ROLES OF PARENT'S PREFERENCES AND STUDENT'S SUBJECTIVE BELIEFS ON COLLEGE DECISION

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บทบาทของความเชื่อของผู้ปกครองและนักเรียนในด้านการศึกษาต่อการเลือกเรียนในระดับอุดมศึกษา

น.ส.กันย์สินี ศิลปวาณิชย์

วิทยานิพนธ์นี้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรปริญญาเศรษฐศาสตรมหาบัณฑิต
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กันย์สินี ศิลปวาณิชย์ : บทบาทของความเชื่อของผู้ปกครองและนักเรียนในด้านการศึกษาต่อการเลือกเรียนในระดับอุดมศึกษา. (ROLES OF PARENT'S PREFERENCES AND STUDENT'S SUBJECTIVE BELIEFS ON COLLEGE DECISION) อ.ที่ปรึกษาหลัก : ผศ. ดร. พัชรสุทธิ์ สุจริตตานนท์

งานวิจัยฉบับนี้ศึกษาผลของความเชื่อผู้ปกครองและการคาดการณ์ผลตอบแทนจะส่งผลต่อการตัดสินใจในการการเรียนต่อในระดับมหาวิทยาลัย และการเลือกสาขาในระดับมหาวิทยาลัยอย่างไร โดยที่เราจะเลือกตัวเลือกที่ทำให้เกิดอรรถประโยชน์ทางด้านการศึกษาสูงที่สุด ซึ่งถูกกำหนดจากหลายปัจจัย เช่น ลักษณะบุคลิกภาพ หรือภูมิหลัง การคาดการณ์ผลตอบแทนในอนาคตและความพึงพอใจในตัวเลือกทางด้านการศึกษาที่ผู้ปกครองอยากให้บุตรเรียน

โดยงานวิจัยฉบับนี้นำแบบจำลองโลจิสติกเพื่อศึกษาถึงปัจจัยที่ส่งผลต่อการเลือกเรียนต่อในระดับมหาวิทยาลัย และแบบจำลองโลจิสติกแบบมีเงื่อนไขเพื่อศึกษาปัจจัยที่ส่งผลต่อการเลือกสาขาในระดับอุดมศึกษา จากข้อมูลแบบสำรวจนักเรียนในประเทศไทย เรื่องการให้บริการต่างๆ ในหน่วยงานราชการ จากผลการศึกษาพบว่าความพึงพอใจผู้ปกครองมีความสัมพันธ์กับตัวเลือกทางด้านการศึกษาของบุตร แต่การคาดการณ์ผลตอบแทนไม่ส่งผลต่อการตัดสินใจทางด้านตัวเลือกด้านการศึกษาอย่างมีนัยสำคัญทางสถิติ โดยการมีนโยบายที่สนับสนุนให้การสื่อสารระหว่างผู้ปกครองและบุตร และนะหว่างผู้ปกครองและอาจารย์ จะทำให้บุตรสามารถเลือกทางเลือกที่สอดคล้องกับความสามารถและความพึงพอใจได้มากยิ่งขึ้น

สาขาวิชา	เศรษฐศาสตร์	ลายมือชื่อนิสิต	....
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Kansini Sillapawanich : ROLES OF PARENT'S PREFERENCES AND STUDENT'S SUBJECTIVE BELIEFS ON COLLEGE DECISION. Advisor: Asst. Prof. PACHARASUT SUJARITTANONTA, Ph.D.

This paper investigates whether and how children’s educational choice is affected by parental preferences and perceived earnings. We assume that individuals choose college major to maximize their own utility which depends on several factors such as personal background, perceived earnings, and importantly parents’ preferences.

The study employs the “Students Survey about Services of Government in Thailand” data to study two educational choice decisions. First, whether to enroll in college. Second, conditional on college enrollment, which major to choose. Empirically, the logistic model and conditional multinomial logit model are estimated. We find strong evidence that parental preferences significantly correlate with educational choice of children, but perceived earnings have no statistically significant relationship with educational choice. Our result calls for a policy that encourages better communication among children, parents and teachers. Such policy could help children choose college major that better aligns with their preferences and ability.

Field of Study:	Economics	Student's Signature ....
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Chapter 1 : Introduction

Occupational choice is driven partly by educational choice as college enrollment, and choice of college major represent an essential human capital investment in specific occupations. However, educational choice is a complicated decision-making problem as it is an intertemporal decision associated with large uncertainty regarding future prospects. Utility that a student derives from choosing different educational choice can depend on several determinants, such as student's ability, personal background, behavioral bias (Coleman & DeLeire, 2003; Montmarquette, Cannings, & Mahseredjian, 2002; Reuben, Wiswall, & Zafar, 2017), and labor market demand.

A student's educational choices such as college enrollment, and college major choice may as well depend on other agents, such as peer (Zölitz & Feld, 2017), teachers, and most importantly parents. Indeed, parents would have an incentive to influence children's human capital because children outcomes such as educational attainment, career success, and high earning can affect the utility of parents (Attanasio, Boneva, & Rauh, 2018; Becker & Tomes, 1986). Parents want children to choose educational choice that parents desire to increase both their children outcomes and their own utility. Some parents may form such preference based on labor market information while others have a belief that high-ability students should study medicine or engineering.

Parent's preferences may affect educational choice directly under two assumptions: (1) students may not fully informed about future outcomes of college major and parents thus give advice to their children (Weinberg, 2001), and (2) parents participate in decision on college major as collective decision (Giustinelli, 2016). To maximize their aggregate utility, the family members may make a collective decision or parents may be a sole decision maker.

Also, perceived earnings may play an important role on educational choice decision. Individuals may include expected future outcome into the expected utility when making human capital investment decision. The expected future outcome would affect the opportunity cost of each alternative in educational choice. As mentioned in Attanasio and Kaufmann (2014), Kaufmann (2014), and Reuben et al. (2017), the educational choice depends on individual's perceived earnings.

In the literature, only few studies directly investigate the effect of both parental preferences and perceived earnings on educational choice of children. We thus aim to study whether and how children's college enrollment and college major choice can be affected by parent's preferences and perceived earnings. We employ the logit model to estimate the college enrollment model, and the conditional multinomial logit model of McFadden (1973) on "Students Survey about Services of Government in Thailand" data. Our dataset includes high school students in Thailand. Furthermore, we use data from the labor force survey of Thailand in 2016 to represent information from labor market.

We find that parents' preferences have the highest correlation with both expected college enrollment and college major choice. Moreover, characteristics, background, and behavioral bias also affect educational choice. However, perceived earnings do not significantly affect decision on educational choice. The results are followed by the assumption that decision on educational choice is a Bayesian group decision between parents and children as mentioned in Giustinelli (2016). However, we cannot conclude whether the decision is consistent with a collective family decision to maximize aggregating members' Bayesian expected utility, or an individual decision with pooled of members' beliefs.

This article is organized as follows. The next section, we review the literature on the influence of parents' preferences on children's decision, the effect of subjective future outcomes on human capital investment, and the determinants of college enrollment & major choice. Section 3 explains the conceptual framework, and describe the data in Section 4. Section 5 outlines the methodology. Section 6 reports the result of college enrollment, and college major model. Finally, Section 7 discusses and concludes the results of this paper.

Chapter 2 : Literature Review

2.1 The Influence of Parental Preference on Children's Decision

Much of the existing literature illustrates that why parents are interested in the children's outcomes. Assuming non-altruistic parents, Becker and Tomes (1986) show that children from poor family have less human capital than those from richer families because poor families face budget and credit constraints, while Attanasio et al. (2018) assuming altruistic parents, parental time, school quality and materials investment increase return to investment. Similarly, Lundberg, Romich, and Tsang (2009) assume that the economic model treat children as goods consumed by adults.

Subjective expectation of parents have an influence on parental preferences. Attanasio and Kaufmann (2014) show that the perspective of parents on educational decisions depends on risk perceptions, and expected returns. Moreover, Zafar (2012) explains that students also believe that their parents are more likely to approve majors associated with high social status and expected returns.

Children's decision may depends on parental preferences. Giustinelli and Manski (2018) explain that parental beliefs have an influence on student's high school choice because parental socialization of children begins at birth and continues through adolescence. Zafar (2012) illustrates that students concern about both their own and parental preferences when choosing college major. However, Bergman (2015) explains that parental preference may not have influence on decision of children. Children may hide information from their parents about their human capital investment because it is difficult to plan the future.

Additionally, parents may participate in the decision on human capital investment. Weinberg (2001) explains that the parent-child relationship is modeled as an agency problem with an altruistic principal from parents under two main assumptions. First, children may not be fully informed about the future costs and benefits of their actions; therefore, parental incentives lead children to choose a level of effort that raises the child's lifetime utility. Second, parental incentives cause children to make decisions that raise the parents' utility at the expense of the child's utility.

Several empirical studies support that parents have an influence on children's decision in human capital investment. Zafar (2013) uses parent's approval about major as a proxy to estimate the effect of parent's preferences on college major choice. However, the parent's approval only affects female students. Moreover, Carmichael (2000) finds that children are more likely to have similar occupations to their parents if the parents are employed in highly paid occupations. Besides, a father's occupation significantly affects his son's occupation while a mother's occupation significantly affects female's occupation. In addition, Lundberg et al. (2009) find the evidence that shared decision-making by parents and children that may signal cooperative negotiation. They conclude that higher parental resources are associated with less sole decision-making by children and more shared decision-making. Weinberg (2001) shows a positive relationship between parental income and children's outcomes, especially at low-income families.

2.2 The Influence of Perceived Earnings on Human Capital Investment

Subjective expectation on future outcomes may influence on human capital investment. College major choice is associated with uncertain outcomes; hence, student's decision-making also depends on future outcomes expectations. Dominitz and Manski (1994) were the first paper that explain how to elicit expectation about returns to schooling by survey. They conclude that this method can illustrate earning expectation under uncertainty of respondents. Delavande, Giné, and McKenzie (2011) explain that besides preferences, subjective expectation may affect economic decisions under uncertainty. Wiswall and Zafar (2015) also incorporate expected income and its uncertainty into a model of college major choice. They illustrate that students will choose major that lead them to receive the highest earnings. Besides, Beffy, Fougere, and Maurel (2012) found? that expected earning has less impact on science major and more impact on humanities and social science major. Arcidiacono, Hotz, and Kang (2012) show that there is no difference between expected and actual earnings. Additionally, schooling attendance decision depends on expected future income (Attanasio & Kaufmann, 2014; Kaufmann, 2014). Furthermore, Reuben et al. (2017) find that students, who chose business and economics, natural science, and humanities major, have a high expectation of future income. On the contrary, Zafar (2013) find that there is no causal relationship between earning expectation and college major choice.

2.3 The Determinant of College Enrollment

There are several factors affect college enrollment decision. Oreopoulos and Petronijevic (2013) explain that students will attend to college when present value of the benefits exceeds the costs and that the investment is optimal. However, students may also face financial constraints, information problems, and behavioral idiosyncrasies that may cause them to make suboptimal decisions about college attendance. Several literatures find that ability of students have a positive relationship with probability of choosing college enrollment (Cappellari & Lucifora, 2009; Ganderton & Santos, 1995). Furthermore, Cappellari and Lucifora (2009) show that higher parental education, and higher level occupation of parents will increase probability of choosing to go to college after graduating from high school. Additionally, students from the academic oriented tracks have the largest probability of choosing college enrollment. Behavioral preference also affects decision on college enrollment. Coleman and DeLeire (2003) illustrate that internal LOC[1] (Locus of Control) person tends to enroll in higher education than external LOC person.

Financial constraints is one of the most important constraints for human capital investment. Belley and Lochner (2007) find that although they control the college enrollment model by cognitive achievement, family composition, race, and residence, youth from high-income families were still 16 percentage points more likely to enroll in college than youth from low-income families. Experiment of Bettinger, Long, Oreopoulos, and Sanbonmatsu (2012) shows that students who

[1] Coleman and DeLeire (2003) explain that LOC (Locus of Control) is a psychological concept measuring a generalized attitude, belief, or expectancy regarding the nature of the causal relationship between individual's behavior and its consequences that can influence on the decision. Individuals with internal locus of control believe that what happen in their life stems from their own actions while individuals with external locus of control believe that outcomes depend on external factors such as other agents, luck, or fate.

receive Free Application for Federal Student Aid (FAFSA) assistant will attend to college rather than another group.

2.4 The Determinants of College Major Choice

Individual preferences and behavioral bias also have an influence on decision-making, especially college major choice. Previous researches show that behavioral bias affects college major choice. Reuben et al. (2017) experimentally and empirically study how preferences and behavioral bias, including risk preference, overconfidence and competitiveness, affect college major choice. They find that overconfident students are more likely to choose natural science major while risk preference and competitiveness has no significant effect on major choice. Additionally, overconfidence and competitiveness increase expected future income.

Besides, there are other factors affect college major choice. Zölitz and Feld (2017) explain that peer effects on college major choices and jobs choices exist. Numerous research show that background of individuals may affect college major choice. Wiswall and Zafar (2015) illustrate that students with higher math ability exhibit stronger tastes for economics & business, engineering and natural science majors. In contrast, Beffy et al. (2012) also concern unobserved preferences for each major by using the high school graduation track as a proxy; however, it is not significant. Furthermore, school years and age may affect college major choice. Wiswall and Zafar (2015) explicate that junior students have significantly more negative tastes for engineering, and natural sciences major than freshman or sophomore students. Beffy et al. (2012) show that students who were more than 12 years old in sixth grade are less likely to choose science major and more likely to choose law, economics and management majors. Interestingly, some studies find that culture or local communities may have influence students' choices. For example, Berger (1988) illustrates that students who live in the south of the USA are less choose science major than others.

Chapter 3 : Conceptual Framework

The framework is developed by Giustinelli (2016). Each family faces a set of alternatives of applying to higher education; including whether to go to college, and college major choice. Assuming each family approaches group decision making on the educational choice that includes two stages.

Stage 1: Children and parents will face decision problems because of uncertainty future outcomes. Then, both children and parent individually evaluate each alternative. When individuals evaluate the alternatives, children will choose the optimal alternatives from their expected utility. The subjective expected utility of educational choice can be written as

$$\max_{j \in J} EU_{ij} = \beta_0 + \beta charac_i + \gamma earnings_{ij} \tag{1}$$

where EU_{ij} is subjective expected utility of educational choice, $charac_i$ is the characteristics, ability, and preferences, $earnings_{ij}$ is perceived earnings on choice j. Individuals will consider the choices from the utility that they will be received from each choice. The utility on each choice depends on several factors such as perceived earnings, characteristics, and behavioral preferences. This model is similar to Burton, Phipps, and Curtis (2002) that both parents and children will maximize their own utilities.

When both children and parents maximize their utility, they will aggregate the subjective expected utilities of parents and children in order to maximize group's subjective expectation as be explained in equation (2).

$$\max_{j \in J} EU_{gj} = EU_{cj} + EU_{pj} \tag{2}$$

$$\max_{j \in J} EU_{gj} = \beta_0 + \alpha Parpref_{ij} + \beta charac_i + \gamma earnings_{ij} \tag{3}$$

where EU_{gj} is group's subjective expected utility, EU_{cj} is subjective expected utility of children, and EU_{pj} or $\alpha Parpref_{ij}$ is subjective expected utility of parents.

Different groups will address the problem differently. Individuals will exchange information, discuss each alternative, and compare probability & utility. This process may depend on bargain power of parents and children which in turn affect the final decision as explained in Dauphin, El Lahga, Fortin, and Lacroix (2011).

Stage 2: Both children and parents will have a final choice of the alternatives. There can be two cases as shown in Figure 3.1: (1) parental preferences has an influence on children's decision, or (2) children decide independently. We assume that family members use one of the following decision processes to choose educational choice.

1. Parental preferences have an influence on children's decision

In this case, we have two main assumptions. First, parental preferences have an influence on decision of children because children may not fully informed about future outcomes, as mentioned in Weinberg (2001). Therefore, children select their choice based on information from parents. Second, parents participate in decision on college major as collective decision as mentioned in Giustinelli (2016). It can divide into two decision processes;

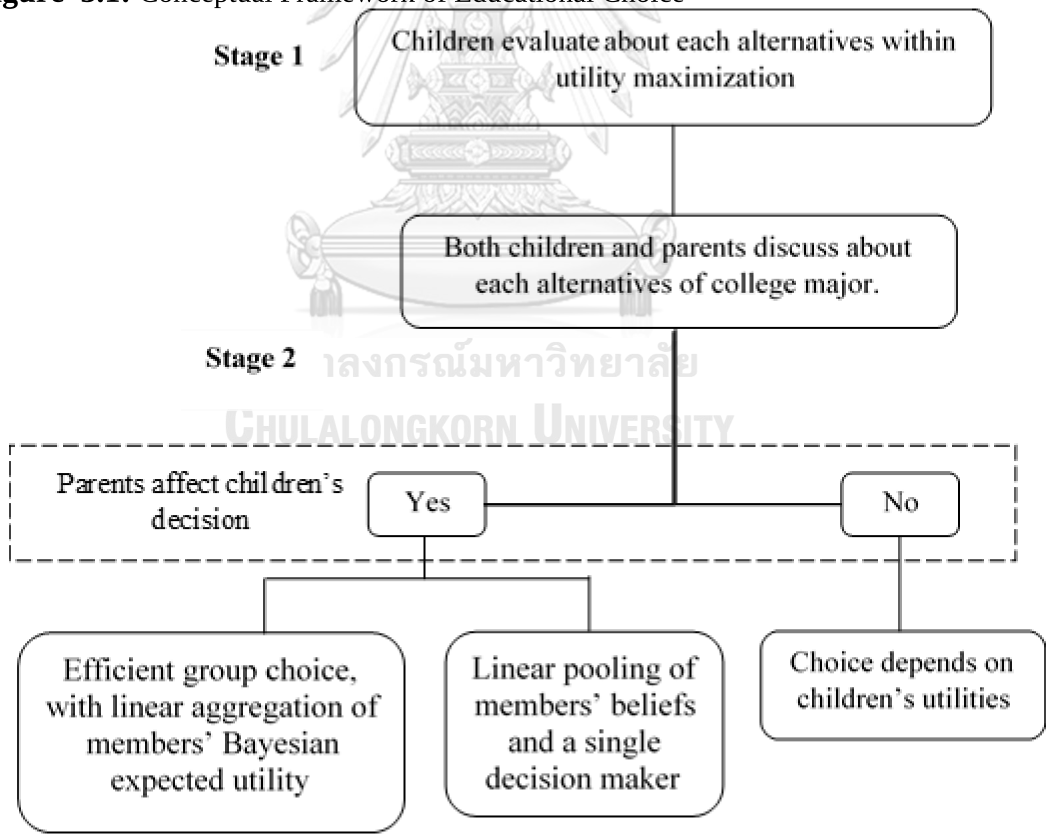
1.1 Efficient group choice, with linear aggregation of members' Bayesian expected utility – Children and parents make a cooperative decision into "family beliefs"; therefore, the major choice is based on children's utility and family beliefs that makes Pareto optimum of the family decision.

1.2 Linear pooling of members' beliefs and a single decision maker – The decision process may be the unitary decision from parents. Children may choose college major after listening to the parents. Especially in Asian society such as Thailand, Chao and Tseng (2002) explain that parents have an influence on children's human capital investments decision because parents can control decision of children. It may the cultural reason that children may obey their parents.

2. Children decide independently

In this case, parental preferences may not influence on college major utility of children. Children may choose college major that maximize their utilities. It implies that it is the unitary decision from children. It relates to Bergman (2015) that children may hide information from their parents about their choice because it is difficult to plan the future outcomes. Parents may not know the information about the educational choice that children choose, or the preferences on educational choice of both parents and children are completely different.

Figure 3.1: Conceptual Framework of Educational Choice



Chapter 4 : Data

4.1 Data

4.1.1 Students Survey about Services of Government in Thailand Data

We use data from "Students Survey about Services of Government in Thailand[2]" in order to estimate college attendance and major choice model. The details of data are shown in Appendix A. This dataset can represent college major preferences of high school students, university students and that of their parents in Thailand. However, we focus on high school students that cover 44 schools in 17 provinces in Thailand and include 1,144 observations to show preference on college majors.

We drop individuals for whom we miss information on any characteristics, and behavioral bias. This leaves us with the observations of 1,068 students. Moreover, we drop those individuals with any missing information on the lifetime earning expectation; hence, we are left with 796 observations for college enrollment model. For college major model, we exclude samples whose the expected highest educational level is lower than bachelor degree. The final number of observations is 760.

The summary statistics are shown in Table 4.1. Columns (1) and (2) shows the characteristics of the samples used to estimate the college enrollment model and the major choice model, respectively. The data include hypothetical parent's preference on educational choice, parents' occupation, parents' years of schooling, perceived earnings (the details are explained in Appendix B), characteristics, behavioral bias, and school types & areas.

Table 4.1: Summary Statistics of Students Survey about Services of Government in Thailand Data

Variables	(1)	(2)
Students who expect to study in college	95.73%	100%
Parents who expect students to study in college	98.49%	98.82%

[2] Students Survey about Services of Government in Thailand is collected by the Thailand Research Fund (TRF) and Faculty of Economics, Chulalongkorn University.

Variables	(1)	(2)
Perceived Earnings		
Log of lifetime perceived earnings per month after	10.25	10.26
graduated (1% discount rate)	(0.65)	(0.64)
Log of perceived earnings after graduated for 0 years	9.78	9.78
(per month)	(0.55)	(0.53)
Log of perceived earnings after graduated for 5 years	10.15	10.15
(per month)	(0.6)	(0.59)
Log of perceived earnings after graduated for 10	10.47	10.47
years (per month)	(0.69)	(0.68)
Log of perceived earnings after graduated for 20	10.77	10.77
years (per month)	(0.84)	(0.83)
Characteristics & Background		
School Years		
M.4	26.89%	27.19%
M.5	47.86%	47.24%
M.6	25.25%	25.57%
Age	16.55	16.54
	(0.90)	(0.91)
GPAX	3.14	3.15
	(0.51)	(0.50)
High school track		
Science	61.56%	62.66%
Arts	38.44%	37.34%
Family's wealth (1 = Poorest, 10 = Richest)	4.89	4.91
	(1.31)	(1.31)
Parents' years of schooling	13.53	13.65
	(3.97)	(3.89)
Parents' occupations		
Work in public sector	32.54%	33.21%
Teacher in public sector	14.95%	15.38%
Military and police	13.32%	13.39%
Politician	1.01%	1.05%
Healthcare in public sector	5.15%	5.26%

Variables	(1)	(2)
Student's Expected probability of not work	0.38	0.37
	(0.34)	(0.34)
Behavioral Preferences		
Risk Averse in Gain Situation	31.91%	31.79%
Risk Averse in Loss Situation	74.25%	74.63%
Internal Locus of Control	4.77%	4.73%
Neutral Locus of Control	29.65%	29.98%
External Locus of Control	65.58%	65.29%
Time Preference in 3 months	0.28	0.28
	(0.17)	(0.17)
School Types and Areas		
Public School	75.75%	75.61%
Urban Area	61.81%	62.86%
Rural Area	38.19%	37.14%
Northern	13.57%	13.61%
Central	34.30%	34.29%
Northeastern	22.61%	22.13%
Southern	16.83%	16.83%
Bangkok	12.69%	13.15%
Number of Observations	**796**	**760**

Notes: For continuous variables, mean is reported in first row, and SD is reported in parentheses in second row.

In order to limit the size of choice set, we aggregate similar majors into seven groups, including business, engineering, health & medicine, humanities & arts, natural science, social science, and others. The following details are shown in Appendix B. Moreover, according to the survey, individuals can choose college major more than one choice; however, we have no information about the ranking of college major preferences. Therefore, we weight the observations by the number of college major choice that each student and parent chose. We assume that each college major choice that they choose has no different preference.

4.1.2 Labor Force Survey of Thailand (LFS) Data

To investigate expected earning within information, we use average income of employed labor force grouped by highest educational level and major from the Labor Force Survey of Thailand (LFS) in 2016 to represent information from labor market. Assuming that labors work until 60 years old. Moreover, we drop individuals whose highest graduation is lower than bachelor degree. Therefore, this leaves us with 49,671 graduated labor force samples. However, this paper does not use weighted observations on LFS survey data. Summary statistics of LFS data are provided in Table 4.2.

Table 4.3 provides the average income per month of each major separated by three different education level (bachelor, master, and doctoral). The result shows that three highest average incomes groups for bachelor level, including health & medicine (32,186.83 Baht), engineering (30,188.61 Baht), and social science (28,636.65 Baht). Furthermore, three highest average incomes groups for master level, including engineering (50,065.65 Baht), health & medicine (42,796.77 Baht), and social science (38,754.29 Baht). Additionally, three highest average incomes groups for doctoral level, including health & medicine (81,820 Baht), social science (55,321.72 Baht), and business (54,583.33 Baht). It implies that a college education is correlated with higher labor market earnings across all college major as mentioned in Oreopoulos and Petronijevic (2013).

Table 4.2: Summary Statistics of LFS data in 2016

Variables	
Age	39.51
	(10.31)
Income Per Month (Baht)	28,144.29
	(21,226.11)
Major	
Business	31.80%
Engineering	5.75%
Health & Medicine	7.66%
Humanities & Arts	4.81%
Natural Science	8.89%
Social Science	38.24%
Others	2.85%
Highest Educational Level	
Bachelor	83.51%
Master	16.00%
Doctoral	0.49%

Notes: For continuous variables, mean is reported in first row, and SD is reported in parentheses in second row.

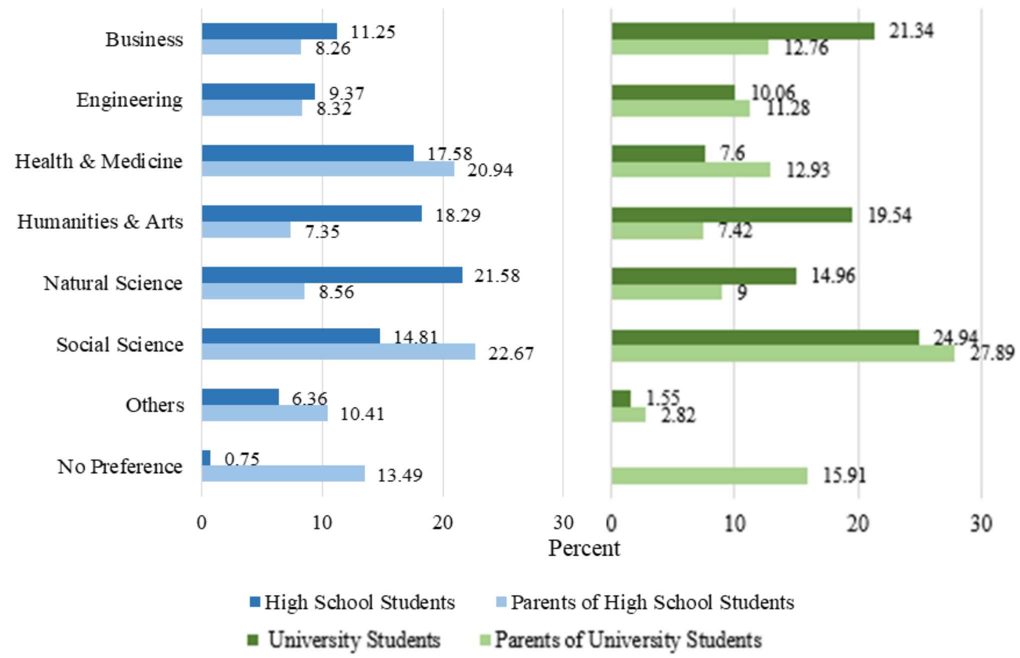
Table 4.3: Percentage of Observations and Average Income Per Month (Baht) Grouped by Highest Educational Level and Major

Major		Highest Graduation Level		
		Bachelor	Master	Doctoral
Business	% of obs	27.26%	4.51%	0.04%
	Avg Income	21,782.55	40,844.3	54,583.33
	SD	(15,766.98)	(37,985.22)	(26,083.15)
Engineering	% of obs	5.21%	0.49%	0.05%
	Avg Income	30,188.61	50,065.65	40,088
	SD	(25,182.48)	(43,116.49)	(19,907.96)
Health & Medicine	% of obs	6.95%	0.66%	0.05%
	Avg Income	32,186.83	42,796.77	81,820
	SD	(18,277.53)	(22,732.79)	(58,969.07)
Humanities & Arts	% of obs	4.38%	0.39%	0.04%
	Avg Income	24,494.14	35,842.92	42,347.78
	SD	(16,992.64)	(22,813.6)	(12,719.14)
Natural Science	% of obs	7.98%	0.84%	0.07%
	Avg Income	21,577.12	36,788.34	34,351.52
	SD	(16,225.56)	(23,525.41)	(94,44.71)
Others	% of obs	2.45%	0.38%	0.02%
	Avg Income	25,364.21	35,947.4	49,810
	SD	(22,609.68)	(25,022.25)	(17,996.56)
Social Science	% of obs	29.27%	8.73%	0.23%
	Avg Income	28,636.65	38,754.29	55,321.72
	SD	(19,406.77)	(19,688.42)	(47,394.77)

4.2 Descriptive Analysis

In this part, we discuss about the overview of college major choice in both students' and parents' views. We separate students into two groups, including high school students, and university students. The choice of high school students come from their preferences; however, the choice of university students come from actual choices that they enrolled.

Figure 4.1: College Major Choice Distributed by Students and Parents' Preferences



Notes: We calculate the college major choice distribution from "Students Survey about Services of Government in Thailand". It includes 1,068 high school students, and 1,222 university students.

College major preferences of both high school students and university students are quite different. From figure 4.2, we find that three most popular college majors in high school students, including Natural Science (21.58 %), Humanities & Art (18.29 %), and Health & Medicine (17.58 %). Nevertheless, among University students, three most majors that students enroll include Social Science (24.94 %), Business (21.34%), and Humanities & Arts (19.5 %). This implies that two groups of samples may have different college major choice preferences. Additionally, limited vacancy of each college major and admission score restrict college major choice of university students. Therefore, college major choice of high school students may be more consistent to decision making by preference than that of university students. This is the reason why we focus only on high school students.

Furthermore, the Figure 4.2 shows that high school students choose Natural Science and Health & Medicine majors rather than actual college major of university students. At the time of this study, the field of science and technology is crucial for driving economy; however, it lacks labor in this field. Therefore, the government launches "STEM Education" policy to increase labor in STEM fields. Nevertheless, one problem is that there is limited vacancy of each college major and admission score.

Parent’s preferences on college major choice of both groups are quite similar that the most popular major is Social Science. Moreover, parents of high school students prefer of Health & Medicine major more than parents of university students. However, around 15% of parents do not response the parent’s preferences on college major choice of children.

Chapter 5 : Methodology

To show the effect of parental preference on human capital decision of children, we estimate two main models: college enrollment model, and college major choice model.

5.1 College Enrollment Model

We investigate more about the effect of parental preference on educational choice of children by college enrollment model. We apply model from Attanasio & Kaufmann (2014) that estimate the probability of college enrollment as a function of parental preference, and other control variables. We use Logistic regression to estimate this model in equation (4).

$$U_i = \alpha Parcol_i + \beta charac_i + \gamma (W_{ienroll} - W_{inotenroll}) + \varphi sch_i + \varepsilon_i \tag{4}$$

$$Col_i = 1 \text{ if } U_{enroll} > U_{notenroll} \tag{5}$$

where $Parcol_i$ is college enrollment preference of parents, $charac_i$ is characteristics, background, and behavioral bias of the respondents, $W_{ienroll} - W_{inotenroll}$ is differences between perceived earnings after graduated on enroll in college and perceived earnings on non-college, sch_i is control variables of school years, school types & areas, Col_i is college enrollment decision. People will enroll in college when utility of college enrollment is greater than utility of not enroll in college as be shown in equation (5). The probability to study in college can be written as

$$\Pr ob(Col_i = 1) = \frac{\exp(\alpha Parcol_i + \beta charac_i + \gamma (W_{ienroll} - W_{inotenroll}) + \varphi sch_i + \varepsilon_i)}{\sum_{c=0}^{1} \exp(\alpha Parcol_i + \beta charac_i + \gamma (W_{ienroll} - W_{inotenroll}) + \varphi sch_i + \varepsilon_i)} \tag{6}$$

5.2 College Major Choice Model

College major choice are modeled with random utility developed by McFadden (1973). Individual’s college major choice depends on the expected utility of college major choice in equation (1)

$$U_{ij} = \alpha_j \, parpref_{ij} + \beta_j charac_i + \gamma_j \, predearn_{ij} + \varphi_j sch_i + \varepsilon_{ij} \qquad (7)$$

where $parpref_{ij}$ is the vector of hypothetical parent's preferences on each college major, and $predearn_i$ is the predicted perceived earnings of the respondents in each major. We use predicted perceived earnings in case of missing data, but we use actual perceived earnings for the major that student chooses.

Individuals face major choice $j = 1, ..., J$ and choose the alternative that yields the highest utility:

$$j = \arg \max_{j=1,...,J} U(\, parpref\,, charac, predearn_j\,, sch) \qquad (8)$$

Based on McFadden (1973) random utility model, individual i choose major j when

$$C_{ij} = 1 \text{ if } U_{ij} > U_{im} \forall j \neq m \qquad (9)$$

where U_{ij} is the utility of choosing college major j, and U_{im} is the utility of choosing college major choice m.

The probability to choose college major j within expected utility of choosing major j and other majors can be written as

$$P_{ij} = \Pr ob(C_{ij} = 1) = \frac{\exp(\alpha_j \, parpref_i + \beta_j charac_i + \gamma_j \, predearn_{ij} + \varphi_j sch_i + \varepsilon_{ij})}{\sum_{m=1}^{J} \exp(\alpha_m \, parpref_i + \beta_m charac_i + \gamma_m \, predearn_{im} + \varphi_m sch_i + \varepsilon_{ij})}$$

(10)

The log-likelihood estimation can be written as

$$\ln L = \sum_{i=1}^{N} \sum_{j=1}^{J} y_{ij} \ln P_{ij} \qquad (11)$$

where y_{ij} is a dummy variable equal to one when individual i choose major j and zero otherwise.

Chapter 6 : Results

6.1 The Results of College Enrollment Model

Table 6.1: Estimation Results of College Enrollment Model

VARIABLES	College Enrollment Decision				
	1	2	3	4	5
College enrollment	0.092***	0.091***	0.083***	0.065**	0.062**
preference of parents	(0.031)	(0.031)	(0.031)	(0.030)	(0.031)
Perceived Earnings					
Log of lifetime perceived		0.007		0.003	
earnings after graduated		(0.013)		(0.012)	
(1% discount rate)					
Log of perceived earnings			0.039*		0.026
after graduated for 0 years			(0.022)		(0.021)
Log of perceived earnings			-0.025		-0.029
after graduated for 5 years			(0.022)		(0.023)
Log of perceived earnings			0.014		0.030
after graduated for 10			(0.024)		(0.025)
years					
Log of perceived earnings			-0.005		-0.014
after graduated for 20			(0.017)		(0.018)
years					
Characteristics & Behavioral Preferences					
Family's wealth				0.008	0.008
				(0.006)	(0.006)
GPAX				0.012	0.011
				(0.013)	(0.013)
High school track				0.038**	0.036**
(Science)				(0.017)	(0.017)
Parents' years of				0.004**	0.005**
schooling				(0.002)	(0.002)

VARIABLES	College Enrollment Decision				
	1	2	3	4	5
Parents work in public sector				0.012	0.011
				(0.019)	(0.019)
Risk averse in gain situation				0.001	0.002
				(0.015)	(0.015)
Risk averse in loss situation				0.010	0.010
				(0.016)	(0.016)
Internal Locus of Control				-0.012	-0.012
				(0.038)	(0.038)
Neutral Locus of Control				0.011	0.012
				(0.015)	(0.015)
Student's Expected probability of not work				-0.020	-0.017
				(0.022)	(0.022)
Observations	796	796	796	796	796
School fixed effect	YES	YES	YES	YES	YES
Pseudo R^2	0.080	0.081	0.095	0.174	0.185

Notes: 1. Standard errors in parentheses 2. *** p<0.01, ** p<0.05, * p<0.1

Table 6.1 shows the results of college enrollment model. The column (1) includes only patent's preference on college enrollment, and control variables. It shows that if parents prefer children to study in college, it will increase the probability of expected college enrollment of children 9.2%.

Perceived earnings affect college enrollment in some case. In column (2) and (3), we add subjective expectation after graduated in the model. Column (2) use present value of lifetime perceived earnings that calculated from inflation rate (We assume that the discount rate is 1%). We find that the lifetime perceived earnings do not affect college enrollment decision. Moreover, we check the robustness by using lifetime perceived earnings that calculated from the respondents' time preferences in Appendix D. The results are not different. On the contrary, perceived earnings after graduated for 0 years significantly increase probability of college enrollment 3.9% as we show in Column (3). It implies that the early future expectation may affect the present decision rather than the expectation in the five years later. However, other variables may affect college enrollment rather than perceived earnings. Column (5) shows that when we include characteristics and behavioral preferences into the model, perceived earnings after graduated for 0 years do not significantly increase the probability of enrolling in the college.

Column (4) and (5) illustrate that background of the respondents also has an effect on college enrollment decision. Parent's year of schooling is positively correlated to decision on college enrollment of children that similar to Cappellari and Lucifora (2009). Furthermore, students who study in science track will prefer to study in college rather than students who study in arts track. It implies that ability also affects expected college enrollment decision because high school track is one of the proxies of ability. It implies that ability has an impact on college enrollment decision, although GPAX, one of the proxies of the ability, does not affect college enrollment because the difference in each evaluation of school. Moreover, students in science track have more choice on college major than students in art track.

Other characteristics may not significantly affect college enrollment decision. Firstly, family's wealth has positive effect on college enrollment decision, but it is not significant. Students who come from low income families may attend to college because they may think that studying in college may help them to get higher opportunities, while Lathapipat (2013) finds that children from high-SES family will earn higher education level than those from lower-SES family. Moreover, we believe that occupation of parents may affect human capital investment of children. Unfortunately, we only have parents' occupation information that indicates whether they work in public sector or not. Therefore, we use this factor as a proxy of parent's occupation. We cannot find the effect of this proxy on college enrollment model. Lastly, probability of not working after graduated of children does not affect college enrollment decision that similar to Attanasio and Kaufmann (2014).

We do not find a consistent relationship between college enrollment and both behavioral preferences. It differs from Coleman and DeLeire (2003) that internal LOC person tends to enroll in higher education than external LOC person. However, our result is similar to Belzil and Leonardi (2007) that differences in risk preference do not appear to be an important determinant of schooling decisions. The weak effect of behavioral preference may be a reflection of the potential endogeneity of the behavioral preference measure and may also be affected by measurement error. However, this problem cannot disturb the effects of other factors on college enrollment model. Although we add behavioral preferences into the model, the main determinants that we are interested are still significant.

Table 6.2: Estimation Results of College Enrollment Model (Seperated by Subgroup)

VARIABLES	(1) GPAX>= p50	(2) GPAX<p50	(3) Parents' Years of Schooling >= p50	(4) Parents' Years of Schooling < p50
% of obs who expect to enroll the college	97.01%	94.42%	97.54%	92.86%
College enrollment preference of parents	0.037	0.137**	0.012	0.093
	(0.047)	(0.063)	(0.044)	(0.069)
Log of expected earnings after graduated for 0 years	0.200***	-0.015	0.009	0.066
	(0.048)	(0.035)	(0.032)	(0.049)
Log of expected earnings after graduated for 5 years	-0.026	-0.078	-0.015	-0.136*
	(0.063)	(0.064)	(0.047)	(0.081)
Log of expected earnings after graduated for 10 years	0.001	0.107	0.029	0.086
	(0.054)	(0.067)	(0.039)	(0.083)
Log of expected earnings after graduated for 20 years	0.016	-0.033	-0.011	-0.002
	(0.030)	(0.034)	(0.021)	(0.044)
Family's wealth	0.013	0.008	0.004	0.003
	(0.009)	(0.012)	(0.009)	(0.011)
GPAX	-0.075	0.007	0.005	0.010

VARIABLES	(1) GPAX>= p50	(2) GPAX<p50	(3) Parents’ Years of Schooling >= p50	(4) Parents’ Years of Schooling < p50
	(0.051)	(0.037)	(0.021)	(0.028)
High school track	0.035*	0.043	0.085**	0.008
(Science)	(0.018)	(0.033)	(0.036)	(0.034)
Parents’ highest	0.005*	0.008**	-0.001	0.011**
graduation level	(0.003)	(0.003)	(0.008)	(0.005)
Parents work in public	0.062*	-0.019	0.011	-0.013
sector	(0.038)	(0.033)	(0.022)	(0.047)
Risk averse in gain situation	0.009	0.014	-0.026	0.052
	(0.018)	(0.029)	(0.022)	(0.036)
Risk averse in loss situation	0.063**	-0.002	-0.023	0.050
	(0.027)	(0.031)	(0.025)	(0.034)
Internal LOC		-0.026	-0.020	0.017
		(0.064)	(0.057)	(0.067)
Neutral LOC	0.027	0.017	0.000	0.031
	(0.017)	(0.028)	(0.021)	(0.032)
Student’s Expected	-0.010	-0.025	0.024	-0.050
probability of not work	(0.034)	(0.043)	(0.031)	(0.047)
Observations	335	346	361	308
School fixed effect	YES	YES	YES	YES
Pseudo R^2	0.610	0.160	0.369	0.204

Notes: 1. Standard errors in parentheses 2. *** p<0.01, ** p<0.05, * p<0.1

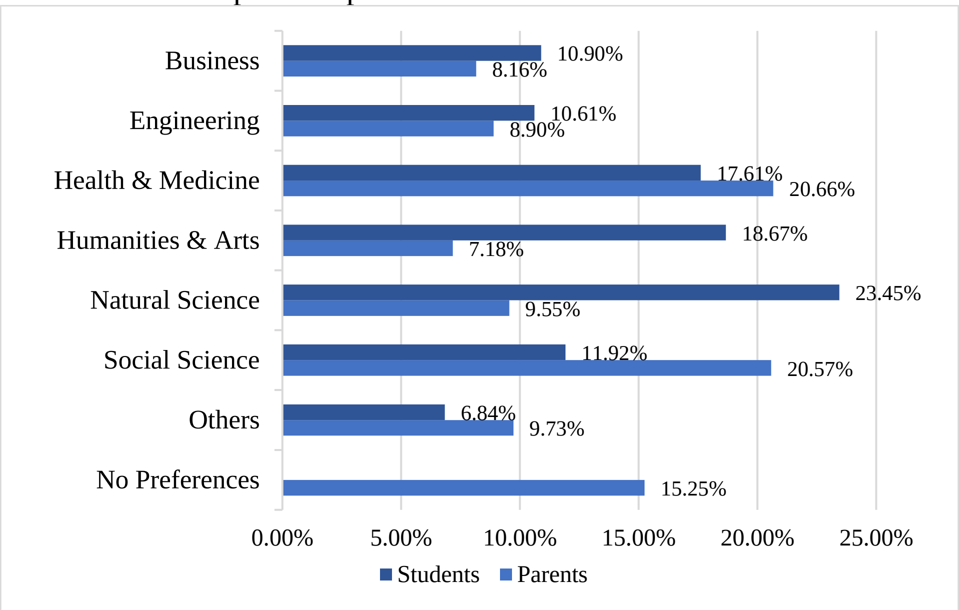
The heterogeneity relates to the characteristics and parents’ background of the respondent. Table 6.2 shows the estimation results from college enrollment model that separated by subgroups. Column (1) and (2) show the subgroups that are separated by the percentile of GPAX. The respondents in the lower GPAX group’s decision may correlate with parental preferences rather than another group. It may imply that students with higher GPAX expect to enroll in college rather than students with lower GPAX. However, different parents' educational level groups may not have different effect from parents' preferences, although the higher graduated level increases the probability of choosing to enroll the college. It may have the sample selection bias when we separate the subgroup.

Appendix D shows the estimated models where the standard errors are clustered at the region-level. The correlation between parental preference and expected choice of children is still statistically significant. We conclude that parental preferences, parents' educational levels, and high school track in science increase probability of expected college enrollment after controlling characteristics, background, behavioral bias, and region of residents. However, perceiving earnings may not significantly affect college enrollment model. It may because of measurement errors from the respondent's answer in the survey.

6.2 The effect of parental preferences on college major

In this part, we analyze the correlation between parental preferences and expected choice of children on college major. Figure 6.1 shows college major preferences of students and parents of the samples. We find that three most popular college majors in students, including natural science (21.58 %), humanities & art (18.29 %), and health & medicine (17.58 %). However, three most popular college majors that parents prefer, including health & medicine (20.66 %), social science (20.66%), and no preferences (15.25%).

Figure 6.1: Expected College Major Choice Distributed by Students and Parents' Preferences for the Sample Group



Although Figure 6.1 cannot see the pattern between parents' preferences and children's preferences on college major. Table 6.3 shows clearly about the transition matrix between parents' preferences and college major choice of children. It can be explained that students may choose college major as same as their parents' preferences.

Table 6.3: Transistion Matrix between Children's and Parents' Preferences on College Major

Children \ Parents	Business	Engineering	Health & Medicine	Humanities & Arts	Natural Science	Social Science	Others	No Preferences
Business	43.96%	6.73%	5.46%	11.44%	3.17%	11.26%	6.04%	10.20%
Engineering	3.22%	45.44%	6.09%	6.87%	14.38%	3.91%	9.89%	9.30%
Health & Medicine	5.37%	3.73%	53.68%	4.38%	5.57%	8.72%	11.09%	13.32%
Humanities & Arts	19.87%	14.08%	6.91%	60.17%	17.68%	20.55%	12.84%	18.92%
Natural Science	10.13%	18.11%	17.24%	14.18%	52.78%	23.40%	14.03%	34.15%
Social Science	14.39%	8.30%	6.98%	1.10%	3.90%	28.07%	10.10%	8.86%
Others	3.05%	3.61%	3.63%	1.86%	2.52%	4.09%	36.01%	5.24%
Total				100%				

Notes: The transition matrix between children's and parents' preferences on college major represent the percentage of children’s preference on college major based on the numer of parents who choose each major.

The college major choice model confirms that parents' preferences have a relationship with college major choice. In Table 6.4 Column (1) includes parents' preferences on each major, and control variables. Parental preferences on each major significantly increase the probabilities of children to choose that major. For example, if parents prefer business major, it will also significantly increase probability of children to choose business major. It implies that children's decision may depends on parents' preferences.

Moreover, the results show that parents' preferences have the highest correlation on college major choice of children in every major, although parents' preference on different major may affect probability of choosing college major. If parents prefer business major, it may significantly increase probability of children to choose humanities & arts, and social science, but it decreases probability of children to choose health & medicine, and natural science majors. If parents prefer engineering major, it may decrease probability of children to choose health & medicine major. If parents prefer health & medicine major, it may decrease probability of children to choose humanities & arts, and natural science majors. If parents prefer humanities & arts major, it may increase probability to choose business, and social science major, but decrease probability to choose health & medicine. If parents prefer natural science major, it may increase probability of children to choose engineering major, but it decreases probability of children to choose business, and health & medicine majors. If parents prefer other group major, it may decrease probability of children to choose natural science major. Lastly, if parents prefer social science major, it may significantly increase probability of children to choose humanities & arts, but it decreases probability of children to choose health & medicine, and engineering majors.

Perceived earnings prediction in each alternative may not correlate with college major choice of the respondents. Column (2) adds earning prediction that calculated the discount rate by 1%. Furthermore, we estimate more about earning prediction by calculating the discount rate from the respondents' time preferences in Appendix E. The results are not different.

Other determinants also affect college major choice. Column (3) shows the model that include characteristics and behavioral preferences. Parents' occupations also have an influence on college major of children. Students with parents who work as military or police are more likely to choose others group that includes military & police; however, they are less likely to choose humanities & arts. Moreover, students with parents who work as politician are more likely to choose major in social science, humanities & arts, and other groups; nevertheless, they are less likely to choose natural science. Furthermore, students with parents who work as teacher in public sector are less likely to choose major in humanities & arts. Additionally, students with parents who work in public sector are more likely to choose health & medicine major. Although we know parents' occupation only who works in public sector, the results can represent that parents' occupation affects college major choice.

Other parental factors also correlate with college major choice. Higher family's wealth will increase probability of choosing health & medicine. It may because health & medicine major has a high cost for admission. In Thai context, majoring in health & medicine has a high competition; therefore, students who prefer this major have to make an effort to entrance. Poovudhikul (2013) explains that private tutoring will increasing test score 10%. Hence, several students may enroll private tutoring in order to increase their own admission scores. Moreover, students whose parents have high years of schooling is less likely to choose natural science major.

Ability of students also affects college major. Higher GPAX will significantly increase probability to choose humanities & arts, and social science; on the other hand, higher GPAX will significantly increase probability to choose health & medicine major. It may because each track of high school has different GPAX evaluation. Hence, we separate another variable that focuses on GPAX of science track students. We find that students in science track with high GPAX will increase probability to choose health & medicine major. It implies that students choose major from their own ability.

Risk averse students are more likely to choose major in the health & medicine major, and others group that include military & police. On the contrary, risk averse students are less likely to choose social science. The reason is that major of health & medicine, and military & police have specific occupations after graduation, while social science major is academic major that some majors have no specific occupation. Therefore, students in social science major may face more risk after graduation rather than students in health & medicine or military & police majors. However, students may not concern about job descriptions because both occupations have to face a lot of risks. Montmarquette et al. (2002) explain that in the USA, majoring in science is more difficult; hence, it is riskier than majoring in education. It implies that students may consider majors on occupational outcomes rather than risk in job.

However, the potential problems of endogeneity that we concern for this model are measurement error. The survey asks the respondents about the major choice that parents mostly prefer; however, some respondents answer more than one major. It means that they may misunderstand about the question. Hence, we check this problem by dropping observations who answer that there are more than one major that parents prefer. The observations for this case are 710 samples. The result in Appendix E shows that it is not different from Table 6.3. The main variables that we are interested still have an effect on the college major choice. It can imply that measurement error may not affect the results of our model.

Table 6.4: The Estimation Results of College Major Model

Variables	College Major Choice											
	Business			Engineering			Health & Medicine			Humanities & Arts		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
Probability of selected choice	0.112	0.112	0.115	0.097	0.097	0.097	0.139	0.139	0.13	0.212	0.212	0.219
Parent's Preference												
Business	0.215***	0.217***	0.223***	-0.072	-0.072	-0.064	-0.127**	-0.127**	-0.121**	0.123**	0.122**	0.125**
	(0.034)	(0.034)	(0.036)	(0.059)	(0.059)	(0.06)	(0.055)	(0.055)	(0.054)	(0.056)	(0.055)	(0.055)
Engineer	-0.004	-0.004	0.01	0.189***	0.189***	0.186***	-0.178***	-0.178***	-0.192***	0.031	0.032	0.058
	(0.04)	(0.04)	(0.041)	(0.031)	(0.031)	(0.032)	(0.052)	(0.052)	(0.049)	(0.05)	(0.05)	(0.053)
Health & Medicine	-0.011	-0.011	0.005	-0.001	-0.001	-0.008	0.209***	0.21***	0.177***	-0.111**	-0.11**	-0.096*
	(0.031)	(0.031)	(0.032)	(0.031)	(0.031)	(0.031)	(0.032)	(0.032)	(0.031)	(0.049)	(0.049)	(0.053)
Humanities & Arts	0.082**	0.082**	0.07*	0.017	0.017	0.026	-0.125*	-0.125*	-0.102	0.383***	0.385***	0.377***
	(0.037)	(0.037)	(0.038)	(0.04)	(0.04)	(0.04)	(0.068)	(0.067)	(0.065)	(0.051)	(0.051)	(0.054)
Natural Science	-0.085**	-0.085**	0.07*	0.08**	0.08**	0.077**	-0.12**	-0.12***	-0.126***	0.061	0.059	0.076
	(0.042)	(0.042)	(0.038)	(0.032)	(0.032)	(0.032)	(0.047)	(0.047)	(0.045)	(0.048)	(0.048)	(0.05)
Social Science	0.045	0.045	0.048	-0.071**	-0.07**	-0.065*	-0.08**	-0.08**	-0.085**	0.067	0.067	0.075*
	(0.029)	(0.029)	(0.029)	(0.035)	(0.035)	(0.034)	(0.035)	(0.035)	(0.033)	(0.042)	(0.042)	(0.043)
Others	-0.013	-0.013	-0.009	0.038	0.038	0.036	-0.04	-0.04	-0.04	0.012	0.013	0.035
	(0.042)	(0.042)	(0.043)	(0.036)	(0.036)	(0.037)	(0.041)	(0.041)	(0.039)	(0.057)	(0.057)	(0.059)

Notes: 1. Marginal effects of logit estimates. 2. Robust standard errors for the marginal effects clustered at the individual level are reported in parentheses. 3. All regressions have major and individual fixed effects, and seven observations for each of the 760 students (one for each of the major categories: business, engineering, health & medicine, humanities & arts, natural sciences, social science, and others) 4. *** p<0.01, ** p<0.05, * p<0.1

(Continue)

Variables	Business			Engineering			Health & Medicine			Humanities & Arts		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
Characteristics												
GPAX			0.001			-0.034			-0.081***			0.079*
			(0.026)			(0.024)			(0.027)			(0.043)
Family's Wealth			0.001			0.003			0.014*			0.013
			(0.008)			(0.007)			(0.007)			(0.01)
Parents' years of schooling			-0.002			0.003			-0.002			0.002
			(0.003)			(0.003)			(0.003)			(0.004)
High School Track (Science)			-0.036			-0.052			-0.172			-0.013
			(0.133)			(0.099)			(0.119)			(0.188)
GPAX of Students Who Study in Science			-0.01			0.038			0.096***			-0.028
			(0.042)			(0.032)			(0.037)			(0.059)
Risk Averse in Gain Situation			-0.011			-0.003			0.062***			-0.021
			(0.023)			(0.02)			(0.021)			(0.028)
Risk Averse in Loss Situation			-0.014			-0.028			0.029			-0.05
			(0.024)			(0.02)			(0.023)			(0.031)
Parents work in public sector			-0.03			-0.009			0.068*			0.053
			(0.036)			(0.044)			(0.037)			(0.044)
Parents work as teacher in public sector			0.029			0.007			-0.028			-0.101**
			(0.041)			(0.047)			(0.037)			(0.047)
Parents work as politician			0.038			-0.145			0.097			0.282**
			(0.106)			(0.103)			(0.099)			(0.117)

Notes: 1. Marginal effects of logit estimates. 2. Robust standard errors for the marginal effects clustered at the individual level are reported in parentheses. 3. All regressions have major and individual fixed effects, and seven observations for each of the 760 students (one for each of the major categories: business, engineering, health & medicine, humanities & arts, natural sciences, social science, and others) 4. *** p<0.01, ** p<0.05, * p<0.1

(Continue)

Variables	Business			Engineering			Health & Medicine			Humanities & Arts		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
Parents work in public healthcare sector			0.004			0.002			-0.027			-0.034
			(0.066)			(0.038)			(0.047)			(0.058)
Parents work as military and police			0.007			0.011			-0.049			-0.089*
			(0.037)			(0.046)			(0.04)			(0.047)
Probability of not work			0.035			-0.001			-0.038			0.046
			(0.033)			(0.03)			(0.031)			(0.04)
<u>Alternative</u>												
Business		-0.018	-0.019		0.002	0.002		0.003	0.003		0.004	0.005
		(0.021)	(0.021)		(0.002)	(0.002)		(0.003)	(0.003)		(0.005)	(0.005)
Engineering		0.002	0.002		-0.016	-0.016		0.002	0.002		0.004	0.004
		(0.002)	(0.002)		(0.018)	(0.018)		(0.003)	(0.003)		(0.004)	(0.004)
Health & Medicine		0.003	0.003		0.002	0.002		-0.022	-0.021		0.005	0.005
		(0.003)	(0.003)		(0.003)	(0.003)		(0.025)	(0.023)		(0.006)	(0.006)
Humanities & Arts		0.004	0.005		0.004	0.004		0.005	0.005		-0.03	-0.032
		(0.005)	(0.005)		(0.004)	(0.004)		(0.006)	(0.006)		(0.035)	(0.035)
Natural Science		0.006	0.006		0.005	0.005		0.007	0.007		0.011	0.012
		(0.006)	(0.007)		(0.006)	(0.006)		(0.008)	(0.008)		(0.012)	(0.013)
Social Science		0.002	0.0023		0.002	0.002		0.003	0.003		0.004	0.004
		(0.003)	(0.003)		(0.002)	(0.002)		(0.003)	(0.003)		(0.005)	(0.005)
Others		0.001	0.001		0.001	0.0008		0.001	0.001		0.002	0.002
		(0.001)	(0.001)		(0.001)	(0.001)		(0.002)	(0.001)		(0.002)	(0.002)
Wald Chi2	923.07	915.19	1131.75	923.07	915.19	1131.75	923.07	915.19	1131.75	923.07	915.19	1131.75

Notes: 1. Marginal effects of logit estimates. 2. Robust standard errors for the marginal effects clustered at the individual level are reported in parentheses. 3. All regressions have major and individual fixed effects, and seven observations for each of the 760 students (one for each of the major categories: business, engineering, health & medicine, humanities & arts, natural sciences, social science, and others) 4. *** p<0.01, ** p<0.05, * p<0.1

(Continue)

Variables	College Major Choice								
	Natural Science			Social Science			Others		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
Probability of selected choice	0.276	0.276	0.286	0.110	0.110	0.107	0.054	0.054	0.046
Parent's Preference									
Business	-0.198***	-0.199***	-0.203***	0.079*	0.078*	0.07	-0.019	-0.019	-0.03
	(0.069)	(0.069)	(0.07)	(0.045)	(0.045)	(0.045)	(0.039)	(0.039)	(0.034)
Engineering	-0.05	-0.051	-0.069	0.023	0.023	0.036	-0.011	-0.011	-0.029
	(0.053)	(0.053)	(0.055)	(0.045)	(0.045)	(0.045)	(0.028)	(0.028)	(0.026)
Health & Medicine	-0.109**	-0.109**	-0.12**	0.023	0.023	0.041	-0.001	-0.001	0.001
	(0.045)	(0.045)	(0.047)	(0.039)	(0.039)	(0.039)	(0.026)	(0.026)	(0.024)
Humanities & Arts	-0.098	-0.099	-0.104	-0.209***	-0.209***	-0.212***	-0.05	-0.05	-0.054*
	(0.064)	(0.064)	(0.066)	(0.061)	(0.061)	(0.062)	(0.035)	(0.035)	(0.031)
Natural Science	0.168***	0.172***	0.164***	-0.07	-0.071	-0.063	-0.034	-0.035	-0.04
	(0.049)	(0.05)	(0.052)	(0.059)	(0.059)	(0.056)	(0.031)	(0.031)	(0.028)
Others	-0.066	-0.066	-0.071	0.125***	0.124***	0.126***	-0.02	-0.02	-0.027
	(0.042)	(0.043)	(0.044)	(0.035)	(0.034)	(0.034)	(0.028)	(0.028)	(0.026)
Social Science	-0.136**	-0.138**	-0.156**	0.034	0.034	0.054	0.106***	0.106***	0.08***
	(0.057)	(0.057)	(0.061)	(0.045)	(0.044)	(0.043)	(0.028)	(0.028)	(0.025)

Notes: 1. Marginal effects of logit estimates. 2. Robust standard errors for the marginal effects clustered at the individual level are reported in parentheses. 3. All regressions have major and individual fixed effects, and seven observations for each of the 760 students (one for each of the major categories: business, engineering, health & medicine, humanities & arts, natural sciences, social science, and others) 4. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

(Continue)

Variables	Natural Science			Social Science			Others		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
Characteristics									
GPAX			-0.055			0.109***			-0.019
			(0.05)			(0.031)			(0.02)
Family's wealth			-0.015			-0.011			-0.004
			(0.012)			(0.008)			(0.005)
Parents' highest educational level			-0.006			0.004			0.002
			(0.004)			(0.003)			(0.002)
High school track (Science)			0.031			0.221			0.021
			(0.192)			(0.137)			(0.082)
GPAX of students who study in science			0.001			-0.092**			-0.005
			(0.063)			(0.043)			(0.027)
Risk averse in gain situation			-0.013			-0.048**			0.035***
			(0.032)			(0.024)			(0.011)
Risk averse in loss situation			0.031			-0.015			0.047***
			(0.035)			(0.024)			(0.016)
Parents work in public sector			-0.046			-0.013			-0.022
			(0.066)			(0.045)			(0.022)
Parents work as teacher in public sector			0.076			-0.012			0.03
			(0.064)			(0.043)			(0.02)
Parents work as politician			-0.526**			0.19***			0.063*
			(0.221)			(0.072)			(0.037)

Notes: 1. Marginal effects of logit estimates. 2. Robust standard errors for the marginal effects clustered at the individual level are reported in parentheses. 3. All regressions have major and individual fixed effects, and seven observations for each of the 760 students (one for each of the major categories: business, engineering, health & medicine, humanities & arts, natural sciences, social science, and others) 4. *** p<0.01, ** p<0.05, * p<0.1

(Continue)

Variables	Natural Science			Social Science			Others		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
Parents work in public healthcare sector			0.077			-0.001			-0.022
			(0.07)			(0.054)			(0.029)
Parents work as military and police			0.031			0.025			0.064***
			(0.067)			(0.041)			(0.022)
Probability of not work			-0.054			-0.012			0.023
			(0.048)			(0.034)			(0.017)
<u>Alternative</u>									
Business		0.006	0.006		0.002	0.0023		0.001	0.001
		(0.006)	(0.007)		(0.003)	(0.003)		(0.001)	(0.001)
Engineering		0.005	0.005		0.002	0.002		0.001	0.001
		(0.006)	(0.006)		(0.002)	(0.002)		(0.001)	(0.001)
Health & Medicine		0.007	0.007		0.003	0.003		0.001	0.0011
		(0.008)	(0.008)		(0.003)	(0.003)		(0.002)	(0.001)
Humanities & Arts		0.011	0.012		0.004	0.004		0.002	0.002
		(0.012)	(0.013)		(0.005)	(0.005)		(0.002)	(0.002)
Natural Science		-0.036	-0.038		0.006	0.006		0.003	0.002
		(0.042)	(0.041)		(0.006)	(0.006)		(0.003)	(0.003)
Others		0.006	0.006		-0.018	-0.018		0.001	0.001
		(0.006)	(0.006)		(0.021)	(0.02)		(0.001)	(0.001)
Social Science		0.003	0.002		0.001	0.001		-0.009	-0.008
		(0.003)	(0.003)		(0.001)	(0.001)		(0.011)	(0.009)
Wald Chi2	923.07	915.19	1131.75	923.07	915.19	1131.75	923.07	915.19	1131.75

Notes: 1. Marginal effects of logit estimates. 2. Robust standard errors for the marginal effects clustered at the individual level are reported in parentheses. 3. All regressions have major and individual fixed effects, and seven observations for each of the 760 students (one for each of the major categories: business, engineering, health & medicine, humanities & arts, natural sciences, social science, and others) 4. *** p<0.01, ** p<0.05, * p<0.1

Chapter 7 : Discussions and Conclusion

This paper investigates the effect of parents' preferences, and perceived earnings on educational choice decision. The estimation results show that parents' preferences have the highest effect on both college enrollment and college major choice. Furthermore, children may choose college major that relate with parents' occupations. Additionally, we find the significant effect of perceived earnings in 0 years after graduated on college enrollment decision. Moreover, other determinants also affect educational choice decision such as background and behavioral bias. It implies that utility of educational choice depends on several factors. However, the lifetime perceived earnings may not significantly affect educational choice.

The results are followed by the assumption that parents' preferences have an influence on children's decision. It implies that decision on educational choice is a Bayesian group decision between parents and children as mentioned in Giustinelli (2016). However, we cannot conclude whether the decision is consistent with a collective family decision to maximize aggregating members' Bayesian expected utility, or an individual decision with pooled of members' beliefs for several reasons. First, as we mentioned in conceptual framework, families approach the alternatives in two stage, however we do not know which stage that the respondents approached during answering the questionnaires. Additionally, we cannot exactly discern that the utility on college major choice comes from students or their parents. Students may take parents' utility into their own utility. As mentioned in Zafar (2013), children may care about parent's preferences because of several reasons such as financial support, cultural and ethnic background.

However, perceived earnings do not affect educational choices because of several reasons. First, other factors other variables may affect educational choice rather than perceived earnings. In the college enrollment model, perceived earnings in 0 years after graduated affect decision on college enrollment when we omit several variables. Furthermore, the imperfect measure of perceived earnings estimations and the bias from the respondent's answer may cause measurement error problem; hence, the estimates of the relationship between perceived earnings and educational choice may be inaccurate. For the policy implication, the government should try to launch the policy that encourages better communication among children, parents and teachers, or provide educational choice information to both parents and children in order to improve imperfect information problem. Therefore, they can evaluate students' preferences and ability. This policy may lead children to choose college major that is more aligned with their preferences and ability.

This paper has six main limitations as follows.

1) We cannot obtain all variables that may affect educational choice because we lack some information such as gender, background of mother and father, occupations of parents in every sector, test scores in each subject, etc.

2) The average income from LFS survey may not show exact average income of some majors because of a small number of observations.

3) The parents' preferences in this paper are reported by children. The response may not reflect the actual preferences of parents. This may occur if children and parents do not have a close relationship. Additionally, we can conclude that parent's preference correlate with expected educational choices.

4) We believe that perceived earnings on each major has an influence on college major choice, however we have only the earning expectation on college major that respondents choose. Hence, we use predicted perceived earnings as an alternative specific variable in the model.

5) We do not control the age effect of perceived earnings; therefore, the perceived earnings from each respondent will start at different ages. It cannot capture the opportunity cost of enrolling in higher education.

6) College major aggregation may not represent the exactly similar types of major. We cannot group some relevant majors such as business and economics since the LFS data combine economics major with other social science majors. Thus, we group economics major together with other social science major.

Our results suggest several possible venues for future research. First, if we compare parents' preferences, and children's preferences with actual college major, it will represent the relationship between them. Another suggestion is that the next future research may focus more on the effect of other agents such as peers, and teachers on college major choice.

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Appendix

Appendix A: The Details of "Students Survey about Services of Government in Thailand" Data

Variables	Questions
Students who expect to study in college	What is the highest educational level that you expect?
Parents who expect students to study in college	What is the highest educational level that your parents expect you to study?
Student's expected college major	Which college major do you expect to study? (You can answer more than one major)
Parent's preferences on college major	Which college major do your parents expect you to study the most?
<u>Perceived Earnings</u>	
Log of perceived earnings after graduated for 0 years (per month)	How much earnings after graduated for 0 years (per month) will you expect to receive?
Log of perceived earnings after graduated for 5 years (per month)	How much earnings after graduated for 5 years (per month) will you expect to receive?
Log of perceived earnings after graduated for 10 years (per month)	How much earnings after graduated for 10 years (per month) will you expect to receive?
Log of perceived earnings after graduated for 20 years (per month)	How much earnings after graduated for 20 years (per month) will you expect to receive?
Log of lifetime perceived earnings per month after graduated (1% discount rate)	The present value of perceived earnings after graduated for 0 - 20 years (The detail is shown in Appendix B)
<u>Characteristics</u>	
Family's wealth (1 = Poorest, 10 = Richest)	If households in Thailand are separated into 10 groups (1 = Poorest, 10 = Richest), which group can describe your household?
Parents' years of schooling	What is the highest educational level of parents? Not Educated 0 years Primary School 6 years Junior High School 9 years Senior High School 12 years Vocational Certificate 12 years High Vocational Certificate 14 years Bachelor Degree 16 years Master Degree 18 years Doctoral Degree 21 years
Student's Expected probability of not work	If you graduated the highest educational level that you expect, what do you think is the percent chance that you would be an unemployment?

<u>Behavioral Preferences</u>	
Locus of Control	How much these statements describe about you? (1 = Strongly disagree, 7 = Strongly agree) 1. I have little power to control anything in my life. 2. I cannot solve the problems by myself. 3. Many events that happen, I know that I cannot change them. 4. I often feel powerless to solve the problems in my life. 5. My life usually is determined by others. 6. I control future by myself. 7. If I intend to success some tasks, I always can do it. (Score:7 - 8 = Internal locus of control, 9 - 16 = Neutral locus of control, 17 - 42 = External locus of control
Risk Averse in Gain Situation	You have to make the decision on 5 situations. Each situation has 2 alternatives (1) In head or tail game, if the coin shows head side, you will receive 3,000 baht. If the coin shows tail side, you will receive nothing. (2) Receiving X baht for sure. Which alternative do you choose? Notes: 1. X = [100,3100] 2. Switching point under 1,500 baht = risk averse
Risk Averse in Loss Situation	You have to make the decision on 5 situations. Each situation has 2 alternatives (1) In head or tail game, if the coin shows head side, you will loss 3,000 baht. If the coin shows tail side, you will loss nothing. (2) Losing X baht for sure. Which alternative do you choose? Notes: 1. X = [100,3100] 2. Switching point under 1,500 baht = risk averse
Time Preference in 3 months	You have to make the decision on 5 situations. Each situation has 2 alternatives (1) Receiving 1,000 baht. (2) Receiving X baht in next 3 months. Which alternative do you choose? Notes: 1. X = [1030, 2150]

Appendix B: The detail of Perceived Earnings Prediction

B.1 Perceived Earnings Prediction Model

Before estimating expected utility of college major choice, we predict unconditional expectation of individuals. Assuming that respondents expect earnings from each major before choosing their college major; however, we have only information of expected earnings on their major choice. Hence, we predict the missing expected earnings. As explained by Brunello, Lucifora, and Winter-Ebmer (2004), unconditional expectations can be useful to test the general knowledge of individuals in the labor market and its development. Moreover, Montmarquette et al. (2002) assume that earning after graduation are defined by the regression because earning expectation depends on many factors. Especially, expected income from this survey is determined by different the expectation of the highest education level. Hence, we predict expected lifetime earnings by expectation of the highest educational level that individuals need and other determinants in equation (13).

$$v_{ij} = \sum_{t=0}^{4} \frac{v_{0i}}{(1+r_i)^t} + \sum_{t=5}^{9} \frac{v_{5i}}{(1+r_i)^t} + \sum_{t=10}^{19} \frac{v_{10i}}{(1+r_i)^t} + \frac{v_{20i}}{(1+r_i)^{20}} \quad (12)$$

$$\hat{v}_{ij} = \alpha'_{ij} charac_i + \beta'_{ij} avgwage_j + \varepsilon'_{ij} \quad (13)$$

where v_{ij} is the present value of total perceived lifetime earnings from each period that discounted by discount rate (Assuming that each person has 1% discount rates) as we show in equation (12). We assume that the outcome will change in year 5, 10, and 20. $avgwage_j$ is the average wage of the occupation types that they selected by major from the "Labor Force Survey of Thailand" in 2016. This factor shows exogenous variables that affect subjective expectation. Lastly, ε'_{ij} is the error term of this regression equation.

Due to the uncertainty of outcomes, assuming that people estimate earnings from employed labor, we exclude unemployed people in LFS data with zero earnings. Furthermore, as follow the assumption of Montmarquette et al. (2002), the model assumed independence between the error terms of the model can be seen as avoiding the usual problem of selection bias. Furthermore, we concern about reverse causality between college major choice and lifetime earnings expectation. As reviewed by Wiswall and Zafar (2015), college major choice is determined by earning expectation. However, as we mentioned previously, college major choice is determined by many factors. Consequently, individuals may expect earning from their college major choice. We believe that predicted lifetime earning expectation regression can mitigate this problem.

B.2 The Results of Perceived Earnings Prediction

Table B reports the results of expected earnings prediction model. Column (1) shows that perceived earnings depend on the average income of employed labor force. It implies that the respondents estimate earnings from labor market information. Moreover, family's wealth significantly increases expected earnings. Furthermore, risk averse in gain situation person have less expected earnings rather than other groups.

Table B: The Results of Expected Earnings Model

VARIABLES	College Enrollment Samples		College Major Samples	
	(1)	(2)	(3)	(4)
	Expected Earning (1%)	Expected Earning (Time Preference)	Expected Earning (1%)	Expected Earning (Time Preference)
Characteristics and Background				
Age	0.02	0.014	0.024	0.011
	(0.024)	(0.042)	(0.025)	(0.043)
GPAX	0.009	-0.072	0.016	-0.076
	(0.046)	(0.079)	(0.048)	(0.083)
Family's wealth	0.035**	-0.003	0.031*	-0.010
	(0.017)	(0.03)	(0.018)	(0.031)
High school track (Science)	0.076	0.041	0.071	0.033
	(0.048)	(0.083)	(0.050)	(0.086)
Behavioral Preferences				
Risk averse in gain situation	-0.087*	0.117	-0.077	0.121
	(0.049)	(0.083)	(0.050)	(0.086)
Risk averse in loss situation	-0.081	-0.255***	-0.070	-0.254***
	(0.053)	(0.09)	(0.054)	(0.093)
Internal LOC	-0.034	-0.033	-0.034	-0.046

VARIABLES	College Enrollment Samples		College Major Samples	
	(1)	(2)	(3)	(4)
	Expected Earning (1%)	Expected Earning (Time Preference)	Expected Earning (1%)	Expected Earning (Time Preference)
	(0.104)	(0.177)	(0.104)	(0.180)
Neutral LOC	0.077	0.131	0.079	0.132
	(0.051)	(0.086)	(0.052)	(0.089)
Log of average	0.425***	0.641***	0.427***	0.616***
	(0.078)	(0.133)	(0.081)	(0.140)
Constant	5.377***	2.154	5.267***	2.515
	(0.9)	(1.536)	(0.927)	(1.601)
Control	YES	YES	YES	YES
Observations	760	760	717	717
R-squared	0.16	0.079	0.160	0.075

Notes: 1. Standard errors in parentheses 2. *** p<0.01, ** p<0.05, * p<0.1

Another point that we concern is that students may use their own time preferences to expect earnings; hence we compare the model with the expected earning that discounted by their own time preferences. Column (2) shows that the R-squared of the model that use time preference as a discount rate is less than the model that we choose. It may because time preference of the respondents is from their own estimation; therefore, it may have measurement error problem that is explained in Belzil and Leonardi (2007).

Although the expected earnings prediction that we show are not perfectly robust, all prediction result does not affect college major model. We compare three types of earnings alternatives, include expected earnings discounted by inflation rate, expected earnings discounted by time preferences, and average earnings in each major from LFS data. Appendix E shows that all alternative does not affect college major model, and all of the college major models is still robust.

Appendix C: List of Majors

List of Majors	
1: Economics & Business	5: Natural Science
- Commerce & Business Management	- Computer Science
- Hoteling & Tourism Management	- Science
2: Engineering & Technology	- Mathematics & Statistics
- Engineering	- Environmental Science
3: Health & Medicine	- Agriculture
- Medicine, Dentistry, Veterinary Science and Nurse	6: Social Science
- Pharmacy, Psychology and Anatomy & Physiology	- Education
4: Humanities & Arts	- Political & Social Science
- Humanities & Arts	- Law
- Architecture	- Communication Arts
	- Economics
	- Psychology
	7: Others

Appendix D: Estimation Results of College Enrollment Model (Robustness Check)

VARIABLES	College Enrollment Model			
	(1)	(2)	(3)	(4)
College enrollment preference of parents	0.094***	0.067**	0.067**	0.062
	(0.031)	(0.030)	(0.032)	(0.048)
Log earning expectation after graduated (Time preferences)	-0.007	-0.004		
	(0.006)	(0.006)		
Log earning expectation after graduated (1% discount rate)			0.003	
			(0.015)	
Log of expected earnings after graduated for 0 years				0.026
				(0.048)
Log of expected earnings after graduated for 5 years				-0.029
				(0.021)
Log of expected earnings after graduated for 10 years				0.030
				(0.024)
Log of expected earnings after graduated for 20 years				-0.014
				(0.028)
Family's wealth		0.008	0.008	0.008*
		(0.006)	(0.005)	(0.004)
GPAX		0.011	0.012	0.011
		(0.014)	(0.008)	(0.010)
High school track (Science)		0.038**	0.038***	0.036***
		(0.017)	(0.010)	(0.007)
Parents' year of schooling		0.004**	0.004***	0.005***
		(0.002)	(0.002)	(0.002)
Parents work in public sector		0.012	0.012***	0.011***
		(0.019)	(0.001)	(0.002)
Risk averse in gain situation		0.001	0.001	0.002
		(0.015)	(0.022)	(0.019)
Risk averse in loss situation		0.008	0.010	0.010
		(0.016)	(0.022)	(0.021)
Internal LOC		-0.011	-0.012	-0.012
		(0.037)	(0.038)	(0.037)
Neutral LOC		0.011	0.011	0.012
		(0.015)	(0.022)	(0.025)
Probability of not work		-0.020	-0.020	-0.017
		(0.022)	(0.025)	(0.024)
Observations	796	796	796	796
School Fixed Effect	YES	YES	YES	YES
Cluster Region	NO	NO	YES	YES
Pseudo R^2	0.084	0.175	0.174	0.185

Notes: 1. Standard errors in parentheses 2. *** p<0.01, ** p<0.05, * p<0.1

Appendix E: Estimation Results of College Major Choice Model (Robustness Check)

Variables	College Major Choice									
	Business				Engineering				Health & Medicine	
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)
Probability of selected choice	0.115	0.113	0.113	0.116	0.097	0.098	0.098	0.097	0.13	0.144
Parent's Preference										
Business	0.221***	0.229***	0.23***	0.236***	-0.064	-0.077	-0.077	-0.07	-0.12**	-0.151**
	(0.036)	(0.037)	(0.037)	(0.039)	(0.06)	(0.067)	(0.067)	(0.068)	(0.054)	(0.063)
Engineering	0.01	0.01	0.01	0.029	0.185***	0.209***	0.209***	0.204***	-0.193***	-0.213***
	(0.041)	(0.047)	(0.047)	(0.05)	(0.032)	(0.035)	(0.035)	(0.037)	(0.05)	(0.062)
Health & Medicine	0.004	-0.007	-0.007	0.014	-0.008	0.209***	0.002	-0.007	0.177***	0.214***
	(0.032)	(0.032)	(0.032)	(0.033)	(0.031)	(0.035)	(0.033)	(0.033)	(0.031)	(0.034)
Humanities & Arts	0.07*	0.104**	0.104**	0.086*	0.026	0.002	0.019	0.029	-0.103	-0.098
	(0.038)	(0.049)	(0.049)	(0.051)	(0.04)	(0.033)	(0.048)	(0.049)	(0.065)	(0.079)
Natural Science	-0.087**	-0.092*	-0.092*	-0.092*	0.077**	0.018	0.086***	0.079**	-0.126***	-0.124**
	(0.042)	(0.048)	(0.048)	(0.049)	(0.032)	(0.048)	(0.034)	(0.034)	(0.045)	(0.051)
Social Science	-0.009	-0.004	-0.004	0.004	0.035	0.086***	0.046	0.041	-0.04	-0.057
	(0.043)	(0.043)	(0.043)	(0.045)	(0.037)	(0.034)	(0.037)	(0.038)	(0.039)	(0.045)
Others	0.048	0.049*	0.049*	0.052*	-0.066*	0.046	-0.075**	-0.068*	-0.085**	-0.087**
	(0.03)	(0.029)	(0.029)	(0.03)	(0.034)	(0.037)	(0.036)	(0.036)	(0.034)	(0.037)
Characteristics										
GPAX	0.001			0.005	-0.035			-0.044*	-0.081***	
	(0.026)			(0.028)	(0.024)			(0.026)	(0.027)	

Notes: 1. Marginal effects of logit estimates. 2. Robust standard errors for the marginal effects clustered at the individual level are reported in parentheses. 3. All regressions have major and individual fixed effects, and seven observations for each student (one for each of the major categories: business, engineering, health & medicine, humanities & arts, natural sciences, social science, and others) 4. *** p<0.01, ** p<0.05, * p<0.1

(Continue)

Variables	Business (1)	Business (2)	Business (3)	Business (4)	Engineering (1)	Engineering (2)	Engineering (3)	Engineering (4)	Health & Medicine (1)	Health & Medicine (2)
Family's Wealth	0.002			0.003	0.002			0.002	0.014*	
	(0.008)			(0.009)	(0.007)			(0.008)	(0.007)	
Parents' years of schooling	-0.002			-0.002	0.003			0.003	-0.002	
	(0.003)			(0.003)	(0.003)			(0.003)	(0.003)	
High School Track (Science)	-0.039			-0.027	-0.058			-0.086	-0.174	
	(0.133)			(0.144)	(0.099)			(0.106)	(0.118)	
GPAX of Students Who Study in Science	-0.009			-0.016	0.039			0.049	0.096***	
	(0.042)			(0.045)	(0.032)			(0.034)	(0.037)	
Risk Averse in Gain Situation	-0.011			-0.011	-0.002			-0.009	0.061***	
	(0.023)			(0.025)	(0.02)			(0.021)	(0.021)	
Risk Averse in Loss Situation	-0.014			-0.017	-0.027			-0.027	0.028	
	(0.024)			(0.025)	(0.02)			(0.021)	(0.023)	
Parents work in public sector	-0.03			-0.022	-0.01			-0.026	0.069*	
	(0.036)			(0.039)	(0.044)			(0.047)	(0.037)	
Parents work as teacher in public sector	0.028			0.029	0.007			0.005	-0.028	
	(0.041)			(0.046)	(0.047)			(0.052)	(0.038)	
Parents work as politician	0.037			0.014	-0.145			-0.157	0.099	
	(0.106)			(0.137)	(0.104)			(0.113)	(0.102)	
Parents work in public healthcare sector	0.003			-0.025	0.003			0.023	-0.027	
	(0.066)			(0.084)	(0.038)			(0.041)	(0.047)	
Parents work as military and police	0.007			-0.006	0.012			0.03	-0.05	
	(0.037)			(0.04)	(0.046)			(0.05)	(0.04)	

Notes: 1. Marginal effects of logit estimates. 2. Robust standard errors for the marginal effects clustered at the individual level are reported in parentheses. 3. All regressions have major and individual fixed effects, and seven observations for each student (one for each of the major categories: business, engineering, health & medicine, humanities & arts, natural sciences, social science, and others) 4. *** p<0.01, ** p<0.05, * p<0.1

(Continue)

Variables	Business				Engineering				Health & Medicine	
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)
Probability of not work	0.035			0.034	-0.0004			0.001	-0.04	
	(0.033)			(0.034)	(0.03)			(0.031)	(0.031)	
Alternative										
Business	0.001		-0.003	0.0004	-0.0001		0.0003	-0.00004	-0.0002	
	(0.011)		(0.012)	(0.012)	(0.001)		(0.001)	(0.001)	(0.002)	
Engineering	-0.0001		0.0003	-0.00004	0.001		-0.002	0.0003	-0.0002	
	(0.001)		(0.001)	(0.001)	(0.01)		(0.011)	(0.01)	(0.001)	
Health & Medicine	-0.0002		0.0004	-0.0001	-0.0002		0.0004	-0.0001	0.001	
	(0.002)		(0.002)	(0.002)	(0.001)		(0.002)	(0.002)	(0.013)	
Humanities & Arts	-0.0003		0.0006	-0.0001	-0.0003		0.001	-0.0001	-0.0004	
	(0.003)		(0.003)	(0.003)	(0.002)		(0.003)	(0.002)	(0.003)	
Natural Science	-0.0004		0.0009	-0.0001	-0.0003		0.001	-0.0001	-0.0005	
	(0.004)		(0.004)	(0.004)	(0.003)		(0.003)	(0.003)	(0.004)	
Others	-0.0001		0.0001	-0.00001	-0.0001		0.0001	-0.000012	-0.0001	
	(0.001)		(0.001)	(0.0004)	(0.001)		(0.0005)	(0.0003)	(0.001)	
Social Science	-0.0002		0.0003	-0.0001	-0.0001		0.0003	-0.00004	-0.0002	
	(0.001)		(0.002)	(0.001)	(0.001)		(0.001)	(0.001)	(0.002)	
Observations	760	717	717	717	760	717	717	717	760	717
Perceived Earnings by 1% discount rate	NO	NO	YES	YES	NO	NO	YES	YES	NO	NO
Perceived Earnings by time preference	YES	NO	NO	NO	YES	NO	NO	NO	YES	NO
Wald Chi2	1143	879.1	879	1089.37	1143	879.1	879	1089.37	1143	879.1

Notes: 1. Marginal effects of logit estimates. 2. Robust standard errors for the marginal effects clustered at the individual level are reported in parentheses. 3. All regressions have major and individual fixed effects, and seven observations for each student (one for each of the major categories: business, engineering, health & medicine, humanities & arts, natural sciences, social science, and others) 4. *** p<0.01, ** p<0.05, * p<0.1

(Continue)

Variables	College Major Choice									
	Health & Medicine		Humanities & Arts				Natural Science			
	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Probability of selected choice	0.145	0.133	0.219	0.209	0.209	0.030	0.286	0.283	0.283	0.297
Parent's Preference										
Business	-0.151**	-0.144**	0.125**	0.129**	0.128**	0.138**	-0.201***	-0.2***	-0.2***	-0.214***
	(0.063)	(0.061)	(0.055)	(0.059)	(0.059)	(0.06)	(0.07)	(0.074)	(0.074)	(0.076)
Engineering	-0.213***	-0.233***	0.058	0.044	0.044	0.075	-0.067	-0.037	-0.038	-0.064
	(0.062)	(0.058)	(0.053)	(0.058)	(0.058)	(0.062)	(0.055)	(0.062)	(0.062)	(0.066)
Health & Medicine	0.214***	0.177***	-0.097*	-0.119**	-0.119**	-0.101*	-0.119**	-0.106**	-0.106**	-0.116**
	(0.034)	(0.033)	(0.052)	(0.053)	(0.053)	(0.057)	(0.047)	(0.048)	(0.048)	(0.05)
Humanities & Arts	-0.098	-0.078	0.375***	0.467***	0.468***	0.464***	-0.102	-0.11	-0.111	-0.123
	(0.079)	(0.075)	(0.053)	(0.064)	(0.064)	(0.069)	(0.066)	(0.09)	(0.09)	(0.094)
Natural Science	-0.124**	-0.137***	0.077	0.073	0.072	0.091*	0.16***	0.191***	0.192***	0.179***
	(0.051)	(0.048)	(0.05)	(0.051)	(0.051)	(0.053)	(0.051)	(0.054)	(0.054)	(0.056)
Social Science	-0.057	-0.057	0.033	0.006	0.006	0.027	-0.153**	-0.112*	-0.113*	-0.129**
	(0.045)	(0.043)	(0.058)	(0.06)	(0.06)	(0.062)	(0.061)	(0.059)	(0.059)	(0.064)
Others	-0.087**	-0.093***	0.074*	0.071	0.072*	0.083*	-0.071	-0.067	-0.067	-0.078*
	(0.037)	(0.035)	(0.043)	(0.044)	(0.044)	(0.045)	(0.044)	(0.044)	(0.044)	(0.046)
Characteristics										
GPAX		-0.089***	0.079*			0.075	-0.054			-0.046
		(0.028)	(0.043)			(0.047)	(0.049)			(0.053)

Notes: 1. Marginal effects of logit estimates. 2. Robust standard errors for the marginal effects clustered at the individual level are reported in parentheses. 3. All regressions have major and individual fixed effects, and seven observations for each student (one for each of the major categories: business, engineering, health & medicine, humanities & arts, natural sciences, social science, and others) 4. *** p<0.01, ** p<0.05, * p<0.1

(Continue)

Variables	Health & Medicine		Humanities & Arts				Natural Science			
	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Family's Wealth		0.015*	0.013			0.009	-0.015			-0.015
		(0.008)	(0.01)			(0.011)	(0.011)			(0.012)
Parents' years of schooling		-0.002	0.002			0.003	-0.006			-0.006
		(0.003)	(0.004)			(0.004)	(0.004)			(0.004)
High School Track (Science)		-0.174	-0.008			-0.068	0.035			0.12
		(0.13)	(0.188)			(0.204)	(0.189)			(0.205)
GPAX of Students Who Study in Science		0.098**	-0.029			-0.01	0.0002			-0.027
		(0.04)	(0.059)			(0.064)	(0.062)			(0.067)
Risk Averse in Gain Situation		0.062***	-0.021			-0.019	-0.013			-0.001
		(0.023)	(0.028)			(0.03)	(0.032)			(0.034)
Risk Averse in Loss Situation		0.038	-0.051*			-0.049	0.031			0.034
		(0.025)	(0.031)			(0.032)	(0.035)			(0.037)
Parents work in public sector		0.074*	0.053			0.035	-0.046			-0.036
		(0.039)	(0.045)			(0.048)	(0.066)			(0.071)
Parents work as teacher in public sector		-0.026	-0.1**			-0.086*	0.075			0.066
		(0.04)	(0.047)			(0.051)	(0.064)			(0.07)
Parents work as politician		0.118	0.281**			0.295**	-0.529**			-0.53**
		(0.108)	(0.119)			(0.132)	(0.222)			(0.233)
Parents work in public healthcare sector		-0.021	-0.035			-0.066	0.077			0.095
		(0.051)	(0.058)			(0.068)	(0.07)			(0.077)
Parents work as military and police		-0.052	-0.089*			-0.079	0.03			0.029
		(0.044)	(0.047)			(0.052)	(0.067)			(0.074)

Notes: 1. Marginal effects of logit estimates. 2. Robust standard errors for the marginal effects clustered at the individual level are reported in parentheses. 3. All regressions have major and individual fixed effects, and seven observations for each student (one for each of the major categories: business, engineering, health & medicine, humanities & arts, natural sciences, social science, and others) 4. *** p<0.01, ** p<0.05, * p<0.1

(Continue)

Variables	Health & Medicine		Humanities & Arts				Natural Science			
	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Probability of not work		-0.043	0.048			0.04	-0.053			-0.038
		(0.033)	(0.04)			(0.042)	(0.048)			(0.051)
Alternative										
Business	0.0004	-0.0001	-0.0003		0.001	-0.0001	-0.0004		0.001	-0.0001
	(0.002)	(0.002)	(0.003)		(0.003)	(0.003)	(0.004)		(0.004)	(0.004)
Engineering	0.0004	-0.0001	-0.0003		0.001	-0.0001	-0.0003		0.001	-0.0001
	(0.002)	(0.002)	(0.002)		(0.003)	(0.002)	(0.003)		(0.003)	(0.003)
Health & Medicine	-0.003	0.0005	-0.0004		0.001	-0.0001	-0.0005		0.001	-0.0002
	(0.015)	(0.013)	(0.003)		(0.004)	(0.003)	(0.004)		(0.005)	(0.005)
Humanities & Arts	0.001	-0.0001	0.002		-0.004	0.0007	-0.001		0.002	-0.0003
	(0.004)	(0.003)	(0.019)		(0.021)	(0.02)	(0.007)		(0.007)	(0.008)
Natural Science	0.001	-0.0002	-0.001		0.002	-0.0003	0.003		-0.005	0.0008
	(0.005)	(0.005)	(0.007)		(0.007)	(0.008)	(0.023)		(0.025)	(0.024)
Others	0.0002	-0.00002	-0.0001		0.0002	-0.00003	-0.0002		0.0003	-0.00004
	(0.001)	(0.0005)	(0.001)		(0.001)	(0.001)	(0.001)		(0.001)	(0.001)
Social Science	0.0004	-0.0001	-0.0003		0.001	-0.0001	-0.0004		0.001	-0.0001
	(0.002)	(0.002)	(0.003)		(0.003)	(0.003)	(0.003)		(0.004)	(0.004)
Observations	717	717	760	717	717	717	760	717	717	717
Perceived Earnings by 1% discount rate	YES	YES	NO	NO	YES	YES	NO	NO	YES	YES
Perceived Earnings by time preference	NO	NO	YES	NO	NO	NO	YES	NO	NO	NO
Wald Chi2	879	1089.37	1143	879.1	879	1089.37	1143	879.1	879	1089.37

Notes: 1. Marginal effects of logit estimates. 2. Robust standard errors for the marginal effects clustered at the individual level are reported in parentheses. 3. All regressions have major and individual fixed effects, and seven observations for each student (one for each of the major categories: business, engineering, health & medicine, humanities & arts, natural sciences, social science, and others) 4. *** p<0.01, ** p<0.05, * p<0.1

(Continue)

Variables	College Major Choice							
	Social Science				Others			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Probability of selected choice	0.107	0.112	0.113	0.109	0.046	0.04	0.040	0.030
Parent's Preference								
Business	0.071	0.091*	0.091*	0.084*	-0.03	-0.021	-0.021	-0.031
	(0.045)	(0.048)	(0.048)	(0.048)	(0.034)	(0.029)	(0.029)	(0.023)
Engineering	0.036	0.056	0.057	0.067	-0.029	-0.07**	-0.07**	-0.079***
	(0.045)	(0.048)	(0.048)	(0.048)	(0.026)	(0.029)	(0.029)	(0.024)
Health & Medicine	0.041	0.024	0.024	0.041	0.002	-0.009	-0.009	-0.008
	(0.04)	(0.042)	(0.042)	(0.042)	(0.024)	(0.019)	(0.019)	(0.016)
Humanities & Arts	-0.21***	-0.308***	-0.307***	-0.311***	-0.054*	-0.074**	-0.074**	-0.067**
	(0.062)	(0.101)	(0.101)	(0.1)	(0.031)	(0.033)	(0.033)	(0.027)
Natural Science	-0.063	-0.057	-0.057	-0.05	-0.039	-0.077**	-0.077**	-0.071***
	(0.056)	(0.061)	(0.061)	(0.058)	(0.028)	(0.031)	(0.031)	(0.025)
Social Science	0.054	0.049	0.05	0.069	0.08***	0.072***	0.072***	0.046**
	(0.043)	(0.047)	(0.047)	(0.045)	(0.025)	(0.024)	(0.024)	(0.018)
Others	0.127***	0.134***	0.133***	0.135***	-0.028	-0.025	-0.025	-0.03*
	(0.034)	(0.036)	(0.036)	(0.036)	(0.026)	(0.021)	(0.021)	(0.017)
Characteristics								
GPAX	0.109***			0.121***	-0.019			-0.022
	(0.031)			(0.033)	(0.02)			(0.016)

Notes: 1. Marginal effects of logit estimates. 2. Robust standard errors for the marginal effects clustered at the individual level are reported in parentheses. 3. All regressions have major and individual fixed effects, and seven observations for each student (one for each of the major categories: business, engineering, health & medicine, humanities & arts, natural sciences, social science, and others) 4. *** p<0.01, ** p<0.05, * p<0.1

(Continue)

Variables	Social Science (1)	(2)	(3)	(4)	Others (1)	(2)	(3)	(4)
Family's Wealth	-0.011			-0.011	-0.004			-0.003
	(0.008)			(0.009)	(0.005)			(0.004)
Parents' years of schooling	0.004			0.004	0.002			0.001
	(0.003)			(0.003)	(0.002)			(0.001)
High School Track (Science)	0.221			0.212	0.022			0.022
	(0.138)			(0.148)	(0.083)			(0.064)
GPAX of Students Who Study in Science	-0.092**			-0.09*	-0.005			-0.004
	(0.044)			(0.047)	(0.027)			(0.021)
Risk Averse in Gain Situation	-0.048**			-0.046*	0.035***			0.025***
	(0.024)			(0.025)	(0.011)			(0.008)
Risk Averse in Loss Situation	-0.015			-0.013	0.047***			0.034***
	(0.024)			(0.025)	(0.016)			(0.012)
Parents work in public sector	-0.015			-0.012	-0.021			-0.013
	(0.045)			(0.046)	(0.022)			(0.018)
Parents work as teacher in public sector	-0.011			-0.005	0.029			0.017
	(0.043)			(0.044)	(0.02)			(0.016)
Parents work as politician	0.194***			0.211***	0.064*			0.05*
	(0.073)			(0.077)	(0.037)			(0.028)
Parents work in public healthcare sector	0.0004			0.009	-0.021			-0.015
	(0.054)			(0.057)	(0.029)			(0.022)
Parents work as military and police	0.026			0.029	0.063***			0.05***
	(0.041)			(0.043)	(0.022)			(0.018)

Notes: 1. Marginal effects of logit estimates. 2. Robust standard errors for the marginal effects clustered at the individual level are reported in parentheses. 3. All regressions have major and individual fixed effects, and seven observations for each student (one for each of the major categories: business, engineering, health & medicine, humanities & arts, natural sciences, social science, and others) 4. *** p<0.01, ** p<0.05, * p<0.1

(Continue)

Variables	Social Science				Others			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Probability of not work	-0.012			-0.011	0.022			0.016
	(0.034)			(0.036)	(0.017)			(0.013)
Alternative								
Business	-0.0002		0.0003	-0.0001	-0.0001		0.0001	-0.00001
	(0.001)		(0.002)	(0.001)	(0.001)		(0.001)	(0.0004)
Engineering	-0.0001		0.0003	-0.00004	-0.0001		0.0001	-0.00001
	(0.001)		(0.001)	(0.001)	(0.001)		(0.0005)	(0.0003)
Health & Medicine	-0.0002		0.0004	-0.0001	-0.0001		0.0002	-0.00002
	(0.002)		(0.002)	(0.002)	(0.001)		(0.001)	(0.0005)
Humanities & Arts	-0.0003		0.0006	-0.0001	-0.0001		0.0002	-0.00003
	(0.003)		(0.003)	(0.003)	(0.001)		(0.001)	(0.001)
Natural Science	-0.0004		0.0009	-0.0001	-0.0002		0.0003	-0.00004
	(0.003)		(0.004)	(0.004)	(0.001)		(0.001)	(0.001)
Others	-0.0001		0.0001	-0.00001	0.001		-0.001	0.00012
	(0.001)		(0.001)	(0.0004)	(0.005)		(0.005)	(0.003)
Social Science	0.001		-0.0027	0.0004	-0.0001		0.0001	-0.00001
	(0.011)		(0.012)	(0.011)	(0.001)		(0.001)	(0.0004)
Observations	760	717	717	717	760	717	717	717
Perceived Earnings by 1% discount rate	NO	NO	YES	YES	NO	NO	YES	YES
Perceived Earnings by time preference	YES	NO	NO	NO	YES	NO	NO	NO
Wald Chi2	1143	879.1	879	1089.37	1143	879.1	879	1089.37

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