Available online at: http://journal.iepa.ir

Iranian Journal of Learning and Memory 2018, 1 (3)

Examining the Effective Factors in the National Ranks of the Entrance Exam Candidates of State Universities and Higher Education Institutions in Iran: A Multilevel Analysis

Ali Moghadamzadeh, Ph.D.
Department of Psychology and Education, University of Tehran, Tehran, Iran.
Fahimeh Abbasi*
PhD Candidate in Educational Psychology, University of Tehran, Tehran, Iran.
Maryam Kazemitabar
PhD Candidate in Measurement and Assessment, University of Tehran, Tehran, Iran.

Abstract

The present study aimed to examine the effective factors in the rank of national entrance exam of the candidates in state universities and higher education institutes in Iran in the form of a multilevel analysis. Therefore, the data of 5000 candidates was gathered randomly from five experimental groups in the national examination of 2017. The HLM7.30 software was used for multilevel data analysis. The results revealed that among the provinces, there were significant differences in the average national ranks of the candidates in Math, Humanity, Art, and English experimental groups. However, there was not any significant difference in the Science group. In the Math group, the average scores of the third year of high school, the total average of diploma, the entrance quota, and gender determined 58.44 percent of the whole variance of the national rank at level one. In the Humanity group, the average scores of the third year of high school, the total average of diploma, and gender explained 49.22 percent. In the Art group, the total average of the third year of high school, the entrance quota and gender were 15.8 percent; and finally in the English group, the average scores of the third year of high school, the total average of diploma, the entrance quota, and gender were wholly 31.45 percent. There was not any relationship between the age of the candidates as well as the time interval between their graduation and the entrance exam with their national rank. In the Humanity group, only in the local districts and among the other groups, in poles and local districts, the national rank of the candidates was different. In the Science group, only the third year high school's average scores of the candidates could predict the national rank.

Keywords: Educational background, Entrance quota, Local province, Multilevel analysis, The national entrance exam

Introduction

Almost in all countries, students need to pass through different filters in order to enter universities; such filters vary according to country's educational system or type of authority or the independence of each country (Helms, 2008). In Iran, the national entrance exam (Konkour), which was established in 1958, has been held nationally and through multiple-choice questions (Safi, 2004). It is the only way to enter university, actually the biggest challenge of all students in different groups of disciplines annually. This exam is considered a high-stake test and has indisputable effects on the future educational and vocational opportunities of the candidates. Therefore, discovering the effective factors in candidates' success has long been a concern for the educational authorities.

The studies performed in this respect (Bahrami & Mokhtari, 2005; Bozorgi, 2000; Dashti, 2008; Noqani, 2007; Noorbakhsh & Haeri, 2011; Roudbari, 2005; Sajjadi, Karamdoost, Dorrani, Salehi & Moghaddam-zadeh, 2017; Sobhaninezhad, Shahhoseini, Hashemi & Khodabandeh, 2013; Tabatabaieyazdi, 2006) show that

* **Corresponding Author**
Email: abbasi.fahimeh@ut.ac.ir

the successful performance on the exam depends both on personal characteristics and contextual features of the candidates. The new theories, like *the ecological perspective* (Bronfenbrenner, 1979, 2001; Bronfenbrenner & Morris; 2008) also contributes to the evolution of human to dynamic processes which occur in multilevel interactions between the individual and various contexts in a course of time. Bronfenbrenner considers an individual as a complex system of relations which several levels of the surrounding environment affect him/her as a string of net structures. The ecological perspective leads to understand the comprehensive causes and fundamental mechanisms in order to understand the educational consequences (Steinberg et al., 1992). Therefore, in this study, success in the entrance exam was considered as a multidimensional variable, affected by a hierarchy of factors and it studies all the effective factors in success to enter university.

The individual Level

At the first level of this hierarchy, there are the candidates with individual characteristics. Researches have shown that the individual factors are an important predictive measure in succeeding in the exam (Sajjadi, 2015; Sajjadi, Karamdoost, Dorrani, Salehi, & Moghaddamzadeh, 2017; Sobhaninezhad, Shahhoseini, & Khodabandehoveyli, 2013). One of such factors is the educational background of the candidates, which refers to their former scores in lessons like English, literature and math and sometimes their average in different years of school (Dumais, 2006; Dumais & Ward, 2010; Jenks, 1972).

Khodaye (2009a) conducted a research on 277185 candidates of Math and Technical group in 2006 and showed that the educational background of the candidates along with cultural and family's economic status could have a predictive power of 72 percent in passing the exam. Also, Noani, Ahanchian, and Rafiei (2011), in a study performed among male and female students of Isfahan that were candidates of university entrance exam in 2010, concluded that social, cultural, and educational background variables have had a meaningful portion in possibility of student's success in university entrance exam. Khodaye (2009b) conducted a research on 287156 candidates of graduate degree in one of the disciplines in 2006 and showed that the average in the bachelor degree was a determining index in passing the exam and that they correlated positively. In other words, the success in a former educational level is effective to the success in later exams.

Moreover, gender, has been an issue of concern for the researchers as individual characteristics. Khodaye (2009a) investigated the effect of gender in determining the success in the entrance exam; he concluded that the chance of success for females in the math group was 0.086 lower than the males. Khodaye, Habibi, Jamali, Bagiyazdel, and Khalgi (2017), in another study conducted on 2186 students admitted at Shahid Beheshti University in 2009, showed that the possibility of females entering the tuition-paying courses (requiring a higher rank compared to the free courses) was more than males. Furthermore, Khodaye (2009b) study revealed that by ignoring the variables of age, BA.BS average, vocational conditions and discipline of candidates, the possibility of success for men was significantly 1.91 times more than women.

However, Jamali (2012) in a study on the whole present candidates, 1217321 individuals, in the national entrance exam session in Humanity group between 2001 to 2009, concluded that during these years there was a significant difference between the performance of males and females; that is females surpassed men and this seemed to be increasing every year.

The research results concerning the gender differences in academic performance have shown that the performance of the genders varied according to disciplines and different lessons, meaning that males outperformed females in math and science while females did better in verbal subjects (Azen, Bronner, & Gafni, 2002; Becker, 1989; Stein Kamp & Maehr, 1983). However, recent researches show the gender gap favoring males over females in science, technology, engineering, and math (STEM) courses is not correct and female students have even surpassed males in some disciplines; the reason for such differences are still seen in some parts of the world is due to access in education and social factors (Alkhadrawi, 2015; Jacobs, 2005). Willingham and Cole (2013), in a comprehensive study of gender differences concluded that females acquired better grades in schools while males performed better in standardized tests. Taking these into account along with incomprehensive studies in Iran, it seems investigating the difference of performance across genders in five different discipline groups (math, science, humanity, art, and foreign languages) might be beneficial.

Furthermore, one of the policies of the national entrance exam and higher education in Iran is to select the candidates based on specific quota of three districts (1, 2, and 3), and quota for the martyr and disabled war veterans' families (Mohammadnezhad, 2004). Some researchers examined the relationship between the ranks of the candidates with the above-mentioned quotas and concluded that there is a positive relationship between them. That is to say the candidates of the first, second, and third districts have a lesser chance compared to the candidates with allocated quota (Khodaye, 2009a). Golkhanbaz and Khodaye (2014) have reported that there is a positive relationship between the entrance exam quota and academic success. Candidates with higher district quota gain higher rank in the entrance exam. Their study showed that most of the first rankers belonged to the first district.

The basis for categorizing the quota of the districts is educational justice. After the Islamic revolution of Iran in 1978, discipline changes occurred in university admission program whose aim was to create equal chance for everyone, regardless of the cultural, economic investments, gender, and geographical conditions. A result of such policy was to allocate especial quotas for the underprivileged districts. According to the bill passed in 1990 by the Supreme Council for Cultural Revolution, Iran was separated into three districts of highly privileged (1), privileged (2) and underprivileged (3) and the admission for various courses depends on the population of such districts. There has been an attempt to provide equality through equal access to educational facilities, meaning that as we approach from first districts toward third districts facilities are less accessible. Besides this allocated quota of districts, following the imposed war of Iraq on Iran and the effects on the suffering families who were war veterans or lost lives, such families are allocated especial quotas. The question is that after thirty years of signing this bill, how the candidates are admitted to university with such quota.

Candidates' age has been considered an important factor affecting success. Golkhanbaz and Khodaye (2014) showed that there is a correlation between age and the national rank. That is to say candidates aged 18 and 19 acquire better ranks and as the age increases, so does the rank. The amount of this relationship is reported to be average (0.21). However, according to Noqani et al. (2011), who considered age as a fundamental predictive variable of success, a neutral effect of age variable was reported. In order to reach a comprehensive understanding of the issue, the present study has sought to consider the effect of the age, the time interval between the graduation and entrance exam on admission in university based on the five different discipline groups.

Contextual Level

Admission to universities in Iran follows specific rules, conditions, and regulations, which Islamic Parliament and Supreme Council of Islamic Revolution determined them. One of such regulations is the draft regulation of *localization,* which was passed by the Committee for National Curriculum Studies and Planning in 1987 and has been run and encountered various difficulties. Regarding this, the 80 percent of admissions in different districts, poles and across the nation belongs to the candidates in the underprivileged districts (Mohammadnezhad, 2004).

Since the universities have expanded quantitatively and qualitatively nationwide, and because the student's issues like finding accommodation, being away from their families, and financial problems plus lack of expert workforce in small cities, this draft has been accepted. On the whole, students' issues and underprivileged areas have been accounted for the need for the *localization* draft and accordingly it has been accepted and administered for the following aims (Khodaee, 1999):

1. Decreasing the accommodation and living problems of university students (like insufficient dorms, academic failure and financial problems);
2. Decreasing cross the nation immigration;
3. Providing expert workforce for different parts of the country;
4. Guiding the candidates toward their favorite majors in their local area;
5. Providing a higher chance in local majors; and
6. Providing an adequate condition for recruiting the elites inside the province in order to increase the university quality level.

Considering the mentioned topics, the localization admission provides special bonus for the candidates of such places and increases their chance of success. On the other hand, it can make the candidates with better academic performance which have less access to the favorite majors in other provinces. Comparing and studying the academic conditions of the candidates in different parts of the nation (provinces, districts and poles) can assist authorities in better programming and having a wider scope.

Based on the discussed issues, the present study sought to consider the role of the educational background, gender, age, admission quota, and the time interval between the graduation time and taking the entrance exam in admission to universities. Furthermore, the difference in performance among the provinces, districts, and local poles are studied and it is hoped that by separating this variances, we could have a more accurate analysis of the success related to variables. As the admission to universities in Iran is based on better ranks in each of the discipline group, the following research questions were therefore addressed:

- Does the average national rank differ in various provinces?
- What is the relationship between individual level predictors (educational background, gender, age, entrance quota, and the time interval between the graduation and test's administration time) with the national rank?
- Does the average national rank of the candidates differ among local districts and poles, which are determined regarding the local provinces?

Method

Participants

The present study was an applied research because its purpose and it methodologically is descriptive-correlational. The statistical population covered all the present candidates in the exam session of 2017. Based on the reports of the National Organization of Educational Testing of Iran, 838972 candidates attended the exam out of which 497524 (59.30 %) were female and 341448 (40.70 %) were male. Math group consisted of 137,788 candidates (16.42 %); 518331 individuals attended the science group (61.78 %); 16780 attended the Humanity group (19.91 %); 9648 participated in the Art group (1.14 %) and 6125 candidates took part in the English group (0.73 %).

Procedure

After the exam's administration, the data concerning 5000 candidates covering all the field groups were randomly selected and 1000 candidates were equally assigned to each group, including males and females. As the aim of the study was to predict the ranks of the candidates based on the two-level variables (candidates and provinces), the sample size was selected according to analysis of such type of data. The presence of at least 20 groups for the 2nd level and 30 cases for each group for the educational status was recommended for the analysis (Mass & Hox, 2005; Snijder & Bosker, 2012).

Variables

Discipline group: different groups concerning the different exam subjects fell into the five groups of (1) Math, (2) Science, (3) Humanity, (4) art, and (5) English.

Two indexes of the total average of diploma and the average scores of the third year of high school were used to examine educational background.

The average score of the third year of high school: it is a score gained from the weight mean (the product of the number of final courses' units in the obtained score over the sum of final course' units) of the third grade final exam.

The total average diploma: the diploma average for both old and new educational system.

The total national rank: the maximum total score of all the subgroups for each candidate without considering the quota is adjusted in a descending order. Candidates with the same score will have the same rank (Parand, Yadegarzade & Khodaye, 2012).

The local province: the determining criteria that make a province local for candidates mentioned below:

A: If a student's diploma of the old education system (the last three years of high or art school) and for the new educational system, the last two years of high school plus pre-university were obtained from that province;

B: If a student did not study the three last years of school in the same province, his/her birthplace is considered the local province;

C: If a candidate graduates abroad, his/her birthplace is considered the local province;

D: If a student was born abroad and graduated there, Tehran is considered the local province.

The Local district: combining the neighboring provinces, a local district is made. The local districts are as follow:

Table 1.
Local districts categorization of the country

Local Districts	Subsidiary Provinces
District 1	Alborz, Tehran, Zanjan, Semnan, Qazvin, Qom, and Markazi.
District 2	West Azerbaijan, East Azerbaijan, and Ardabil.
District 3	Isfahan, Chaharmahal and Bakhtiari, and Yazd.
District 4	Sistan and Balouchestan, and Kerman.
District 5	Bushehr, Fars, Kohgilouyeh and Boyer-Ahmad, and Hormozgan.
District 6	Kordestan, Kermanshah, and Hamadan.
District 7	Ilam, Khouzestan, and Lorestan.
District 8	Razavi Khorasan, North Khorasan, and South Khorasan.
District 9	Golestan, Gilan, and Mazandaran.

Local pole: combining some districts, a local pole is made and they are as follows:

Table 2.
Local poles categorization of the country

Local Poles	Subsidiary Provinces
Pole 1	Alborz, Tehran, Zanjan, Semnan, Qazvin, Qom, Markazi, Golestan, Gilan, and Mazandaran.
Pole 2	Razavi Khorasan, North Khorasan, South Khorasan, Sistan and Balouchestan, and Kerman.
Pole 3	West Azerbaijan, East Azerbaijan, Ardabil, Kordestan, Kermanshah, and Hamadan.
Pole 4	Isfahan, Chaharmahal and Bakhtiari, Yazd, Ilam, Khouzestan, and Lorestan.
Pole 5	Bushehr, Fars, Kohgilouyeh and Boyer-Ahmad, and Hormozgan.

The entrance quota: According to the 213th act passed in the council of Supreme Council for Cultural Revolution in 1990, the graduates obtaining their degree of the last three years of school fall into three districts. Furthermore, based on their conditions they can make use of especial quota allocated for the martyr families and the disabled war veterans (25%) and militants. In this study, the candidates with such quota were placed in one group. Therefore, there are four types of quota: quota 1, 2, 3, and 4 (the martyr families, the disabled war veterans and militant).

For determining the age, the last two digits of the candidates' birth year was used; for determining the gap between graduation and attending the exam, the last two digits of graduation year was used.

For predicting the national rank of the candidates based on the two-level variables, the local province was selected as the grouping variable; the national rank (without the quota) was selected as the dependent variable. Variables of gender, age, average scores of the third year of high school, diploma average, the gap between the graduation and entrance exam along with quota were the level one variables, while the local districts and poles were considered as the level two variables.

Findings

In this study, the hierarchical linear model (multilevel linear model) was used for data analysis based on the nature of the data and their organization at two levels of students and their provinces. The multilevel analysis (here 2-level) was done through HLM 7.03 software. Before analyzing the data, for determining the descriptive statistics, bivariate correlations and testing the assumptions of multilevel model, SPSS 21 was used. The descriptive statistics are shown in the Tables 3 and the bivariate correlations in Table 4.

Table 3.
Means and standard deviations

		English group		Art group		Math group		Humanity group		Sciences group	
		n=1000									
Percentages of male and female		Male 33.8	Female 66.2	Male 20.3	Female79.7	Male 64.8	Female 35.2	Male 30.5	Female 69.5	Male 40.5	Female 59.5
Written average	M	16.66		16.66		14.95		14.22		16.66	
	SD	2.70		2.70		3.09		3.08		2.70	
Diploma average	M	17.32		16.58		17.40		16.47		18.17	
	SD	1.55		1.82		1.63		1.92		1.52	
Age	M	19.93		20.36		18.97		19.86		19.65	
	SD	3.45		3.66		1.94		4.10		2.14	
Gap between graduation and exam	M	1.55		2.19		.55		1.46		1.29	
	SD	5.93		8.91		3.47		8.40		4.58	
Total score	M	7130.29		6521.74		6108.43		6453.53		7426.43	
	SD	1166		1357.04		1584.10		1533.95		1588.23	

Table 4.
Bivariate correlations between study variables

Group	Variable	1. Average scores of the third year of high school	2. Diploma average	3. Total score	4. Age	5. Gap between graduation and exam	Group	1. Average scores of the third year of high school	2. Diploma average	3. Total score	4. Age	5. Gap between graduation and exam
Science group	1	1					Art group	1				
	2	.88	1					.77**	1			
	3	.71	.61**	1				.44**	.45**	1		
	4	.16**	.23**	.09**	1			.13**	.23**	.08**	1	
	5	.71**	.23**	.07	.72**	*1*		.06	.06	.06	.60**	1
Humanity group	1	1					English group	1				
	2	.86**	1					.81**	1			
	3	.71**	.67**	1				.41**	.37**	1		
	4	.13	.20**	.15**	1			.07**	.22**	.04	1	
	5	.05	.12**	.07*	.69**	1		.05	.14**	-.01	.75**	1
Math group	1	1										
	2	.86**	1									
	3	.77**	.68**	1								
	4	.14**	.20**	.13**	1							
	5	.07*	.15**	.06*	.73**	1						

$P<.05^{*}$, $p<.01^{**}$

The content of the bivariate correlation table shows that there is a significant relationship between most of the variables and that some of the correlation coefficients (.06, .07, .08, .09), even though small, are significant which is due to a large sample size (n=1000).

In order to use the multilevel analysis, certain assumptions needed to be checked (Field, 2013; Tabachnick & Fidel, 2013). The following assumptions were checked: normal distribution of the outcome variable, univariate, and multivariate normality of predictors, independence of errors, multiple homoscedasticity, and singularity, statistically significance relationships between most of the variables.

After investigating the assumptions, the multilevel analysis with full maximum likelihood method was used in order to answer the questions of the study.

To answer the question, “is the average national rank different in various provinces?” the null model with designating the national rank as the outcome variable was conducted. The null model, also called the unconditional model, intercept-only model or one-way ANOVA with random effects serves two purposes:

(1) It is the basis for calculating the Intraclass Correlation Coefficient (ICC), which is the usual test of whether multilevel modeling is appropriate and needed.

When ICC approaches is little, there is not significant difference between groups in terms of dependent variable and we can analyze the data at the individual (first) level (Garson, 2013; Tabachnick & Fidell, 2013).

The ICC is calculated through the following formula (which is different for various field groups):

$$\rho = \tau_{00}/(\tau_{00} + \sigma^2)$$

Math experimental group	113445189. (113445189+863220367) = .1161
Science experimental group	107532537. (107532537+8615265362) = .0123
Humanity experimental group	92801110. (92801110+1486273369) = .0587
Art experimental group	18669353. (18669353+115959460) = .1386
English experimental group	17206343. (17206343+243247734) = .0660

These indicated that in the Math group 11.61 %, in Humanity 5.87%, in Art 13.86 % and in the English group 6.60 % of the national rank’s total variance was attributed to the provinces. For the Science group this coefficient is 1.23%, which shows there is not a significant difference among the provinces for the national rank. Because of trivial amount of ICC in this field group, the hierarchal model is not appropriate (Garson, 2013) and the data should be analyzed individually. Therefore, this study used a simple linear regression to predict the national rank of the Science group. Insignificance of the between and within group variance in this group also makes the use of multilevel analysis impossible. These variances were significant for the other groups (Tables 7, 8, 9, and 10).

(2) It outputs the statistic (-2LL) which will be used as a baseline for comparing later, complex models. The index value for the Math group 23457.059; for the Humanity group 23987.157; for the Art group 21454.868 and for the English group 22178.483 and estimated parameters was obtained 3.

In order to answer, “what is the relationship between individual level predictors (gender, age, entrance quota, the average scores of the third year of high school, the total average of diploma and the gap between the graduation and exam time) and the national rank?”, the random intercept model with first level predictors was run. Since there was no hypothesis concerning the difference between provinces and the predictors, the slopes were considered fix. In this model, all the variables are entered to the equation through grand-mean-centered method. The results are shown in Table 7, 8, 9, and 10.

In the Math group, the average scores of the third year of high school (B=-68.594, p<0.001) and the diploma average (B=-21.947, p<0.01) had a significant and negative relationship with the national rank, meaning that the higher the average scores of the third year of high school and diploma averages were, the better ranks were acquired. The average national rank in the four entrance quotas were significantly different (B=1959.724, p<0.001). The male candidates (code 1) gained a better national rank than the females (code 0) (B=-8144.203, p<0.001). According to the Snijder Bosker formula (1999, pp. 102-103), it can be concluded in Math group the written average, the total average, the entrance quota and gender explained 58.44 percent of the national rank variance in level one.

$$R_1^2 = 1 - \frac{\sigma^2(full) + \tau_0^2(full)}{\sigma^2(null) + \tau_0^2(null)}$$

$$1 - \frac{331271536 + 32281479}{8863220367 + 11344518} = .5844$$

Furthermore, in the Humanity group there was a significant and negative relationship between the average scores of the third year of high school (B=-61.69, p<0.001) and total average of the candidates (B=-52.313, p<0.001) and their national rank. There was no significant difference between the quota and the national rank (B=-130.220, p>0.05). Furthermore, male candidates had better ranks compared to the female candidates (B=-2564.144, p<0.001). According to the mentioned formula, the average scores of the third year of high school, the total average, and gender explained the 49.22 percent of the national rank variance at level one.

In the Art group, between the written and the total average only the latter predicted their national rank (B=-20.053, p<0.001). The average national rank with different entrance quota was different and significant (B=-1236.273, p<0.001). In addition, the male candidates gained better national rank than the females (B=-2706.522, p<0.001). The diploma’s total average, the entrance quota, and gender explained 15.8 percent of the national rank variance at level one.

In the Art group only the total average of diploma was a predictor for the national rank (B=-20.053, p<0.001). The average of national rank of candidates had a significant relationship with the entrance quotas (B=1236.273, p<0.001). In addition, male candidates had better national ranks compared to female candidates (B=-2706.522, p<0.001). Total average of diploma, entrance quota, and gender altogether determined 15.8 percent of national rank variance in level one.

In the English group both the average scores of the third year of high school (B=-14.591, p<0.001) and total average (B=-16.966, p<0.01) could predict the national rank. The average national rank in the four entrance quotas had a significant difference (B=6154.522, p<0.001). Here, males outperformed the females in national rank (B=-2564.144, p<0.001). In this group, the average scores of the third year of high school, the diploma’s total average, the entrance quota, and gender explained the 31.45 percent of the whole national rank variance.

In none of the groups was there any relationship between the graduation time and age with the national rank in any of the groups (Tables 7, 8, 9, and 10).

The difference of -2LL was significant in all groups which showed that the model one had improved in all field groups compared to the null model, meaning that the predictability of the national rank of candidates with the predictors of level one was significantly better than the predictability based on chance.

For answering the question “Is the average national rank of the candidates different among local districts and poles which are determined by the local provinces?”, the intercepts as outcome model was run. The interaction effects were not studied in this research. The local districts and poles variables were separately entered the equation with level one predictors. Predictors are centered at their grand-mean (since the candidates are nested within provincial group and the provinces nested the local districts and poles, it can be said that provinces are level two and districts and poles level three. However, there were 5 poles and 9 local districts, that considered a constant predictor at level 2 instead of level 3 analysis).

The results show that in the Humanity group, only in local district, the average national rank was different and the model with local districts had an -2LL index lower than model with predictors of level one ($\Delta\chi^2$.Δdf= 6.110, $p<0.05$). In this group, the local districts explained the 74.16 percent of the total national rank variance at provincial level based on the Snijder and Bosker formula (1999, pp. 102-103).

$$R_2^2 = 1 - \frac{\sigma^2(full).B + \tau_0^2(full)}{\sigma^2(null).B + \tau_0^2(null)}$$

$$1 - \frac{783138092.32 + 11520113}{1486273369.32 + 92801110} = .7416$$

In other groups, in both poles and local districts the average national rank was different. In these groups, both models of local poles and local districts had a -2LL coefficient less than model one. The local districts in Math group explained 75.03 percent, in English group 88.69 percent, in Art group 62.18 percent of the national rank variance at the provincial level. This percentage for local poles in the Math group was 77.10, for English group 87.28 and for the Art group was 62.90 percent.

Since the within and between group variance was not significant for Science group, the multiple regression was used in order to predict the national rank of the candidates based on variables like the total average, average scores of the third year of high school, age, and graduation year which is shown in Table 5 and 6.

Table 5.
Results of Multiple Regression

Model	SS	df	MS	F	sig	R	R^2	A.R	Durbin-Watson Statistic
Regression	4396465356165	4	1099116339041	251.362	0.001	0.709	0.503	0.501	1.994
Residual	4350779331710	995	4372642544						
Total	8747244687876	999							

Predictors: (Constant), Gap between graduation and exam, Written average, Diploma average, Age.
Dependent Variable: National rank

Table 6.
Coefficients

Model	Unstandardized coefficients		Standardized coefficients	t	Sig	Collinearity Statistics	
	b	Std. Error	Beta			Tolerance	VIF
Constant	437686.875	78244.710		5.594	0.001		
Gap between graduation and exam	-860.794	669.585	0.042	-1.286	0.199	0.465	2.149
Average score of the third year of high school	-247.060	16.966	-0.717	-14.562	0.001	0.206	4.849
Diploma average	4.341	30.756	0.007	0.141	0.888	0.200	5.010
Age	1855.643	1431.320	0.042	1.296	0.195	0.466	2.145

The Table 6 shows that only the average scores of the third year of high school can predict the national rank in this field group (B=-0.717, p=0.001).

Table 7.
Model estimates for the two-level analyses in the Math group

	Null model B (SE)	Model 1 B (SE)	Model 2 B (SE)	Model 3 B (SE)
Fixed effects				
Intercept	49885.079*** (2276.566)	44730.478*** (1297.710)	44972.772*** (1144.780)	44962.477*** (1191.177)
Level 1				
Gender		-8144.703*** (1245.618)	-8132.057*** (1245.334)	-8157.214*** (1245.631)
Age		-301.507 (449.528)	-259.788 (449.147)	-289.747 (449.215)
quota		1959.724*** (655.671)	1954.657*** (647.278)	1805.333** (654.202)
Written average		-68.594*** (3.883)	-68.500*** (3.879)	-68.313 (3.886)
Diploma average		-21.947** (7.394)	-21.327** (7.387)	-21.682** (7.390)
Gap between graduation and exam		134.879 (251.071)	106.294 (250.549)	142.886 (250.785)
Level 2				
Ecological poles			2104.886** (811.520)	
Ecological districts				882.456* (432.785)
Random effects				
Level-2 variance	113445189.301 (10651.065)	32281479.048 (5681.679)	21802506.816 (4669.315)	24705069.186 (4970.419)
Level-1 variance	863220367.891 (29380.612)	331271536.472 (18200.866)	331760735.540 (18214.300)	331731152.285 (18213.488)
df	30	30	29	29
χ^2	166.675	99.839	93.855	97.193
p	0.001	0.001	0.001	0.001
Model fit				
Deviance (-2LL)	23457.059	22493.032	22487.094	22489.244
Number of estimated parameters	3	9	10	10
χ^2		964.026	5.938	3.788
df		6	1	1
p		<0.001	<0.01	<0.05
Reliability estimate	0.707	0.648	0.565	0.592

$p<0.05^{*}$, $p<0.01^{**}$, $p<0.001^{***}$

Table 8.
Model estimates for the two-level analyses in the Humanity group

	Null model B (SE)	Model 1 B (SE)	Model 2 B (SE)	Model 3 B (SE)
Fixed effects				
Intercept	46632.993*** (2281.067)	46561.698*** (1255.145)	46749.459*** (1080.101)	46913.626*** (1165.692)
Level 1				
Gender		-7564.144*** (1996.091)	-7728.131*** (1454.838)	-7695.600*** (1990.906)
Age		-467.298 (308.147)	-453.634 (321.080)	-463.370 (370.240)

	Null model B (SE)	Model 1 B (SE)	Model 2 B (SE)	Model 3 B (SE)
Quota		-130.220 (860.781)	-58.775 (816.178)	-545.541 (864.920)
Written average		-61.169*** (6.003)	-62.116*** (7.162)	-58.993*** (6.044)
Diploma average		-52.313*** (9.568)	-51.338*** (10.164)	-54.163*** (9.567)
Gap between graduation and exam		113.082 (148.635)	100.248 (165.869)	125.703 (148.459)
Level 2				
Ecological poles			-1437.488 (835.590)	
Ecological districts				1205.979* (480.408)
Random effects				
Level-2 variance	92801110.820 (9633.333)	16665244.450 (4082.308)	10185596.380 (3191.488)	11520113.241 (3394.129)
Level-1 variance	1486273369.051 (38552.216)	785223101.558 (28021.832)	786780355.854 (28049.605)	783138092.396 (27984.604)
df	30	30	29	29
χ^2	86.094	52.704	45.435	45.934
p	0.001	0.007	0.026	0.024
Model fit				
Deviance (-2LL)	23987.157	23333.709	23331.105	23327.599
Number of estimated parameters	3	9	10	10
χ^2		653.447	2.603	6.110
df		6	1	1
p		<0.001	0.102	0.013
Reliability estimate	0.575	0.345	0.254	0.276

$p<0.05^{*}$, $p<0.01^{**}$, $p<0.001^{***}$

Table 8.
Model estimates for the two-level analyses in the Art group

	Null model B (SE)	Model 1 B (SE)	Model 2 B (SE)	Model 3 B (SE)
Fixed effects				
Intercept	13221.294*** (897.089)	12464.184*** (718.688)	12465.272*** (571.867)	12452.642*** (577.289)
Level 1				
Gender		-2706.572*** (836.945)	-2715.370*** (835.412)	-2689.332*** (835.846)
Age		174.373 (113.621)	173.886 (113.434)	175.546 (113.460)
Quota		1236.273*** (377.864)	1269.023*** (373.620)	1237.498*** (373.960)
Written average		-1.463 (1.722)	-1.32 (1.715)	-1.056 (1.721)
Diploma average		-20.053*** (2.904)	-20.064*** (2.891)	-20.262*** (2.892)
Gap between graduation and exam		43.498 (45.972)	100.248 (165.869)	125.703 (148.459)
Level 2				
Ecological poles			-1479.336 (373.994)	
Ecological districts				810.547*** (212.627)

	Null model B (SE)	Model 1 B (SE)	Model 2 B (SE)	Model 3 B (SE)
Random effects				
Level-2 variance	18669353.234 (4320.804)	10409878.272 (3226.434)	5047465.102 (2246.656)	5213754.435 (2283.364)
Level-1 variance	115959460.421 (10768.447)	103026068.042 (10150.175)	103211248.772 (10159.293)	103235781.243 (10160.501)
Df	30	30	29	29
χ^2	280.384	158.044	75.444	75.985
P	0.001	0.001	0.001	0.001
Model fit				
Deviance (-2LL)	21454.868	21326.421	21315.054	21315.800
Number of estimated parameters	3	9	10	10
χ^2		128.446	11.367	10.621
Df		6	1	1
P		<0.001	0.001	0.002
Reliability estimate	0.748	0.662	0.508	0.515

$p<0.05^{*}$, $p<0.01^{**}$, $p<0.001^{***}$

Table 9.
Model estimates for the two-level analyses in the English group

	Null model B (SE)	Model 1 B (SE)	Model 2 B (SE)	Model 3 B (SE)
Fixed effects				
Intercept	20538.016^{***} (975.695)	19426.831^{***} (886.552)	19745.710^{***} (831.827)	19815.222^{***} (787.756)
Level 1				
Gender		-4787.898^{***} (766.739)	-4861.665^{***} (912.328)	-4850.804^{***} (910.888)
Age		-127.866 (136.892)	-139.888 (185.088)	-133.318 (184.857)
Quota		6154.522^{***} (421.684)	6152.436^{***} (420.901)	6119.300^{***} (420.158)
Written average		-14.591^{***} (2.771)	-14.613^{***} (2.762)	-14.997^{***} (2.764)
Diploma average		-16.966^{***} (4.807)	-17.091^{***} (4.759)	-16.322^{***} (4.765)
Gap between graduation and exam		116.709 (103.582)	117.379 (104.226)	116.173 (104.175)
Level 2				
Ecological poles			1256.776^{*} (686.160)	
Ecological districts				935.834^{**} (309.034)
Random effects				
Level-2 variance	17206343.131 (4148.052)	15571110.653 (3946.024)	12771358.284 (3573.703)	10801113.598 (3286.504)
Level-1 variance	243247734.935 (15596.401)	16297838.492 (12766.312)	163047163.797 (12768.992)	162939924.838 (12764.792)
Df	30	30	29	29
χ^2	113.593	143.290	111.291	96.876
P	0.001	0.001	0.001	0.001
Model fit				
Deviance (-2LL)	22178.483	21783.738	21780.313	21776.633
Number of estimated parameters	3	9	10	10
χ^2		394.744	4.181	7.861

Df		6	1	1
P		<0.001	0.038	0.005
Reliability estimate	0.583	0.644	0.604	0.569

$p<0.05^{*}$, $p<0.01^{**}$, $p<0.001^{***}$

Discussion and Conclusion

The aim of the present study was to investigate the effective factors in the academic rank of the candidates in the national entrance exam of universities and higher education institutes in Iran through a multilevel analysis. Results showed that in the Math group 11.61 percent, in the Humanity group 5.87 percent, in the Art group 13.86 percent and in the English group 6.60 percent of the rank's variance belonged to provinces. That is to say, due to the average national rank in these field groups there was a significant difference among the provinces. The average national rank was also significantly different in different quotas, ecological districts, and poles.

It seems that due to the remarkable success after the Islamic revolution in expanding the quantity of education all around the nation especially in underprivileged area, there is a remarkable inequality in educational opportunities. The results of copious research carried out in this respect confirm these findings. For example, Daryanastaneh, Tahmasebi, and Rezaei (2016) study on inequality pattern analysis in educational environment confirmed that the cities located in the borderlines have fewer facilities and this lack of equality is more outstanding in southern parts of Iran like Bushehr and Sistan-Balouchestan. Heidarzadeqan and Sandooqdaran (2017) study on educational facilities of Sistan-Balouchestan showed that the index of education, utilizing educational environment index, the rate of accumulation and distribution of teachers in elementary, middle and high schools had unfavorable conditions and educational opportunities are not fair. According to Karimian Bostani (2011); Esmaeilsorkh (2001; 2007) and Dashkhaneh (2001) there is a lack of equality in urban and rural, ethical and bilingual areas, gender, and social class when it comes to educational facilities. All of these researches indicated the fact that the underprivileged areas have urgent need for better planning and policies.

In Science group, the intraclass correlation coefficient was 0.0123, meaning that 1.23 percent of the national rank variance was among provinces and 98.78 percent was among the candidates. Therefore, there was a trivial difference between the average national ranks among the provinces. Since 61.78 percent (518331 candidates out of 838972) of the candidates attending the entrance exam belonged to the Science group, it seems that the competition in this group is harder and it has influenced the affectability pattern of the national rank based on the related variables making it different from the other groups. The overwhelming participation of the candidates in the Science group and the hope to be accepted into medical majors, because of the better vocational status, in one hand and the capacity limitation of acceptation in medical majors in the other hand disappoints a remarkable percentage of candidates, which can bear mental, social, and economical consequences. Educational and vocational counselling and guidance based on aptitude, abilities, personality types, and available opportunities in the line with making vocational opportunities and developing market demands seemed to be a necessary in order to overcome the issues.

Results also showed that in the Math group, the average score of the third year of high school, the total average of diploma, the entrance quota and gender determined 58.44 percent. In the Humanity group, the average scores of the third year of high school, the total average, and gender composed 49.22 percent of total variance. In the Art group, the total average, the entrance quota and gender composed 15.8 percent; and finally in the English group the average scores of the third year of high school, the total average, the entrance quota, and gender composed 31.45 percent of the whole variance of the national rank variance at level one.

The affectability of educational background in succeeding in the entrance exam has never been a fart-fetched idea and different researches such as Khodaye (2009a; 2009b); Noqani, Ahanchian, and Rafiei (2011); and Khodaye et al. (2017) have approved it. However, males' outperformance in all field groups needs to be taken into account and seeks further research. Other researches like Khodaye (2009a; 2009b) and Khodaye et al. (2017) showed that such a difference existed in the national entrance exam. Since researches have shown that male and female students have no significant difference in IQ and cognitive abilities (Jacobs, 2005; Mickelson, 1989), we should consider the role of other factors in determining the difference in their performance. Hannon (2012) concluded the high-stake testing appears not to be a conducive assessment format for many female students since they experience a high level of test anxiety. Hannon (2012) suggested that the test anxiety and performance-avoidance goals (avoidance from looking inefficient and unable to others) accounted for all of the gender difference in SAT scores and all the gender differences in scores are as a result of social and learning factors.

Data from Trends in International Mathematics and Science Study (TIMSS) and the Programme for International Students Assessment (PISA) have shown a wide range in cross-national variability in gender gaps in STEM[1] (Else-Quest, et al., 2010). Gender equity, in terms of female school enrollment numbers, women's share of research jobs, and parliamentary representation was the most powerful predictor for these persistent differences.

Yoo (2017) studying the effective factors modelling on gender differences in math development has also suggested that increasing involvement in mathematics education and providing positive reinforcement to raise girls' self-confidence in mathematics by parents and teachers should be an integral part of any initiative to reduce gender gap in mathematics achievement.

Furthermore, some studies (Britner, 2007; Santrock, 2008; Saunders, Davis, Williams, & Williams, 2004) have stated that while males and females perform alike, girls obtain higher scores in class while boys do better in formal tests. Further researches especially with regard to motivational factors, beliefs, goals, and social-cultural factors such as gender stereotype can shed light on the differences on performance in the university entrance exam in Iran.

References

1. Alkhadrawi, A. A. (2015). *Gender differences in math and science choices and preferences.* Theses and Dissertations.
2. Azen, R., Bronner, S., & Gafni, N. (2002). Examination of gender bias in university admissions. *Applied Measurement in Education, 15*(1), 75-94.
3. Bahrami, F., & Mokhtari, A. (2005). Factors affecting academic success of junior high school students with acute family problems in Isfahan. *Counseling Research & Developments*, 14, 41-54. (in Persian)
4. Becker, B. J. (1989). Gender and science achievement: A reanalysis of studies from two meta-analyses. *Journal of Research in Science Teaching, 26*(2), 141-169.
5. Bozorgi, A. (2000). *Exploring the success factors of high school students of Bandpi in the university entrance exam and literature Olympiad from the perspective of students, teachers and admitted.* Master's thesis. Islamic Azad University (Surrey). (in Persian)
6. Britner, S. L. (2008). Motivation in high school science students: A comparison of gender differences in life, physics, and earth science classes. *Journal of Research in Science Teaching, 45*(8), 955–970.
7. Bronfenbrenner, U. (1979). *The ecology of human development.* Cambridge. MA: Harvard.
8. Bronfenbrenner, U. (2001). The bioecological theory of human development. In N. J. Smelser & P. B. Baltes (Eds.), *International encyclopedia of the social and behavioral sciences* (Vol. 10, pp. 6963–6970). New York: Elsevier.
9. Bronfenbrenner, U., & Morris, P. A. (2008). The Bioecological Model of Human Development. In W. Damon & R. M. Lerner (Eds.), *Handbook of child psychology* (Vol. 1). New Jersey: John Wiley & Sons.
10. Daryanastaneh, A., Tahmasebi, S., & Rezai, P. (2016). Analysis of unequal educational space pattern in the country. *Educational planning studies, 5* (9), 31-50. (in Persian).
11. Dashkhaneh, F. (2001). Examining Factors influencing educational inequality in general education to provide theoretical model for girls' education. *Journal of Education, 4*(68), 32-48. (in Persian)
12. Dashti, K. (1999). *Factors influencing student's success in 1999 university entrance exam*. Master's thesis. Gilan University. (in Persian)
13. Dumais, S. A. (2006). Early childhood cultural capital, parental habitus, and teachers' perceptions. *Poetics, 34*(2), 83-107.
14. Dumais, S. A., & Ward, A. (2010). Cultural capital and first-generation college success. *Poetics, 38*(3), 245-265.
15. Else-Quest, N. M., Hyde, J. S., & Linn, M. C. (2010). Cross- National patterns of gender differences in mathematics: *A meta-analysis. Psychological Bulletin, 136*(1), 103–127. Doi:10.1037.a0018053.
16. Esmailsorkh, J. (2001). Kurdistan and educational inequality. *Research and Planning in Higher Education*, 19, 143-181. (in Persian)
17. Esmailsorkh, J. (200۷). Educational inequality and space inequality in terms of ethnic and region. *Journal of Education, 23*(3), 103-124. (in Persian).
18. Garson, G.. D.. (2013). *Introductory guide to HLM with HLM 7 software.* Hierarchical linear modeling: Guide and applications, 55-96.
19. Ghalkhanbaz, F., & Khodaye, E. (2014). Impact of socioeconomic status on academic achievement of university entrance exam candidates. *Journal of Educational Measurement & Evaluation Studies, 4*(5), 55-79. (in Persian)
20. Hannon, B. (2012). Test anxiety and performance-avoidance goals explain gender differences in SAT-V, SAT-M, and overall SAT scores. *Personality and Individual Differences, 53*(7), 816–820.
21. Heidarzadegan, A., & Sandooghdaran, M. (2017). Educational opportunities for nomad's students in Sistan and Baluchestan: Equal or Unequal. *Journal of*

1 Science, Technology, Engineering, Math

Educational Planning Studies, 11(6), 159-175. (in Persian)

22. Helms, R. M. (2008). *University admission worldwide*. World Bank.
23. Jacobs, J. E. (2005). Twenty-five years of research on gender and ethnic differences in math and science career choices: What have we learned? *New directions for child and adolescent development, 2005*(110), 85-94.
24. Jamali, E. (2012). Trend of socio-economic status effect on academic performance of university entrance exam candidates during the years 2001-2009. *Iranian Higher Education, 4*(4), 25-56. (in Persian)
25. Jamali, E., & Bagiyazdel, R. (2016). The challenges of the local admission of Iran's national university entrance examination. *Iranian Higher Education, 2*(8), 1-30. (In Persian)
26. Jencks, C. (1972). *Inequality: A reassessment of the effect of family and schooling in America*.
27. Khodaye, A. (1999). *The impact of localization on chance of admission during the years 1998 to 2000.* Plans and statistics Bureau, Technical and statistics Deputy, National Organization of Educational Testing. (In Persian)
28. Khodaye, E. (2009a). The Relationship between economic and cultural capital of parents with the students chance of admission in 2006 university entrance exam. *Iranian Higher Education, 4* (1), 65-84. (In Persian)
29. Khodaye, E. (2009b). Factors influencing admission in master exam. *Research and Planning in Higher Education*, 54, 34-19. (In Persian)
30. Khodaye, E., Habibi, M., Jamali, E., Bagiyazdel, R., & Kholgi, H. (2017). Identify factors that predict academic achievement of students based on academic information of high school and university entrance examination. *Educational Measurement and Evaluation Studies, 19*(7), 7-33. (in Persian)
31. Maas, C. J., & Hox, J. J. (2005). Sufficient sample sizes for multilevel modeling. *Methodology, 1*(3), 86-92.
32. Mickelson, R. A. (1989). Why does Jane read and write so well? The anomaly of Women's achievement. *Sociology of Education*, 62, 47–63.
33. Mohammadnezhad, Y. (2004). Encyclopedia of higher education. Volume II. Tehran: Great Persian Encyclopedia Foundation. (in Persian)
34. Noqani, M. (2007). The impact of unequal Cultural capital on students' academic success. *Journal of Education*, 91, 71-101. (in Persian)
35. Noqani, M., Ahanchian, M., & Rafiei, M. (2011). The impact of economic, social and cultural capital on student's success in entrance examination. *Journal of Sociology of Education*, 1, 191-218. (in Persian)
36. Noorbakhsh, S., & Haeri, M. (2011). Sociological survey of success in entrance examination. *Higher Education, 4*(15), 33-57. (in Persian)
37. Parand, K., Yadegarzade, G., & Khodaye, E. (2012). *Major choice is future choice: Guide to Choosing College Majors*. Tehran: National Organization of Educational Testing. (in Persian)
38. Roudbari, M. (2005). *Examining frequency and factors influencing student's results in 2005 university entrance exam.* Education Organization of Sistan and Baluchestan province. (In Persian)
39. Safi, A. (2004). *Academic guide to Iran universities and higher educational institutes*. Tehran: Ravan. (In Persian)
40. Sajjadi, R. (2015). *Effective success factors of top people in the university entrance exam*. Master's thesis. Tehran University. (In Persian)
41. Sajjadi, R., Karamdoost, N., Dorrani, K., Salehi, K., & Moghaddamzadeh, A. (2017). Exploring the key success factors of top people in the university entrance exam. *Journal of Higher Education Curriculum Studies, 8*(16), 163 -190. (In Persian)
42. Santrock, J. (2008). *Educational psychology* (4th Ed.). New York: McGraw-Hill.
43. Saunders, J., Davis, L., Williams, T., & Williams, J. H. (2004). Gender Differences in Self-Perceptions and Academic Outcomes: A Study of African American High School Students. *Journal of Youth and Adolescence, 33*(1), 81–90.
44. Snijders, T. A. B., & Bosker, R. J. (2012). *Discrete dependent variables. Multilevel analysis: An introduction to basic and advanced multilevel modeling*, 304-307.
45. Snijders, T., & Bosker, R. (1999). *Multilevel analysis: An introduction to basic and applied multilevel analysis.* London: Sage.
46. Sobhaninezhad, M., Shahhoseini, N., & Khodabandeh-oveyli, A. (2014). Factors influencing Yazd province student success in getting top rank in university entrance exam during the years 2005-2008. *Educational planning studies, 2*(3), 199-234. (in Persian)
47. Steinberg, L., Dornbusch, S. M., & Brown, B. B. (1992). Ethnic differences in adolescent achievement: An ecological perspective. *American psychologist, 47*(6), 7-23.
48. Steinkamp, M. W., & Maehr, M. L. (1983). Affect, ability, and science achievement: A quantitative synthesis of correlational research. *Review of Educational Research, 53*(3), 369-396.
49. Tabatabaieyazdi, M. (2006). *Studying increasing trends of female students and factors influencing this trend*. Master's thesis. Islamic Azad University (Roodehen). (in Persian)
50. Willingham, W. W., & Cole, N. S. (2013). *Gender and fair assessment*. Routledge.
51. Yoo, Y. S. (2017). Modelling of factors influencing gender difference in mathematics achievement using TIMSS 2011 data for Singaporean eighth grade students. *Asia Pacific Journal of Education*, 1-14.