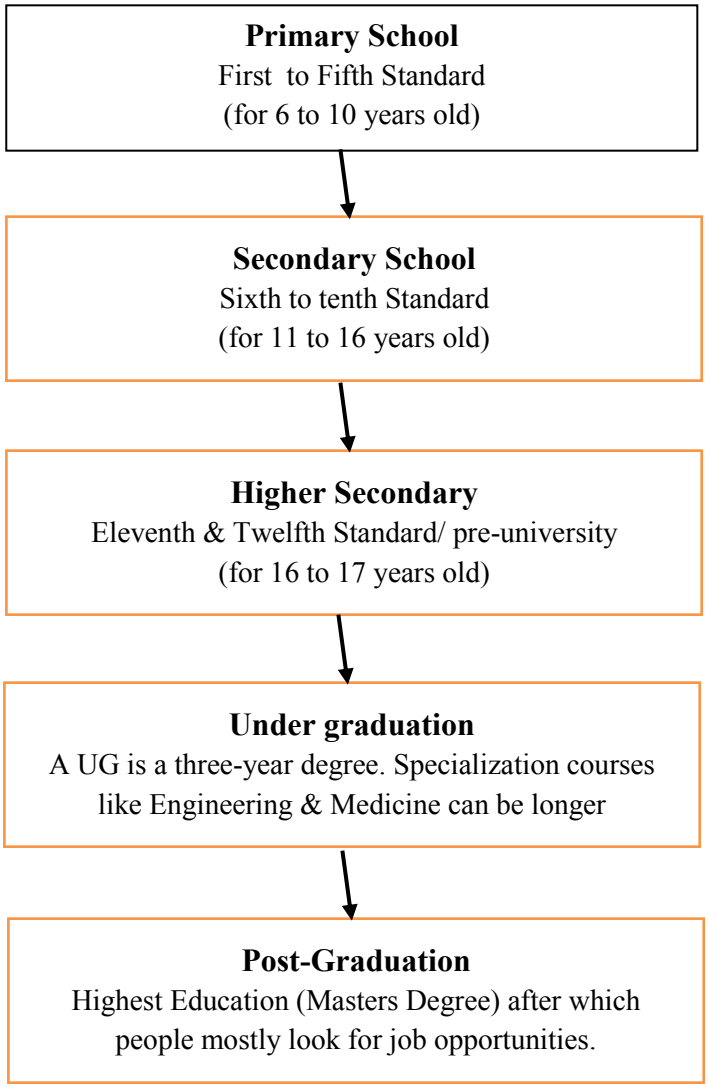
Introduction

Education migration provides useful insight for policy makers regarding the determinants, effects of migration for education and how this may lead to regional imbalances and impede structural economic development in certain states. Choice of education is based mainly on rational thinking. However, irrational behaviour among student population can also sometimes influence their migration decisions. There exists a legion of literature on determinants for push and pull factors for both inter-state and international migration. There are two main factors influencing the decision to migrate. One being the geographic location and the second being the choice of the type of institution for education. Researchers have contributed significantly to the first question while addressing the reasons for students' migration to a specific geographic location (within the country or abroad).This paper tries to establish whether students' demographic factors influence their choice of type of institution with special reference to Karnataka, India. According to the Directorate of Economics and Statistics, Government of Karnataka, this Indian state has an annual GSDP of Rupees 871,995 crores and a GDP of Rupees 12,165,481 crore (2016-17). 2011 census shows that 720,385 people of the total 25,078,333 migrants were for the purpose for education, which is an increase of more than 3800 percent over the 18,190 student migrants as per 2001 census.

2009 Right to Education Act of the Indian constitution provides free and compulsory schooling for all children between the ages of 6 to 14 years. The broad Indian education system stages are shown in the figure-1 which are classified based on age group and degree into five broad categories – primary, secondary, higher secondary, under graduation and post-graduation.

Figure 1: Education system in India



This paper focuses on migration for higher education (Under-graduation and post-graduation). India has 45 Central Universities (40 are under the purview of Ministry of Human Resource Development), 318 State Universities, 185 State Private universities, 129 Deemed to be Universities, 51 Institutions of National Importance (established under Acts of Parliament) under Ministry of Human Resource Development (Indian Institute of Technology - 16, National Institute of Technology – 30 and Indian Statistical Social and Economic Research – 5) and four Institutions (established under various State legislations), (Ministry Of HRD, Republic of India, 2014). We

classify these institutes broadly into Private and Non-Private Higher Educational Institutions (hereon called as HEI) for this study. Private HEI include private universities, deemed universities and autonomous institutions wholly managed and run by private bodies, societies and/or trusts. All other HEI are classified under non-private HEI.

Literature Review

The choice process has changed significantly during the past half-century as a result of changes in student demographics as well as the development of institutional admissions and marketing practices (Kinzie, et al., 2004). Student decision-making process is classified into three phases: aspirations development and alternative evaluation; options consideration; and evaluation of the remaining options and final decision (Jackson, 1982).

Many previous studies distinguish between the important levels of different choice factors (Sevier, 1993; Freeman, 1999; Bers & Galowich, 2002; Price Matzdorf, Shin & Milton, 2004). Some of them are listed in the table 1.

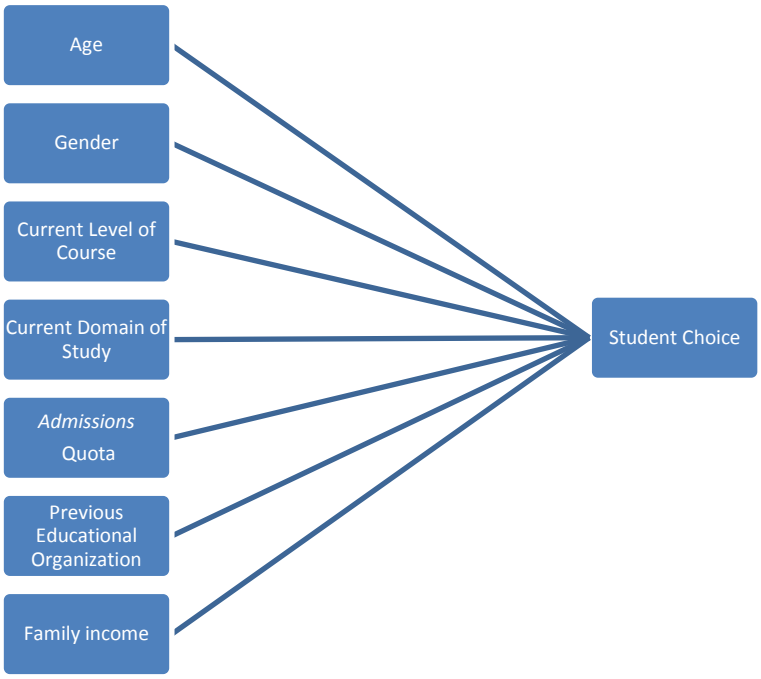
Insert table 1 here

Essentially, most of the researches have concluded that the administrators of universities and colleges need to realize that students have become very selective and are more well-informed in selecting the higher institutions to pursue their education. This requires more research along these lines to better understand the needs and requirements of students.

Conceptual Framework and Need for the Study

The literature review provides us with various demographic factors which are studied under migration. These studies show how the factors influence migration and do not establish the university choice. We use the same for to hypotheses whether these important demographic factors identified by previous research have any significant influence on the choice of the student with respect to the type of HEI using the logistic regression model.

Figure 2: Demographic factors influencing the student choice



Thus, the main objective of this study is to predict the likelihood of respondents' preference towards private university based on the demographic characteristics of the respondent like age, gender, current level of course studying, current domain of study, quota through which the

admission is sought, the current annual income of the family and the type of previous educational organization studied.

Hypotheses for the Study

The following are the proposed Hypotheses

H1: Age has no significant effect on predicting the selection of private university for higher education in Karnataka by migrant students.

H2: Gender has no significant effect on predicting the selection of private university for higher education in Karnataka by migrant students.

H3: Current level of course has no significant effect on predicting the selection of private university for higher education in Karnataka by migrant students.

H4: Current domain of study has no significant effect on predicting the selection of private university for higher education in Karnataka by migrant students.

H5: Admission Quota has no significant effect on predicting the selection of private university for higher education in Karnataka by migrant students.

H6: Annual income of family has no significant effect on predicting the selection of private university for higher education in Karnataka by migrant students.

H7: Previous educational organization has no significant effect on predicting the selection of private university for higher education in Karnataka by migrant students.

Limitations of the Study:

1. The study is limited only to the students migrated to Karnataka for education

2. Data is collected only from education hubs of Karnataka.
3. Data has not been collected from medicine related areas.

Research Methodology

The research method used in this paper is descriptive research - study designed to understand the respondents, who are part of the study in an accurate way. Survey method, which is one of the three types of descriptive research, is used in this paper. The study required both primary and secondary data. The primary data is collected from a survey conducted in Karnataka.

Primary data relating to personal and other required information for the study from respondents was collected by making personal visits to the colleges. The secondary data for literature review is collected from EBSCO database, online sources and research reports on this topic.

As a common database on educational migrants was not available, purposive sampling, a non-probability technique was used for data collection. Purposive sampling is a method where researcher chooses a certain group of people or place to study because it is known to be of the type needed(McNeill & Chapman, 2005). In purposive sampling, population elements are purposively selected and they are representative of population of interest. They can offer the contributions sought (Churchill Gilbert, 2009). The survey comprised of both closed and open-ended questions. Age, gender, previous study details, current study details etc are the type of information collected through the survey. According to Rao's software sample size calculator, a sample size of 364 was planned. However, the data collected was from 360 respondents, depending on their availability. The survey used a questionnaire, which had both categorical and continuous variables.

Result of Analysis

The study uses logistic regression for predicting the likelihood of respondents' choice between two outcome categories of 'selecting private university' or 'not selecting private university' when migrating to Karnataka for higher education. Logistic regression helps to distinguish between two groups. Using IBM SPSS-21.00, the logistic regression output was generated using 'selecting private university' or 'not selecting private university' as dependent variable and age group, gender, current level of course, current domain of study, admissions quota, family income and previous educational organization as explanatory variables.

In the Logit model 'selecting private university' is treated as success and is coded as 1, where as"not selecting the private university" is treated as failure with code 0.

For all the predictive variables, respective focus group and their reference categories are given in the table 2

Insert table 2 here

Insert table 3 here

Insert table 4 here

Hosmer and Lemeshow test statistic was generated with 0.05 level of significance for odds ratio. The classification cut-off (0.5), was used for classifying each case into reference and focus group. The output of binary logistic regression is as follows. The table 3 and 4 shows the total number of respondents processed for analysis and the frequencies of categorical variables.

The classification table 5 shows the intercept model without any independent variable. The table 5 shows that 52.8 percentage of students who migrate to Karnataka would have chosen the private university for higher education in Karnataka, without further categorization of students.

Insert table 5 here

Table 6 shows the variables in the equation for the intercept model with no other predictive variables, an odds ratio of 1.120 is seen, which denotes that there is 1.12 times likelihood that a student migrant will choose private university for higher education in Karnataka

Insert table 6 here

Table 7 shows the results of Omnibus Tests of Model Coefficients. The model chi-square is 59.340 and is statistically significant at 5 percent level of significance with 18 degrees of freedom.

Insert table 7 here

Insert table 8 here

The Nagelkerke R Square value is 0.207 (Table 8). We can conclude that approximately 21 percent of the variance associated with the selection of private university is explained by all the independent variables considered in the model. R squared value equal to or above 0.20in research relating to social science are considered substantial (Cohen, 1998).

The Hosmer and Lemeshow Test assess how well the predicted probabilities match the observed probabilities using the Chi-square goodness of fit statistic. The goal is to obtain a non-significant p-value (Mayers, Gamst, Guarino, 2013).

Insert table 9 here

Table 9 shows a chi-square value of 2.312 with a p-value of 0.97, which is non-significant at 5 percent level of significance. This shows that there is no significant variance between the predicted and actual probabilities.

The table 10 shows the contingency table for Hosmer and Lemeshow Test. From table 9, it is clear that the observed value and expected value of the choice of private university selection are approximately equal.

Insert table 10 here

The classification Table 11 shows the overall predictive accuracy of the model to be 66.2 percent with various independent variables introduced in the model.

Insert table 11 here

The table 11 indicates 130 cases has observed cases of 'selecting private university' and is correctly predicted as the case of success and 103 cases are observed to be 'not selecting the private university' and are correctly predicted as failure. However, 63 cases observed to be 'not selecting the private university' are predicted as 'selecting private university' and similarly 56 cases are observed as success instead of failure. This it shows that approximately 66 percentage of students who migrate to Karnataka would have chosen the private university for higher education in Karnataka.

Insert table 12 here

The table 12 shows the variables in the equation, significance levels and their odds ratio. Significance of predictive variables and the support for hypothesis is provided in table 13

Insert table 13 here

Thus the Logistic model can be written as below

P(success) = A/(1+A), where $A=e^{(\log(\text{odds of choice 1(selecting private university)}))}$

If the value of probability is greater than 0.5 then the respondent is considered to select private university else the respondent selects a university other than private which could be state, central or deemed university.

Insert table 14 here

Exp(B) column in table 14 shows the odds ratio associated with each predictor at 5% level of significance. The odds ratio for age group 20 - 25 years is 3.395, can be interpreted as the odds of respondents belonging to this age group selecting private university is 3.395 times the odds of the age group 15 – 20 years, controlling all other explanatory variables. The odds ratio of female to male is 1.705, the odds of students studying in state/central university for selecting private university is 3.773 when compared to those already studying in private university and finally the odds of students studying post – graduation to select private university is 0.645 than those studying under graduate programs.

Discussion

This paper predicts the likelihood of respondents' choice between two outcome categories of 'selecting private university' or 'not selecting private university' when migrating to Karnataka for higher education using predictor variables like age, gender, current level of course, current domain of study, admissions quota, family income and previous educational institution. The Nagelkerke R Square value shows approximately 21 percent of the variance associated with the selection of private university is explained by all the independent variables taken in the model and the Hosmer and Lemeshow Test shows an overall predictive accuracy of the model to be 66.2 percent with various independent variables introduced in the model. While all the factors tested for hypothesis

shows significant effect on predicting the selection of private university for higher education in Karnataka by migrant students, Admission Quota has no significant effect.

The Odds ratios for choice of private universities shows that odds of respondents belonging to this 20-25 years group selecting private university is 3.395 times the odds of the age group 15 – 20 years. Similarly, female has an odds ratio of 1.705, Post-graduation (current level of course) has an odds ratio of 0.645, respondents who studied in State / Central university previously has an odds ratio of 3.773 when compared to those who studied in private university previously.

Conclusion

Understanding the choice of university is important for private educational institutions as it provides them the necessary data to probe further into how they could improve their admissions and also better formulate their promotion strategies. While private institutions are keen on this, the government of both the migration destination and origin states can use the information to analyze the impact of state policies on Higher education. At the base level we have shown how the odds of Admissions Quota has little influence on the choice of university type especially for the migrating students. So, the question to ask here is whether the 'Quota' system in one's own state is influencing migration, or how effective this system is in achieving its intended objectives.

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Table 1: Summary of Literature

Serial Number	Variables Identified (literature Review)	Reference

1	Learning environment, political environment, concern for students, cost of education, facilities, location parental preference and influence of peers,	Baharun, et al., 2011
2	Field of study, course preferences ,institutional reputations, course entry scores, easy access to home and institutional characteristics	James et al.1999
3	Type of school attended	Hoxby and Long, 1999
4	Familial groups such as parents,relatives and teachers	Oosterbeek, et al.,1992; Hossler, et al., 1999
5	Academic reputation, course availability, location, tuition costs as well as campus amenities ,study mode, tuition fees and the university itself	Hagel and Shaw 2007
6	Reputation of the institution	Kusumwati et al. 2010
7	Degree program flexibility, academic reputation , prestige reflecting national and international recognition, physical aspects of the campus such as the quality of the infrastructure and services, career opportunities upon completion, location of the institution and the time required for the completion of the program.	Joseph and Ford 1999
8	Income or the socioeconomic status of students	Heller 1997
9	Academic achievement of students or standardized examination results	Braxton, 1990
10	Excellence in teaching	Keskinen et al., 2008; Sidin, et al.,2003; Soutar& Turner, 2002
11	Demand for private universities tends to be higher level of price sensitivity than public ones	Bezmen & Depken, 1998
12	Importance of price depends on the income and quality of the student	Long's 2004
13	Gender differences	Paulsen, 1990; McDonough, 1997
14	Women view safety as an important determinant factor of choice while men place more importance on scheduling and sporting activities. Females prefer information regarding institutions from close social connections more than males	Baharun et al., 2011
15	Females also prefer information provided by the institutions above males.	Joseph and Joseph 2000
16	Attending a private university	Ciriaci, 2014

17	Lack of access to higher education in certain regions, a commonality of languages as well as availability of technology based programs	Mazzarol and Soutar 2002 & 2008
18	Types of academic programmes available, quality of education, administration standards, faculty qualifications and convenient accessible location	Baharun 2002
19	Institution's good image	Mazzarol, 1998; Gutman and Miaoulis, 2003.
20	Good job prospects, the reputation of the university, the availability of programmes desired by students and the reputation of the programmes	Nagaraj, 2008; Jacqueline Fernendez 2010
21	Availability of required programme, academic reputation of university/college, quality of the faculty/lecturers and financial assistance offered by university/college	Mohar, Siti Nur Bayad, Musyer and Ravindran 2008
22	Field of study preferences, course and institutional reputations, course entry scores, easy access to home and institutional characteristics	James et al. 2000
23	Quality and responsiveness of staff, research activities, social opportunities, economic considerations and the size of the institution	Baksh and Hoyt 2001; Bradshaw, et al 2001
24	Campus safety and flexibility in course offering	Espinoza et al 2002
25	Academic rating	Arpan, et al 2003
26	Famousness of the university, public relations and stability	Punnarach 2004
27	Reputation and prestige, career preparation, specific academic programmes, distance from home, quality of research programmes and library resources	Martin, 1994
28	Auxiliary services, reputation of the institution and admission	De Jager & Du Plooy, 2006
29	Gender roles are changing- males and females differ in terms of consumer traits, information processing, decision-making styles and buying patterns	Hoyer and MacInnis 2001:384
30	Gender influences both purchase and consumption situations	Sheth, Mittal &Newmand, 1999
31	Variety of gender differences	Galotti & Mark, 1994; Desjardins et al, 1999
32	Females rated residential life as a more important factor in the selection process than their male counterparts	Litten 1982

33	Importance of financial aid, security, academics, atmosphere and religious culture	Mansfield's research 2006
34	Female students view security as a more important choice factor than their male counterparts	De Jager & Du Plooy, 2006

Table 2 : Focus group and their Reference categories of Predictive variables

Predictive Variable	Focus Group	Reference Group
Age Group	15 – 20 years	20 – 25 years
		25 – 30 years
Gender	Male	Female
Current Level of Course	Under Graduate	Post-Graduation
		Others
Current Domain of Study	Engineering	Commerce
		Management
		Pure Science
		Others
Admissions Quota	Management Quota	General Merit
		Other Quotas
Family income	Less than 5 hundred thousand	5 – 10 hundred thousand
		10 –20 hundred thousand
		Above 20 hundred thousand
Previous Educational Organization	Private University	State / Central university
		Deemed university
		Autonomous
		State / Central Education Board

Table 3. Case processing summary

Unweighted Cases*		N	Percent
Selected Cases	Included in Analysis	352	100
	Missing Cases	0	0
	Total	352	100
Unselected Cases		0	0
Total		352	100
* If weight is in effect, see classification table for the total number of cases.			

Table 4. Categorical variable codings

		Frequency	Parameter coding			
			-1	-2	-3	-4
Previous Educational Organisation	Private university	75	1	0	0	0
	State /Centel university	92	0	1	0	0
	Deemed university	6	0	0	1	0
	Autonomous	16	0	0	0	1
	State / Centa I Education Board	163	0	0	0	0
Current Domain of Study	Engineering	207	1	0	0	0
	Commerce	31	0	1	0	0
	Management	67	0	0	1	0
	Pure Science	30	0	0	0	1
	Others	17	0	0	0	0
Family Income	Less than 5 hundred thousand	112	1	0	0	
	5-10 hundred thousand	115	0	i	0	
	10-20 hundred thousand	88	0	0	1	
	More than 20 hundred thousand	37	0	0	0	
Addmission Quota	Management Quota	179	I	0		
	General Merit	162	0	1		
	Other Quota	11	0	0		
Current Leavel of Course	UG	290	1	0		
	PG	53	0	1		
	Others	9	0	0		
Age Group	15-20 years	181	1	0		
	20-25 years	156	0	1		
	25-30 years	15	0	0		
Gender	Male	263	1			
	Female	89	0			

Table 5. Classification table

Observed			Predicted		
			Choice of private university		
			Non-private university	Private university	Percentage correct
Step 0	Choice of private university	Non-private university	0	166	0
		Private university	0	186	100
Overall percentage					52.8

Table 6. Variables in the equation

		Beta	Standard Error	Wald	Degree of freedom	Significance	Exp(B)
Step 0	Constant	0.114	0.107	1.135	1	0.287	1.12

Table 7: Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	59.34	18	0
	Block	59.34	18	0
	Model	59.34	18	0

Table 8: Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	427.499[a]	0.155	0.207

Table 9: Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	2.312	8	0.97

Table 10: Contingency Table for Hosmer and Lemeshow Test

		Choice of Private university = Non Private University		Choice of Private university = Private University		Total
		Observed	Expected	Observed	Expected	
Step 1	1	28	28.203	7	6.797	35
	2	22	23.678	13	11.322	35
	3	21	20.98	13	13.02	34
	4	21	18.223	11	13.777	32
	5	18	17.94	17	17.06	35
	6	12	14.398	19	16.602	31
	7	15	14.277	19	19.723	34
	8	13	12	22	23	35
	9	9	8.971	26	26.029	35
	10	7	7.329	39	38.671	46

Table 11 Classification table

Observed		Predicted		
		Choice of Private university		Percentage Correct
		Non Private University	Private University	
Choice of Private Step 1 university	Non Private University	103	63	62
	Private University	56	130	69.9
Overall Percentage				66.2
a. The cut value is .500				

Table 12. Variables in the equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C .1.foi EXP(B)	
								Lower	Upper
Step 1	Age Group			9.844	2	0.007			
	Age Group (1)	1.222	0.605	4.083	1	0.043	3.395	1.037	11.113
	Age Group (2)	0.431	0.605	0.507	1	0.478	1.539	0.47	5.038
	Gender (1)	0.534	0.291	3.366	1	0.087	1.705	0.964	3.016
	Current Level of Course			5.713	2	0.057			
	Current Level of Course (1)	-0.438	0.862	0.258	1	0.611	0.645	0.119	3.494
	Current Level of Course (2)	0.671	0.926	0.526	1	0.468	1.957	0.319	12.01
	Current Domain of Study			13.932	4	0.008			
	Current Domain of Study (1)	-1.268	0.698	3.299	1	0.069	0.281	0.072	1.105
	Current Domain of Study (2)	-1.37	0.792	2.992	1	0.084	0.254	0.054	1.2
	Current Domain of Study (3)	-1.409	0.764	3.403	1	0.085	0.244	0.055	1.092
	Current Domain of Study (4)	-2.82	0.825	11.682	1	0.001	0.06	0.012	0.3
	Admissions Quoia			0.666	2	0.717			
	Admissions Quoia (1)	0.341	0.715	0.228	1	0.633	0.711	0.175	2.885
	Admissions Quoia (2)	0.486	0.719	0.456	1	0.499	0.615	0.15	2.52
	Family income			9.504	3	0.023			
	Family income (1)	-1.442	0.469	9.462	1	0.002	0.236	0.094	0.593
	Family income (2)	-1.205	0.466	6.693	1	0.01	0.3	0.12	0.747
	Family income (3)	-1.183	0.478	6.114	1	0.013	0.306	0.12	0.782
	Previous Educational Organisation			17.731	4	0.001			

	Previous Educational Organisation (1)	1.328	0.334	15.83	1	0	3.773	1.962	7.258
	Previous Educational Organisation (2)	0.165	0.3	0.304	1	0.581	1.180	0.655	2.123
	Previous Educational Organisation (3)	-0.667	0.986	0.457	1	0.499	0.513	0.074	3.545
	Previous Educational Organisation (4)	0.69	0.631	1.195	1	0.274	1.993	0.579	6.862
	Constant	1.761	1.511	1.357	1	0.244	5.818		

a. Variables(s) entered on step 1: Age Group, Gender, Current Level of Course, Current Domain Study, Admission Quota, Family income, Previous Educationl Organisation.

Table 13: Significance and Hypotheses support

	Null hypotheses	P Values	Level of significance	Hypotheses support
H1	Age has no significant effect on predicting the selection of private university for higher education in Karnataka by migrant students.	0.007	5%	Yes
H2	Gender has no significant effect on predicting the selection of private university for higher education in Karnataka by migrant students.	0.067	10%	Yes
H3	Current level of course has no significant effect on predicting the selection of private university for higher education in Karnataka by migrant students.	0.057	10%	Yes
H4	Current domain of study has no significant effect on predicting the selection of private university for higher education in Karnataka by migrant students.	0.008	5%	Yes
H5	Admission Quota has no significant effect on predicting the selection of private university for higher education in Karnataka by migrant students.	0.717	10%	NO
H6	Annual income of family has no significant effect on predicting the selection of private university for higher education in Karnataka by migrant students.	0.023	5%	Yes
H7	Previous educational organization has no significant effect on predicting the selection of private university for higher education in Karnataka by migrant students.	0.001	5%	Yes

Table 14: Odds Ratio of predictor variables

Reference Group Label	Reference Group Variables	Exp(B)
AgeGroup		
AgeGroup(1)	20 - 25 years	3.395
AgeGroup(2)	25 - 30 years	1.539
Gender(1)	Female	1.705
CurrentLevelofCourse		
CurrentLevelofCourse(1)	Post Graduation	0.645
CurrentLevelofCourse(2)	Others	1.957
CurrentDomainofStudy		
CurrentDomainofStudy(1)	Commerce	0.281
CurrentDomainofStudy(2)	Management	0.254
CurrentDomainofStudy(3)	Pure Science	0.244
CurrentDomainofStudy(4)	Others	0.06
AdmissionsQuota		
AdmissionsQuota(1)	General Merit	0.711
AdmissionsQuota(2)	Other Quota	0.615
Familyincome		
Familyincome(1)	5-10 Lacs	0.236
Familyincome(2)	10-20 Lacs	0.3
Familyincome(3)	More than 20 Lacs	0.306
PreviousEducationalOrganisation		
PreviousEducationalOrganisation(1)	State / Central university	3.773
PreviousEducationalOrganisation(2)	Deemed University	1.18
PreviousEducationalOrganisation(3)	Autonomous	0.513
PreviousEducationalOrganisation(4)	State / Central Education Board	1.993
Constant		5.818