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The Relationship between Deadline Setting and Students' Time Preferences

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Abstract

Research on the application of Quasi-hyperbolic Discounting Model in behavioral economics has been a hot area, but there is not much information on its application at the secondary school level. In this article, the author mainly explores several influencing factors of students' time preference, including gender, degree of self-controlling under free condition and degree of self-controlling under teacher's mandatory, collects data through paper interview papers and uses T-test to analyze method and analysis of averages to analyze the results. In the result, it is found that there is a relationship between the student's self-discipline and the delta parameter in the student's time preference. Due to practical limitations and a small sample size, this conclusion cannot use the analysis method suitable for large sample size analysis. Therefore, the conclusion drawn may be slightly biased, and later research is needed.

Keywords

Deadline; Behavioral Economics; High School; Homework; Time Preferences.

1. Introduction

In the field of behavioral economics, the research and application of time preference have always been a big topic. From the Discounted Utility model of time preference (Samuelson, 1937) to the Hyperbolic Discount Model of time preference (Mazur & Coe, 1987) to the Quasi-hyperbolic Discount Model (Laibson, 1997) that further modified it, the research tools of time preference have become mature, like Diamond's research in 2000 about retirement (Diamond & Koszegi, 2000).

However, the authors note that the application of the Quasi-Hyperbolic Discount Model in the middle school stage is not too much. This is undoubtedly a gap in the research field that needs to be filled urgently. The main problems of middle school students in terms of time preference are mainly reflected in the setting of deadlines for homework and the procrastination before that, which is a very realistic problem. In addition, the minds of middle school students are relatively young, and the choice of time preference may be somewhat different. Therefore, it is of great significance to explore the influencing factors for further exploring the optimal solution of the deadline setting.

In this study, the author collected a part of the time preference data, gender distribution, and self-discipline of the students in the ICC project of the Middle School Affiliated to Renmin University of China using questionnaires. The experimental method analyzes the relationship between these variables.

2. Model Setting and Experiment Design

2.1. Model Setting

For the convenience of research, this experiment is mainly based on the following two assumptions. The firsst hypothesis assumes that students' time preferences follow the Quasi-

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Hyperbolic Discounting Model (Laibson, 1997), which means students' preference follow the equation as follow:

$$u(x_0, x_1 \dots x_T) = u(x_0) + \beta[\delta u(x_1) + \cdots + \delta^T u(x_{t+T})]$$

the second hypothesis assumes that students' utility function in the Quasi-Hyperbolic Discounting Model is linear. In this situation, the equation above should be transformed into the form:

$$x_0, x_{1,} \dots x_T = x_0 + \beta(\delta x_1 + \cdots + \delta^T x_{t+T})$$

2.2. Model Setting

This experiment is carried out by the investigation. In addition, this experiment uses paper questionnaires, and the subject students complete the test paper under the supervision of the teacher, which guarantees the rigor of the answer to the test paper.

In this experiment, students' time preference is the dependent variable, and a hyperbolic discount model is used to describe students' time preferences, namely the parameters δ and β in this model. Considering that the deadline is used as a side to explore its relationship with students' time preference, two modes of the deadline will be selected as independent variables here, namely, students set the deadline freely and teachers force the deadline. In these two independent variables, the numbers 1, 2, and 3 are used to represent the students' self-discipline in this situation. In addition, the dependent variable also selected the most basic biological gender. Male was denoted as number 1, the female was denoted as number 2.

Specifically, except for the gender question in the questionnaire and the question of measuring time preference, the other questionnaire questions are set with a semester length of 16 weeks and a total number of assignments of 4 essays. The first type of question asked in the questionnaire is gender. The gender question was a choice between male and female, and the subjects were asked about their biological sex. The second type of problem is the time preference problem. The set of time preference questions is divided into two sequences. The A option of all questions in the first sequence is to get 100 RMB now, and the B option of the first sequence question is to get a few RMB in a week, the number of RMB in the option is an arithmetic sequence, the first item is 100 yuan, the last item is 200 yuan, and the tolerance is 10 yuan. Option A of all the questions in the second series is to get 100 yuan after one week, and option B of the second series of questions is to get a number of RMB after two weeks. 200 yuan, the tolerance is 10 yuan. Option A was denoted as the number 1, Option B was denoted as the number 2.

The third question of the questionnaire is to measure the self-discipline set by the students in the face of the deadline, which is divided into two specific questions. The first specific question asks the subject's choice of the deadline when they can freely set the deadline, and the second specific question asks that the subject can only choose the three kinds of deadline that the teacher is forced to choose about deadline time selection. There are three options for these two specific questions. The meanings of the three options are to put all the assignments of the four essays at the end of the semester; to place the assignments of two of the essays at the end of the term, and to place the assignments of two of the essays. The deadline is placed at the end of the term; the deadline of the four essays is distributed evenly throughout the semester. The three options represent the degree of awareness of 1, 2, and 3, respectively. The higher the number is, the higher the self-discipline nature the student has. The options for these two specific questions are the same, but the wording is slightly changed. This is to prevent the subjects from

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thinking that these two specific questions are essentially one question, to get a glimpse of the real thoughts of the subjects.

The list of the question can be seen in Appendix.

3. Model Setting and Experiment Design

3.1. Calculation of βs and δs

The final presented data is shown in the list attached at the end of the paper. Since the measurement of time preference only needs to find the change point of the option selected, all the points except the point where the option changes, that is, the point where 1 becomes 2, are stripped, and only the data of the change point is normalized. The processing of change point data is denoted here as x.y. Among them, x represents the xth sequence in which the subject chooses the turning point to appear in the time preference problem, and y represents the amount of money obtained from delayed gratification when the subject chooses the turning point. Since the turning point appears in the middle of the two questions before and after, the amount of delayed gratification represented by the turning point is the average of the amount of delayed gratification of option B in the two questions before and after. Then, according to the data of the conversion point, Quasi-Hyperbolic Discount Model is brought into the model to obtain the final data.

The transition point in the first question sequence is denoted as CPi, the transition point in the second question sequence is denoted as CPii, in this experiment, the computational approaches are as follows:

$$\delta = \frac{1}{10(CPii - 2)}$$

$$\beta = \frac{CPii - 2}{CPi - 1}$$

3.2. T-test

The analysis of the relationship between students' time preference and the degree of self-discipline under the teacher's mandatory deadline depends on the data of students' βs and δs, which has been calculated in 3.1, and the data of consciousness under the teacher's mandatory deadline, which has been represented by the number 1, 2, 3 in List 1 and List 2. The paper uses the T-test to determine whether these two variable quantities are significantly relevant.

3.2.1. The Relationship between Students' Time Preference and the Degree of Self-discipline under the Teacher'S Mandatory Deadline

Table 1. δs' T-test Cross Check in the Class of Degree of Self-discipline under Teachers' Mandatory

X/Y	Mandatory1 δ	Mandatory2 δ	Mandatory3 δ
Mandatory1 δ	None	0.2174	0.0977
Mandatory2 δ	0.4347	None	0.3134
Mandatory3 δ	0.1954	0.6268	None

When it comes to discussing the relationship between students' time preference and the degree of self-discipline under the teacher's mandatory deadline, in other words, determining the correlation between these two variable quantities, a T-test is necessary.

For analysis, the author set the data of students' indicators of time preference, βs, and δs into three parts, following the three grades of self-discipline under the teacher's mandatory deadline: 1, 2, 3, and divide the three kinds of variables according to the characteristics of

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students' consciousness into two groups and conduct t-test respectively. Fortunately, students' time preference, especially students' δs, is relevant to the self-discipline under the teacher's mandatory deadline.

Table 2. βs' T-test Cross Check in the Class of Degree of Self-discipline under Teachers' Mandatory

X/Y	Mandatory1 β	Mandatory2 β	Mandatory3 β
Mandatory1 β	None	0.5414	0.7204
Mandatory2 β	0.9172	None	0.3820
Mandatory3 β	0.5593	0.7640	None

3.2.2. The Relationship between Students' Time Preference and the Degree of Self-discipline under the Freely Choosing on Deadline

Also, a T-test is necessary for determining the relationship between students' time preference and the degree of self-discipline under the teacher's mandatory deadline. And the progress of setting the part and doing the T-test is the same as above. However, the results present information that the self-discipline under the freely choosing on deadline is not relevant to students' time preference. The detailed sheet can be seen in Appendix.

3.2.3. The Relationship between Students' Time Preferences and Students' Gender

In determining whether students' time preferences are relevant to students' gender, a T-test is also necessary. In this situation, the author discovered that students' time preferences are not relevant to students' gender. The detailed sheet can be seen in Appendix.

3.2.4. T-test Results Summary

Unfortunately, in the examination of the correlation between students' time preferences (in the form of δs and βs) and other variable quantities like gender, students' consciousness under freely choosing and teacher's mandatory, T-test reveals a fact that students' time preference has little to do with gender and performance under the freely chosen deadline, but the only bright spot is that there is a certain relationship between students' time preference and the self-discipline of deadline choice under the mandatory requirement of the teacher. In the next subsection, I will focus on the correlation between students' time preferences and self-discipline performance under teacher coercion.

3.3. The Average of Students' βs and δs

In the above, we have mentioned that there is a certain relationship between students' time preference and their self-discipline under the mandatory requirements of teachers, that is, the so-called "marginally significant". In this section, we will mainly discuss in-depth research in this area - about their averages. I divided the students' time preference data into three categories according to the complexity of the teacher's mandatory condition (graded according to 1, 2, 3), and calculated the average value of their time preference respectively. The results are as follows:

Table 3. Average of βs and δs in the Class of Degree of Self-discipline in Teacher's Mandatory

Degree of Self-discipline = x	$\bar{\beta}$s	$\bar{\delta}$s
1	0.81	0.91
2	0.85	0.91
3	0.87	0.92

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According to the above analysis data, we can find that in the β column, the value of δ increases continuously according to the degree of self-discipline of the students under the forced state of the teacher.

4. Conclusion

In this study, the author collected the time preference information of the subject students and their gender, the degree of self-discipline in the state of free setting, or the state of forced setting by the teacher using questionnaires and explored the correlation between them. The author collected 200 questionnaires, selected 71 valid samples among them, and conducted T-test and average analysis with them as samples respectively. It was found that there was a certain impact on students' preferences, and only the teacher forced the setting. The lower the level of the self-discipline of students, that is, when teachers force students to complete tasks, students with higher self-discipline tend to be more patient with long-term feedback at the time level.

There are still many deficiencies in this research in the long run. The first is that the number of valid samples collected is relatively small, which is not conducive to the correlation analysis of samples and may ultimately affect the experimental results to a certain extent. However, it is worth noting that students' δs still show marginal correlations in such a small sample, which is enough to prove part of the relationship between students' time preferences and teacher mandates. The second is that due to tool limitations, it is very likely that no potential correlation factors could be found in terms of correlation, which is a very regrettable thing.

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Appendix

Table4. Questionnaire List

Question	Options		
Your Gender	Male	Female	
Which one is your choice?	Now, ¥100	After a week, ¥100	
	Now, ¥100	After a week, ¥110	
	Now, ¥100	After a week, ¥120	
	Now, ¥100	After a week, ¥130	
	Now, ¥100	After a week, ¥140	
	Now, ¥100	After a week, ¥150	
	Now, ¥100	After a week, ¥160	
	Now, ¥100	After a week, ¥170	
	Now, ¥100	After a week, ¥180	
	Now, ¥100	After a week, ¥190	
	Now, ¥100	After a week, ¥200	
	After a week, ¥100	After 2 weeks, ¥100	
	After a week, ¥100	After 2 weeks, ¥110	
	After a week, ¥100	After 2 weeks, ¥120	
	After a week, ¥100	After 2 weeks, ¥130	
	After a week, ¥100	After 2 weeks, ¥140	
	After a week, ¥100	After 2 weeks, ¥150	
	After a week, ¥100	After 2 weeks, ¥160	
	After a week, ¥100	After 2 weeks, ¥170	
	After a week, ¥100	After 2 weeks, ¥180	
	After a week, ¥100	After 2 weeks, ¥190	
	After a week, ¥100	After 2 weeks, ¥200	
Assuming a total of 16 weeks in this semester, you need to complete 4 essays during this period, you are free to set the submission time. In this case, what kind of arrangement do you think will maximize the rate of on-time submission of your assignments?	Set all deadlines on the last day of the semester.	One article from the first week to the fourth week, one article from the fourth week to the eighth week, and so on.	Submit two papers at mid-term and the remaining two at the end of the term.
Let's say there are 16 weeks in the semester, and you'll need to complete four essays during that time. The teacher forces everyone to choose the submission time from the following three options. In this case, which of the following arrangements do you think will maximize the on-time submission rate of your assignments?	Submit two articles in week 8 and two more articles in week 16.	Submit all articles at the end of the term.	The essays are apportioned equally over the length of the semester.

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Table 5. Students' Data after Handling Critical Point

Number	Gender	Free	Pushed	Critical Point 1	Criticle Point 2
1	2	2	3	1.145	2.135
2	2	2	2	1.125	2.105
3	2	2	2	1.145	2.115
4	2	3	3	1.125	2.105
5	2	2	2	1.195	2.195
6	2	3	3	1.105	2.105
7	2	3	2	1.135	2.105
8	1	2	2	1.105	2.105
9	1	2	2	1.135	2.135
10	1	2	2	1.155	2.145
11	2	2	1	1.145	2.135
12	1	2	3	1.195	2.105
13	2	2	3	1.115	2.105
14	2	2	2	1.105	2.105
15	2	3	1	1.105	2.105
16	2	3	3	1.125	2.115
17	1	3	3	1.105	2.105
18	2	3	3	1.115	2.105
19	2	2	2	1.105	2.105
20	2	3	2	1.165	2.145
21	1	3	3	1.125	2.115
22	2	2	2	1.105	2.105
23	2	2	2	1.125	2.115
24	1	2	3	1.105	2.105
25	2	3	3	1.105	2.105
26	1	3	2	1.105	2.105
27	2	1	1	1.155	2.125
28	2	2	3	1.125	2.125
29	1	3	2	1.135	2.125
30	2	3	3	1.145	2.135
31	2	2	3	1.175	2.125
32	2	1	3	1.155	2.155
33	2	3	3	1.145	2.145
34	2	3	3	1.105	2.105
35	1	3	3	1.145	2.135
36	1	2	2	1.145	2.115
37	2	1	1	1.145	2.125
38	2	2	2	1.105	2.105
39	1	3	2	1.145	2.115
40	2	2	2	1.175	2.155
41	2	2	3	1.105	2.105
42	2	2	2	1.155	2.145
43	2	2	1	1.135	2.135
44	1	2	3	1.145	2.115
45	2	3	2	1.165	2.115
46	2	2	2	1.105	2.105

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47	1	3	3	1.105	2.105
48	1	2	1	1.155	2.145
49	1	3	3	1.155	2.135
50	2	3	1	1.145	2.145
51	1	3	1	1.145	2.105
52	2	3	3	1.105	2.105
53	2	2	2	1.125	2.105
54	1	3	3	1.145	2.135
55	1	1	1	1.105	2.105
56	1	3	3	1.105	2.105
57	1	2	2	1.105	2.105
58	2	3	3	1.125	2.105

Table 6. δs' T-test Cross Check in the Class of Degree of Self-discipline when Time Setting is Free

X/Y	**Free1 δ**	**Free2 δ**	**Free3 δ**
Free1 $\boldsymbol{\delta}$	None	0.2520	0.1086
Free2 $\boldsymbol{\delta}$	0.5041	None	0.2024
Free3 $\boldsymbol{\delta}$	0.2172	0.4047	None

Table 7. βs' T-test Cross Check in the Class of Degree of Self-discipline when Time Setting is Free

X/Y	**Free1 β**	**Free2 β**	**Free3 β**
Free1 $\boldsymbol{\beta}$	None	0.4953	0.4852
Free2 $\boldsymbol{\beta}$	0.9905	None	0.4835
Free3 $\boldsymbol{\beta}$	0.9705	0.9670	None

Table 8. δs' T-test Cross Check in the Class of Gender

X/Y	**Male δ**	**Female δ**
Male $\boldsymbol{\delta}$	None	0.6428
Female $\boldsymbol{\delta}$	0.7144	None

Table 9. βs' T-test Cross Check in the Class of Gender

X/Y	**Male β**	**Female β**
Male $\boldsymbol{\beta}$	None	0.3025
Female $\boldsymbol{\beta}$	0.6049	None