Students' Risk Attitudes in College Choice Game under Information Constraint

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Abstract

From the viewpoint of game method, an empirical study on Chinese students' risk attitudes in college choice behavior was done in order to see in what ways students choose in the game of college choice. An experiment simulated the application course was carried out ten times in ten different groups of ten students to find the strategy space of students. According to the data got in the experiment, conclusions are drawn that students' risk attitudes change with their rankings of scores, and students are more risky when they make decisions on small ratio matters, while more risk-aversive on big ratio matters.

Keywords: Information Constraint, risk attitudes, College Choice, Game

1. Game Exists in Students' College Choices for Maximum Benefits

Game theory focuses on the rational individuals' interaction and decision-making behavior.

We can model the college choice behavior of individuals on the basis of a utility maximization framework in a multinomial choice model. Let θ_i represent a high school graduate i with a certain score got in the entrance exam to university. Let Θ_i stand for the collection of all students. Suppose $\{\theta_i\}_{i=1}^{n}$ comes from an objective contribution function $P(\theta_i, \cdots, \theta_n)$. Let $\theta_{-i}=(\theta_i, \cdots, \theta_{-1}, \theta_{+1}\cdots, \theta_n)$ represent all students except i. Since it's impossible for students to get complete information in the application course to go to college, and all students apply at the same time, it's an incomplete information static Bayesian game. Since whether students can go to college and which colleges they can go to are up to the students' scores (θ_i) got in the National Entrance Exam, their scores decide the range of their application choices, that is to say, their scores which will be used as payment in the market of higher education decide their strategy space S_i, which is the same to their action space A_i. Students base their choices on their scores within the strategy space S_i. Therefore, let $A_i(\theta_i)$ indicate student i's score-contingent action space, a_i stands for a certain application action of student i, $u_i(a_i, a_{-i}; \theta_i)$ represents the utility function of individual i, the strategy model of a static Bayesian game of n participating people is shown in the following: a collection of students $\Theta_1, \cdots, \Theta_n$, with conditional ratio $p_1, \cdots, p_n$, score-contingent strategy space $A_i(\theta_i), \cdots, A_n(\theta_n)$, and score-contingent payment function $u_1(a_i, a_{-1}; \theta_i), \cdots, u_n(a_1, \cdots, a_n; \theta_n)$. Student i knows his score, $\theta \in \Theta_1$, conditional function $p_i=p_i(\theta_{-i}|\theta_i)$

describes the uncertainties of the relationship between student i (with a given θ_i)and other competitors. The game is then given by G={A_1, …, A_n ; θ_1 , … , θ_n ; P_1 , …P_n ; U_1, …U_n, }. [1]

In the last ten years, the acceptance rate of universities and colleges is around 70%, as seen in the following chart.

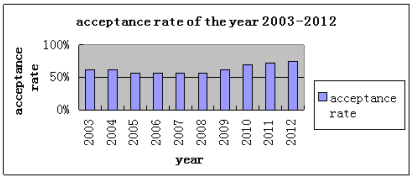

Chart 1. the acceptance rate of the year 2003-2012

Note: statistics comes from "acceptance rate of the National Entrance Exam to College of the past years" http://wenku.baidu.com/view/85108d0290c69ec3d5bb75b1.html

In this game, the proper choice increases the possibility of getting the first and true choice, while improper risk-aversion or risky action will make them lose.

2. Information constraint exist in students' college choice

In the process of application, there exists asymmetric information, such as information about major establishment, quality of education, job prospects of graduates. The information students can get in the application process will be limited and constrained by many kinds of social factors. The first is the uncertainty of individuals' preferences. The scores of students can be regarded as their payments. Since the supply of university resources can't satisfy the demand for them, the payment function will change with the demand function. The more students want to get into some universities or majors, the higher the payment (scores of students) will be. However, it's impossible for students to forecast before their choices about how many other people prefer to choose the university and the major they like, or the scores of the competitors, the demand function is uncertain and can't be observed. The second reason is that people's ability in processing information is limited. The third lies in the cost of information search. The complicated situation leads to insufficient information in application course. Students are unwilling to spend much time and money in information search because of the uncertainty which makes the energy, the time and the money spent on information search become sunk cost easily. Therefore, the students' final decisions become the game of choice behavior under the constraint of information.

3. An Empirical Study on Students' Risk Attitudes in the game of Choice Behavior

The purpose of the experiment is to see the preferences of students' choices and make analysis of their risk attitudes after getting their action space and strategy space A_i （θ_i） . The data on student choices and other characteristics are derived from an experiment of college choice game behavior, which was carried out among the university students in Qingdao University. Since there are many similar characteristics among Chinese university students such as age, past education experience and so on, their choice behavior can be regarded as typical students' choice behavior. In China, around 70% of all students who take part in the entrance exam to university will get their enrollment chances, and the left will choose to try again the next year or to give up. Therefore, the choice behavior is really important to the final result.

3.1 Data and Variables

The students' risk attitudes in their choice behavior in application are studied in the following empirical study.

First, make evaluation of all universities and majors with method of combined evaluation about the education quality, reputation, teachers' qualification, major establishment, geographical location, number of enrollments, scores for previous enrollments, prospects of graduates and so on. Then, after simplifying the index, decide the weights, calculate the quantitative index and get non-dimensional quantities.

Make classifications of universities and majors. Let X_1 stand for the universities and majors of the top 10%, X_2 stand for the top 10% to 20% universities and majors and so on, until X_{10} stand for universities and majors of the last 10%. Let Y stand for the students within different score ranking. Let Y_1 stand for the top 10% ranking of students, Y_2 stand for the students with scores from top 10% to 20% and so on, until Y_{10} stand for the last 10% students. Altogether about 70% of all candidates will get the enrollment chances. Those candidates who choose well will win while those who choose improperly will lose.

3.2 Results and Analysis

The students' strategy space S_i is shown in the following table 1.

Table 1: Students' strategy space based on their scores

	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10
Y1	78	91	51	29	18	9				
Y2	41	92	89	31	22	19				
Y3	1	61	78	90	89	28	8			
Y4		9	28	51	91	42	9	7		
Y5		8	19	49	72	89	31	21		
Y6					41	72	73	33		
Y7					21	62	91	48	19	
Y8							30	81	43	41
Y9							32	63	61	59
Y10							8	72	89	92

Results show that students' risk attitudes vary with their different rankings in scores.

In the investigation carried out at the same time in the experiment on students' willingness to get information, the results show that students' information search behavior decreases with the lowering down of the possibility to go to college, as seen in table 2.

Table 2: students' willingness to search information

	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10
Y1	100	100	91	9	0	0	0	0	0	0
Y2	100	100	100	51	9	0	0	0	0	0
Y3	89	99	100	92	43	0	0	0	0	0
Y4	19	58	98	100	91	11	0	0	0	0
Y5	9	28	87	100	92	83	10	0	0	0
Y6	8	11	19	63	84	72	58	0	0	0
Y7	0	0	19	28	61	83	80	42	0	0
Y8	0	0	0	11	31	52	78	81	28	0
Y9	0	0	0	0	12	78	57	72	61	31
Y10	0	0	0	0	0	7	39	69	70	51

From the table, facts can be found that students are more willing to spend more time and energy when their scores are high which means the possibility to go to college is high, while unwilling to spend much when their scores are low. However, the amount of information is very important in their decision-making.

According to the formula of the amount of information, the amount of information will reach its maximum when

$$H_{\max} = -\sum_{i=1}^{n} P(X_i)\log P(X_i) \quad [2]$$

The more information they get, the more rational their decisions may be. An analysis is made according to the data of college choice behavior.

Students of the top 30% appeared to be risk-aversive when they choose universities and majors. For them, it's a probability of large events to get the chances, but they tend to be more risk-aversive, as shown in the following chart.

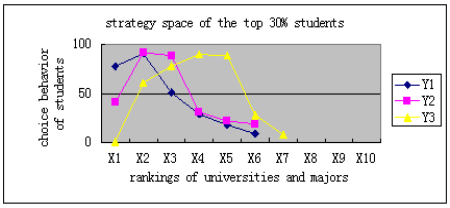

Chart 2: strategy space of the top 30% students

At the same time, they're more willing to spend money and time to get more information as shown in the above table2.

The students with the rankings from 30% to 70% appeared to be very rational in choosing universities and majors. For them, they have the probability to go to college, but it's an art to choose. They are neither very risky nor very risk-aversive in choosing universities and majors. Their choices fall into the possible range of choices.

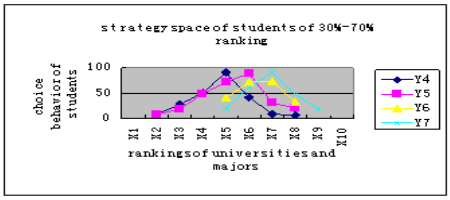

Chart 3: strategy space of student rankings from 30% to 70%

The last 30% ranking of students appeared to be risk lovers. In fact, it's a small ratio matter for them to win since the acceptance rate is around 70%. If they choose lower, say, to choose universities and majors of the ranking after 90%, they may possibly win. However, their action space doesn't show they are willing to do that.

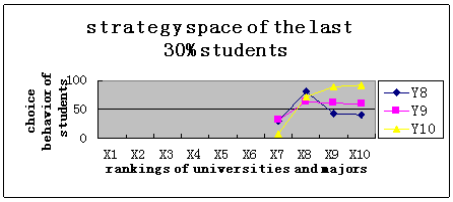

Chart 4: strategy space of the last 30% students

The strategy space of the last 30% students shows that their choices fall within the range from 60% to after 90%.

In fact, the students of the last 30% only have limited chances to go to college. Whether they can win is a matter of luck to a large degree. Although they know it's a small ratio matter for them to win, there are still some students who are willing to try their luck. Their strategy space shows that they seem to believe the law of small numbers and they are willing to take risky action. At the same time, the information search behavior results show that they are unwilling to spend much in information search, which worsen their decision-making situation and make it more difficult for them to make rational decisions.

4. Conclusions

According to the data got from the experiment, two conclusions were drawn.

Conclusion 1: Students' risk attitudes change with their rankings of scores.

Conclusion 2: When students make decisions in the game of college choice, they follow the law of large numbers and they are more risk-aversive if the possibility to win chances to go to college is high, while follow the law of small numbers and become risk lovers if the possibility is low and they probably lose. .

References

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[2] WU Jiapei, XIE Kang, WANG Mingming, *"Informtion .Economics"* , Higher Education Press,June, 2002 pp226