

THE DETERMINANTS OF POST-COMPULSORY EDUCATION DECISION
IN RURAL CHINA: WITH AN ANALYSIS OF A GRASSROOTS NGO
INTERVENTION

Haogen Yao

Submitted in partial fulfillment of the requirements for
the degree of Doctor of Philosophy
under the Executive Committee of the Graduate School of Arts and Sciences

COLUMBIA UNIVERSITY

2016

ABSTRACT

The Determinants of Post-Compulsory Education Decision in Rural China: With an Analysis of a Grassroots NGO Intervention

Haogen Yao

In rural China, when approaching the end of nine-year compulsory schooling, students face four equally popular post-compulsory education decisions (PCED): dropout, work after graduation, vocational high school, and academic high school. The literature tends to simply treat PCED as dichotomous (continue vs. leave school), and there is a geographical research imbalance favoring inner China. An increasing volume of studies also suggest that traditionally recognized factors like socioeconomic status and academic performance are not as influential as before in advancing the schooling. People have started to look at socio-emotional support, such as the promotion of self-discipline and confidence. At present, it is grassroots NGOs (GNGO) who take the major responsibility for providing this type of support in rural China, and there is rare discussion of achievements, let alone evaluation of practical impact.

Given the existing problems, the key research questions of this study are: (1) What are the current PCED determinants for China's rural students? More specifically, what are the PCED determinants for lower secondary students in rural Guangdong, a coastal province? (2) How can GNGO intervention affect PCED by boosting certain subjective factor(s)? The tested treatment is the Lighthouse program, whose one-month summer camp aims to improve student attitudes towards their life, such as making them more confident, organized, and social.

The key to answering the first question is to explore a comprehensive list of variables applying to local populations, which cannot be achieved simply through a literature review. When answering the

second question, since Lighthouse participation is voluntary, it is important to deal with selection bias, to ensure that any identified Lighthouse impact results from its activities rather than the student characteristics that lead to their participation.

To overcome these methodological challenges, I first employed the Delphi approach. Delphi is an iterative process used to collect and distill the judgments of experts using a series of questionnaires interspersed with feedback. It is used to identify possible PCED determinants that are missing in the literature, to determine factors that lead to Lighthouse participation, and to collect discussions about both PCED determinants and GNGO intervention. Based on the Delphi results and literature, I then designed five questionnaires for students, households, teachers, principals, and Lighthouse volunteers. In Jun-Oct 2012, I led seven research assistants in conducting two waves of surveys in eight towns, building a firsthand dataset of 6298 valid observations with imputations. Multinomial logit was used to investigate PCED determinants. It predicted the PCED probabilities, given nine groups of independent variables. Propensity score matching was used to evaluate the program impact. It calculates the treatment propensity for each student based on their characteristics, so the Lighthouse impact can be compared between treated and untreated students of similar treatment propensity. Tests of robustness and heterogeneity were conducted after both methods. Qualitative materials collected from Delphi and on-site interviews were used to explore the causal mechanism.

I use relative risk ratios to report the findings of PCED determinants. The findings challenge the existing literature regarding the roles of gender and parental background, further extend knowledge of monetary reward/cost and subjective factors, and confirm new possible determinants that have seldom been investigated in literature. The main model passes the robustness check, and there exist explainable heterogeneity effects. It is notable that education aspiration stands out as a strong PCED determinant, *ceteris paribus*.

Propensity score matching shows that the Lighthouse program mainly affects PCED by boosting educational aspiration for students with high academic performance, although that impact fades gradually if there is no follow-up service. The novelty of the program to local people, volunteer team

morale, and volunteer acceptance of Lighthouse training could help explain why increases in aspiration varied across sites. The role-model effect might explain why the increase in aspiration exists, as there are signs that the students tried to copy the volunteer's schooling decision once trust was built.

This study makes three major contributions. It can be translated into comprehensive advocacy for education policies related to PCED, such as dropout prevention and the promotion of VHS. It may also suggest the value of, or at least the required improvement to, China's educational GNGOs, which are young and remain confined by governmental regulations. Last but not least, this is a unique showcase of how qualitative-quantitative sequential mixed-method works better in exploratory analyses. The study has limitations in timing, missing data, external validity, implementation of research methods, and heavy rely on self-reported questionnaires, but they can be largely eliminated by conducting proper further studies.

TABLE OF CONTENTS

LIST OF TABLES.....	iv
LIST OF FIGURES.....	v
ACKNOWLEDGEMENTS	vi
Chapter 1 Introduction.....	1
1.1 Context and Motivation.....	1
1.2 Statement of the Problem	5
1.3 Key Research Questions.....	7
1.4 Structure of Dissertation	7
1.5 Definition of Key Terms.....	10
Chapter 2 Determinants of Post-Compulsory Education Decision: A Review	13
2.1 Theoretical Explanation	13
2.1.1 <i>The Basic Neoclassical Model of Schooling Decisions</i>	13
2.1.2 <i>Extensions of the Basic Model</i>	15
2.2 Methodology	22
2.2.1 <i>Data</i>	25
2.2.2 <i>Analytical Approaches</i>	27
2.3 Evidence regarding the Determinants of Post-Compulsory Education Decision	36
2.3.1 <i>Case-Specific Determinants</i>	40
2.3.2 <i>Alternative-Specific Determinants</i>	53
2.4 Summary	64
2.4.1 <i>Major Findings from the Literature</i>	64
2.4.2 <i>Gaps in the Knowledge</i>	66
Chapter 3 China's GNGOs in Education and the Case of Lighthouse	68
3.1 Theories about NGOs	69
3.1.1 <i>Market Failure, Government Failure, and Voluntary Failure</i>	69
3.1.2 <i>Pluralism, Civil Society, and Corporatism</i>	71
3.1.3 <i>NGO Theory Studies in China</i>	72
3.2 NGOs in China.....	74
3.2.1 <i>Classifying NGOs in China</i>	74
3.2.2 <i>Regulations Regarding NGOs</i>	76
3.2.3 <i>The State of NGOs in China</i>	78
3.3 Educational NGOs (ENGOS)	82
3.3.1 <i>NGO Functions in Education</i>	82
3.3.2 <i>Educational NGOs in the World</i>	83
3.3.3 <i>Educational GNGOs in China</i>	83
3.4 Grassroots NGOs for China's Rural Education: Lighthouse	87
3.4.1 <i>Origin and Theme</i>	88
3.4.2 <i>Operation</i>	89

3.4.3 <i>The Growth of Lighthouse</i>	92
3.4.4 <i>Developmental Issues</i>	95
3.4.5 <i>Synthesis of Theory and State</i>	97
Chapter 4 Research Design and Data Collection	99
4.1 Theoretical Framework and Methodological Challenges	99
4.2 Delphi Survey as Qualitative Input to the Quantitative Design	102
4.2.1 <i>The Delphi Process</i>	102
4.2.2 <i>Delphi Results</i>	104
4.2.3 <i>(In)accuracy of the Delphi Results</i>	107
4.3 Answering Question 1: Multinomial Logit	108
4.4 Answering Question 2: Propensity Score Matching	111
4.5 Survey Design and Data Collection	116
4.5.1 <i>Sampling Strategy</i>	117
4.5.2 <i>Questionnaire Design</i>	119
4.5.3 <i>Data Collection</i>	120
4.6 Missing data.....	124
4.7 Variable Construction	126
4.8 Synthesis of Research Components.....	132
Chapter 5 Descriptive Statistics	134
5.1 Expected PCED and Actual PCED	134
5.2 Independent Variables and Treatment-Related Variables	139
5.2.1 <i>Gender, Age and Ethnicity</i>	139
5.2.2 <i>Parental Background</i>	140
5.2.3 <i>Number of Siblings and Birth Order</i>	141
5.2.4 <i>Peer, Teacher, and School Factors</i>	142
5.2.5 <i>Household Economic Status and Credit Constraints</i>	144
5.2.6 <i>Subjective Factors</i>	145
5.2.7 <i>Health</i>	147
5.2.8 <i>Monetary Costs and Rewards</i>	147
5.2.9 <i>Academic Performance and Other Variables</i>	148
5.2.10 <i>Additional Variables for Treatment Outcomes or Determinants</i>	150
Chapter 6 Empirical Results for PCED Determinants	151
6.1 Determinants of PCED	153
6.1.1 <i>Gender, Age and Ethnicity</i>	153
6.1.2 <i>Parental Background</i>	154
6.1.3 <i>Number of Siblings and Birth Order</i>	155
6.1.4 <i>Peer, Teacher and School Factors</i>	155
6.1.5 <i>Household Economic Status and Credit Constraints</i>	157
6.1.6 <i>Subjective Factors</i>	158
6.1.7 <i>Health</i>	160
6.1.8 <i>Monetary Costs and Rewards</i>	160
6.1.9 <i>Academic Performance and Other Variables</i>	161

6.2 Robustness.....	162
6.3 Heterogeneity	174
6.4 Synthesis: Subjective vs. Traditional vs. Localized Determinants	177
6.5 Summary and Discussion of Findings Regarding PCED Determinants	179
6.5.1 <i>Summary of Findings Regarding PCED Determinants</i>	179
6.5.2 <i>Comparison with the Literature</i>	182
Chapter 7 Empirical Findings Regarding Lighthouse Impact	185
7.1 Determinants of Lighthouse Participation.....	185
7.2 Effect of Lighthouse Participation.....	189
7.2.1 <i>Impact of the Most Recent Participation</i>	189
7.2.2 <i>Impact of Any Participation</i>	192
7.2.3 <i>Educational Aspiration as the Key Outcome</i>	195
7.3 Heterogeneous Effect, School Engagement and Program Quality.....	199
7.3.1 <i>Impact by Student Characteristics</i>	199
7.3.2 <i>Impact by Lighthouse Site</i>	201
7.4 Causal Mechanisms	205
7.4.1 <i>Delphi-Based Discussion</i>	205
7.4.2 <i>Interview/Diary-Based Discussion</i>	206
7.5 Summary and Discussion of Findings Regarding Lighthouse Impact	207
7.5.1 <i>Summary of Findings Regarding Lighthouse Impact</i>	207
7.5.2 <i>Untestable Elements across the PSM Implementation</i>	209
Chapter 8 Conclusions and Policy Implications.....	211
8.1 Summary of Key Findings	211
8.1.1 <i>PCED Determinants</i>	211
8.1.2 <i>Impact of Lighthouse Intervention</i>	213
8.2 Significance and Implications	214
8.2.1 <i>Education Policy</i>	214
8.2.2 <i>Educational Grassroots NGO</i>	216
8.2.3 <i>Sequential Mixed-Methods</i>	218
8.3 Limitations and Suggestions for Further Studies	220
References	224
Appendix	238
Appendix A: Lighthouse Intervention: From Volunteer Recruitment to Revisit	238
Appendix B: Questionnaires (Students/Households/Teachers/Principals/Volunteers).....	241
Appendix C: Delphi Ratings for Figure 4-3 and Figure 4-4	261
Appendix D: Summary Statistics for the Six Lighthouse School Sample.....	263
Appendix E: Output for Multinomial Logit with Multiple Imputations	265
Appendix F: Propensity Score Matching with Adjusted Specification	278
Appendix G: Statistics for Lighthouse Teams	282

LIST OF TABLES

Table 2-1 Shortlisted Post-2000 Studies on the Determinants of PCED in Rural China.....	23
Table 2-2 Determinants Suggested by the Shortlisted Studies in Table 2-1.....	38
Table 3-1 Example of Volunteer Roles in a Lighthouse Team.....	89
Table 4-1 Determinants of PCED and Program Participation Suggested by Delphi.....	105
Table 4-2 Instruments Related to Lighthouse Intervention.....	113
Table 4-3 Survey Log.....	123
Table 4-4 Variable Construction	127
Table 5-1 Sample Distribution by Expected PCED and Student Background.....	135
Table 5-2 Expected PCED by Grade: Whole Sample vs. Treated Sample.....	135
Table 5-3 Changeable Expected PCED (Qingyuan Panel Sample).....	137
Table 5-4 Change from Expected to Actual PCED (Qingyuan Panel Sample)	137
Table 5-5 Summary Statistics_ Gender, Age and Ethnicity.....	140
Table 5-6 Summary Statistics_ Parental Background	141
Table 5-7 Summary Statistics_ Siblings and Birth Order	142
Table 5-8 Summary Statistics_ Peer	142
Table 5-9 Summary Statistics_ Teacher.....	143
Table 5-10 Summary Statistics_ School	144
Table 5-11 Summary Statistics_ Household Economic Status and Credit Constraints	145
Table 5-12 Summary Statistics_ Subjective Factors	146
Table 5-13 Summary Statistics_ Health	147
Table 5-14 Summary Statistics_ Monetary Costs and Rewards	147
Table 5-15 Summary Statistics_ Academic Performance and Other Variables	149
Table 5-16 Summary Statistics_ Additional Variables Related to Treatment.....	150
Table 6-1 Relative Risk Ratios_ Gender, Age and Ethnicity	154
Table 6-2 Relative Risk Ratios_ Parental Background.....	154
Table 6-3 Relative Risk Ratios_ Siblings and Birth Order	155
Table 6-4 Relative Risk Ratios_ Peer, Teacher and School Factors.....	156
Table 6-5 Relative Risk Ratios_ Household Economic Status and Credit Constraints	157
Table 6-6 Relative Risk Ratios_ Subjective Factors.....	159
Table 6-7 Relative Risk Ratios_ Health	160
Table 6-8 Relative Risk Ratios_ Monetary Costs and Rewards	161
Table 6-9 Relative Risk Ratios_ Academic Performance and Other Variables.....	162
Table 6-10 Relative Risk Ratios of “Dropout” and “Work”_ Various Samples and Specifications.....	165
Table 6-11 Relative Risk Ratios of “VHS” and “Undecided”_ Various Samples and Specifications	170
Table 7-1 Probit Outputs for the Determinants of Lighthouse Participation	187
Table 7-2 Nearest Neighborhood Matching Results (t Scores)_ Most Recent Participation as Treatment	191

Table 7-3 Nearest Neighborhood Matching Results (t Scores)_ Any Participation as Treatment.....	194
Table 7-4 Akaike/Bayesian Information Criteria_ Various Models and Specifications.....	195
Table 7-5 Matching Results by Background Characteristics (t Scores)	200

LIST OF FIGURES

Figure 1-1 Typical Routes from Compulsory Education to Work for a Rural Student in China	2
Figure 1-2 China's Changing Distribution of PCED (1997-2014)	3
Figure 1-3 National Trend of Student Supply	4
Figure 2-1 Geographical Coverage of PCED Literature	26
Figure 2-2 Possible Nested Structures of PCED	30
Figure 2-3 Pre-2010 Estimates of Return to Education in China	56
Figure 2-4 PCED Determinants Suggested by the Literature	65
Figure 3-1 Number of NGOs Registered in the Government Sectors for Civil Affairs	75
Figure 3-2 Locations of Rural Middle Schools with Lighthouse Interventions (by 2012)	91
Figure 4-1 PCED Process Suggested by the Literature	101
Figure 4-2 Structure of the Delphi Panel	103
Figure 4-3 Suggested Impacts of the Lighthouse Program	106
Figure 4-4 Sorting the Determinants for Choosing Work in the 2nd to 3rd Rounds	108
Figure 4-5 Schools with Lighthouse Interventions in Guangdong	118
Figure 4-6: Connections of Research Steps	133
Figure 5-1 PCED from Grade-7 to Post-Graduation (Qingyuan Panel Sample).....	136
Figure 5-2 High School Entrance Exam Score vs. Actual PCED (Qingyuan Panel Sample)	138
Figure 6-1 Visualization of Standardized Effect Size and Statistical Significance	178
Figure 7-1 Distribution of Propensity Scores_ Adjusted Specification	196
Figure 7-2 Propensity Score Matching Results for Educational Aspiration	198
Figure 7-3 Three-School Comparison of the Increase in Educational Aspiration	202

ACKNOWLEDGEMENTS

I would like to express my sincere respect and deep gratitude to my advisor Professor Mun Tsang for his insightful navigation throughout my doctoral study, his strong support to my adventure in the field study and data collection, his strict training of my analytical skill, and his understanding of and patience on my slow research progress that had been intertwined with family and out-of-campus commitments. Professor Tsang's lifelong influence on me is not just academic, but also about being the one always cares about social justice as well as the growth of next generation.

My deep gratitude goes to my dissertation committee. I would like to thank Professor Henry Levin for his insightful comments throughout my research, particularly during the year Professor Tsang was in Sabbatical. I also sincerely appreciate Professor Aaron Pallas, Professor Peter Bergman, and Professor Yao Lu for their constructive comments and advice. In addition, I am thankful to professors and peer researchers who have been at one of my six Chinese Education Seminar or Economics & Education Workshop presentations. Without their precious feedbacks, my dissertation would never reach the current level of sophistication.

My sincere appreciation goes to my research assistants in China. I thank Guiying Zhou and Chulin Cheng for their outstanding outreach to local officials, principals, and students, as well as their professional arrangement of logistics. I thank Dan Chen, Huiyan Xu, Huizhen Huang, Jia'ai Lin, Peiyu Wang, Qihang Fan and Yisen Fang for their enormous help on data collection, data entry and filed interviews. We are more than a researcher and his assistants. We are friends who shared the same enthusiasm on rural education and grew together through an intellectual odyssey.

My heartfelt thanks to the educators, officials, NGO members and researchers engaged in the qualitative Delphi survey or quantitative data collection. Due to IRB protocol or personal request, their names cannot be revealed, but their help will never be forgotten. It is warm to be invited to a family dinner when the field survey was halted; it is convenient to receive suggestion of localized questionnaire design when literature does not offer much help; and it is a great relief to have

someone willing to standardize over one hundred village names during data cleaning.

I am also grateful to the financial supports on data collection and dissertation writing provided by multiple institutes. In chronological order, they are Sasakawa Young Leaders Fellowship Fund Grant from Nippon Foundation, Y.F. & L.C.C. Wu Fellowship and Weatherhead Ph.D. Summer Training Grant from Weatherhead East Asian Institute, Sasakawa Research Abroad Award from Nippon Foundation, Outstanding Abroad Student Award from China Ministry of Education, Doctoral Fellowship from Chiang Ching-kuo Foundation, and Doctoral Dissertation Grant and Grant-in-aid from Teachers College, Columbia University.

My deep gratitude and love goes to my family, in particular my parents and parents-in-law who are always supporting my pursuit of the PhD degree, and my wife Wenwen Liu and elder son Yige Yao who have stayed with me to bear the family-unfriendly living condition of New York City.

Finally, my special thanks go to Qingpeng Lu and Jinying Zhi. When I met Qingpeng, I was a sophomore and he was a 9 year-old boys who lived with grandparents in a Dong Chinese village. He has a decent appearance, but his shirt has no button. He scored the top among the boys at his class, but he also needed to get up at 4 a.m. to feed the pigs. When I met Jinying, I was a junior teaching volunteer and she was a grade-8 student in northwest Guangdong. She gifted me a small bottle of swine oil to cure my pustule caused by local insects. She was the youngest among her seven siblings, but she did not proceed to grade-9 even though she performed quite well in tests. I had not met Qingpeng again, and the last time I met Jinying was near her factory when she told me about her attempt to get an accounting training at vocational school. These all happened over 10 years ago. They are the reason for my persistence on this dissertation research. I want to know more about and then do more for Qingpengs and Jinyings. My dissertation finally reaches its end. And the commitment continues.

Chapter 1 Introduction

1.1 Context and Motivation

In 2014, China had 138 million¹ students enrolled in its 9-year compulsory education system, with nearly half living in rural regions. Most of these students need to make decisions based on four alternatives when approaching the end of their compulsory schooling. These can be called ‘post-compulsory education decisions’ (PCED). They are:

- A. Drop out before compulsory schooling is finished (Dropout);
- B. Work right after finishing compulsory education (Work);
- C. Further their education in academic high schools (AHS);
- D. Further their education in vocational high schools (VHS).

For over 90% of school-aged Chinese, “compulsory education” means six years of primary schooling plus three years of lower secondary education.² Students then need to take the summer high school entrance exam (HSEE) if they want to enter a three-year AHS, but not everyone who succeeds in the exam decides to enroll. People who enter an AHS usually plan to continue post-secondary education, which requires them to take the national college entrance exam (NCEE). Contrary to AHS, VHS does not impose strict requirements for HSEE performance. VHS graduates mostly go directly to the labor market. There are three types of VHS in China (specialized, vocational, and skilled workers schools), which are similar in setting and curriculum. Those who decide not to engage in upper secondary schooling may choose Work. For rural students, work means being a farmer in the village, a local worker, or more often than not, a migrant worker. Other than upper high school and work, a number of rural students choose to drop out. Dropout usually takes place at eighth grade (Wang, 2005; Jiang & Dai, 2005) and therefore most dropouts are also supposed to find

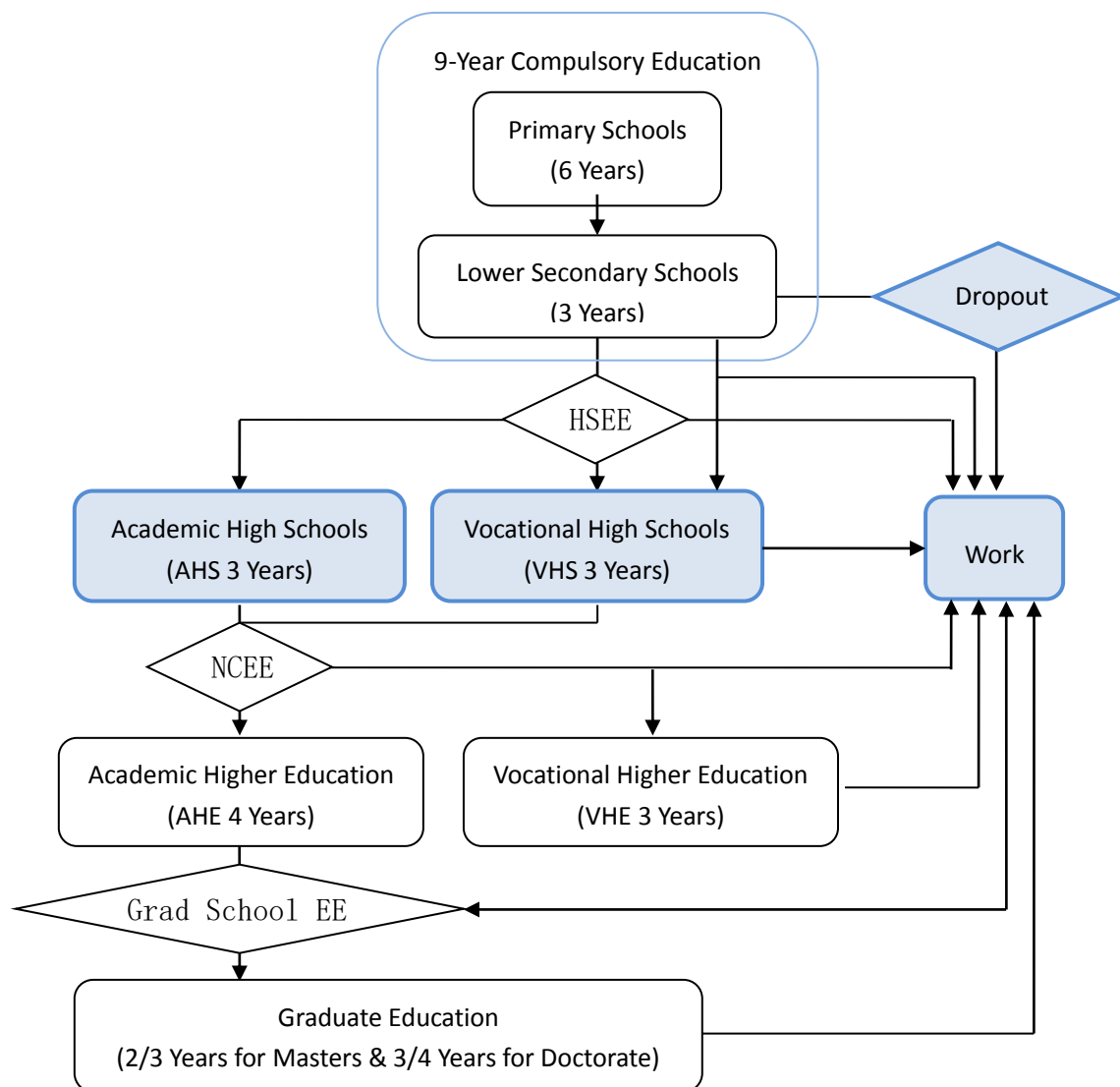
¹ All data presented in this section was calculated from the Educational Statistics Yearbook of China.

² The others attend five-year elementary schools or a system that does not differentiate between elementary and middle schools.

a job quickly, however, this group should be separated from the Work group since it is definitely not a recommended option under the Chinese Compulsory Education Law.

Figure 1-1 illustrates the above process. The end of compulsory education appears to be a critical turning point for future paths. This is especially true for rural students, since Dropout and Work are more likely to be options for them than they are for urban students, as discussed next.

Figure 1-1 Typical Routes from Compulsory Education to Work for a Rural Student in China

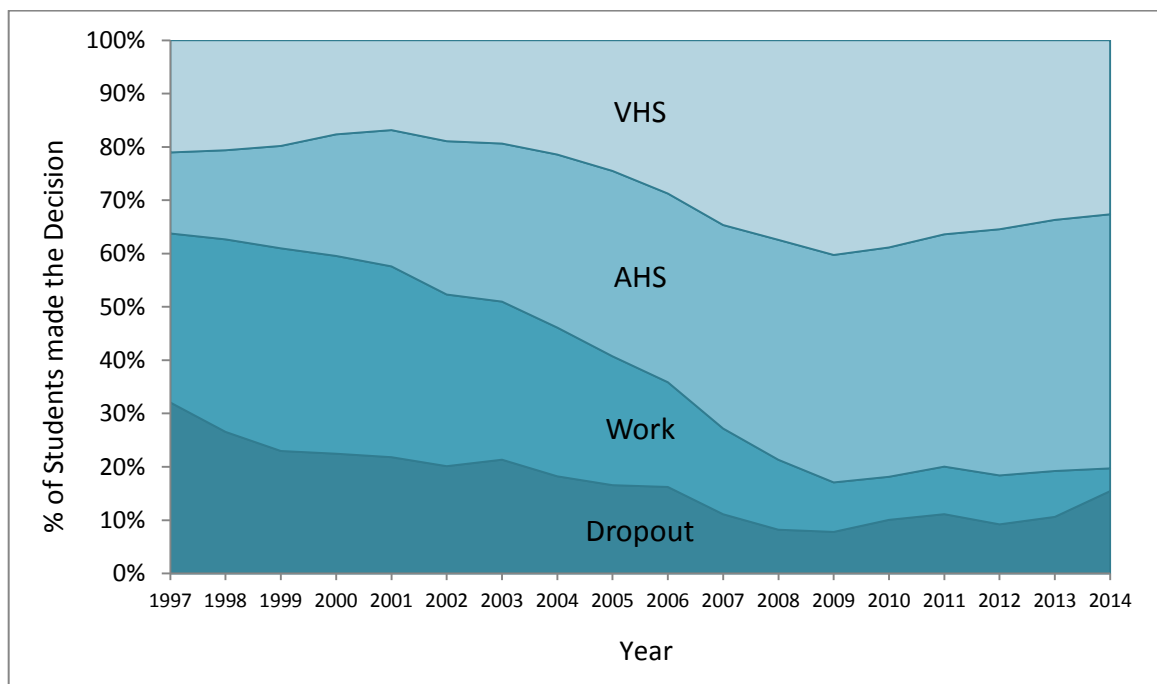


Note: This diagram presents the most common process, but the real routes could vary. First, as of 2010, about 10% of Chinese students are not in a 6-3 system of compulsory education. Second, there are at least nine options for students who fail the NCEE (<http://learning.sohu.com/s2006/gkchulu/> plus the option of joining the army). Third, examination is not the sole channel of further education. Fourth, VHS students also have the chance to enter higher education. The ongoing NCEE reform offers the Spring NCEE that leads to VHEs and the Summer NCEE that leads to AHEs. Both AHS and VHS students are allowed to take both exams.

From the mid-2000s, there have been two trends among rural students. They face a more complicated PCED situation than their urban peers, who now usually only need to make a decision between AHS and VHS. This disparity is apparent in coastal regions with large rural-urban gaps, such as Guangdong where the data for this study will be collected.

Figure 1-2 shows the yearly estimates of PCED distribution for the whole nation. In 2014, almost all students in Dropout or Work were from rural areas. There are also unofficial reports that the percentage of rural Dropout/Work groups might have been seriously understated by official data (Wang, 2005; Wang et al., 2009). Recalling that about half China's compulsory education enrollment is rural, one can expect a relatively even distribution of rural PCED. For these students, ending compulsory education appears to be a critical turning point in their future paths.

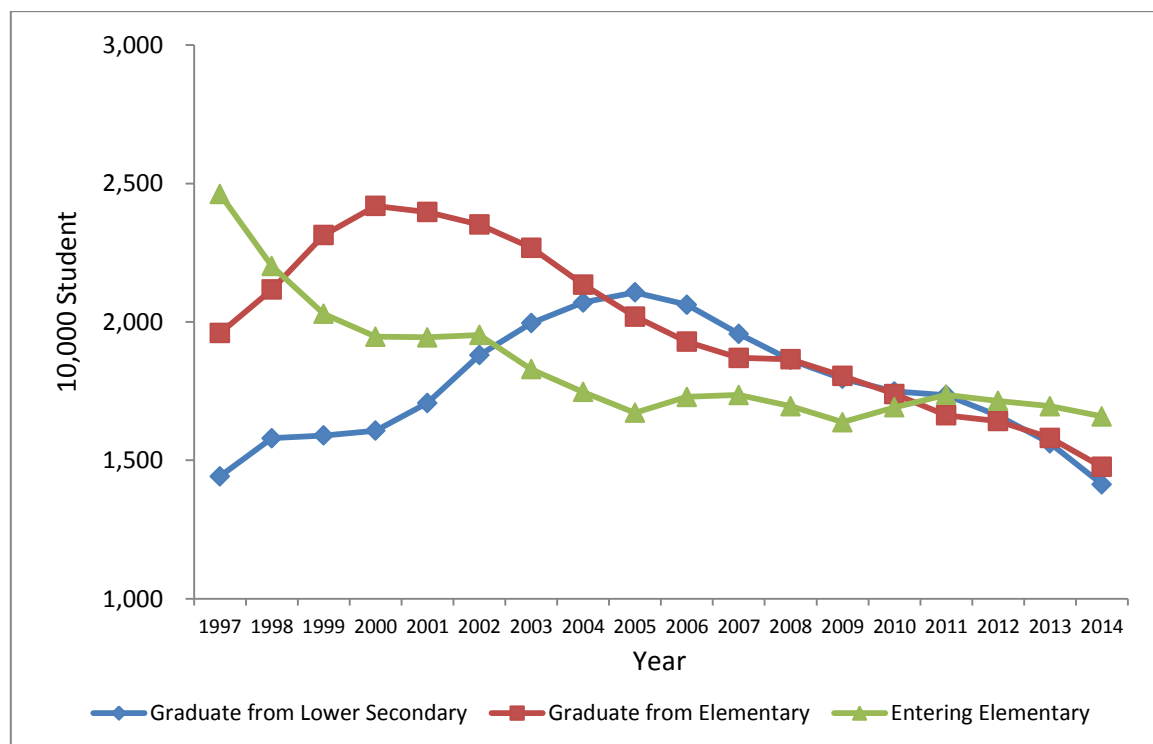
Figure 1-2 China's Changing Distribution of PCED (1997-2014)



Note: Data is calculated from the Educational Statistics Yearbook of China. I assume the four alternatives to be the only PCEDs, although there are other alternatives, such as studying abroad and getting married. The new enrollment in vocational high schools (VHS) is the sum of new enrollment in specialized secondary, vocational, and skilled workers' schools. The new enrollment in academic high schools (AHS) was obtained directly. The number of students graduating and working (Work) was obtained by subtracting the new enrollment in VHSs/AHSs from the number of lower-secondary graduates. The number of dropouts (Dropout) was calculated by subtracting the new enrollment in elementary schools nine years ago from the present number of lower-secondary graduates.

In the meantime, as Figure 1-3 shows, graduation from lower-secondary schools declined after 2005. New enrollments in elementary and lower-secondary schools are also smaller due to the demographic change (caused by the One-Child Policy). It is safe to say that today's students face less competition to enter AHSs, VHSs or even the labor market. The stabilized post-2008 PCED distribution together with the eased competition among students suggest that PCED determinants cannot be simply about cost concerns or the availability of AHS/VHS/work opportunities.

Figure 1-3 National Trend of Student Supply



Note: Data was collected from the Educational Statistics Yearbook of China.

There is an increasing concern that the traditional material support provided for students lacks impact in affecting rural PCED. Figure 1-2 shows that the PCED distribution changed at an accelerated rate from 2006 to 2008. An increasing percentage of students chose upper secondary education. Two possible catalysts of this include the 2005 policy of the Promotion of Vocational Education, which expanded enrollment and offered subsidies, or even eliminated, tuition for VHS attendance, and the 2006 Amendment of Compulsory Education Law, which made compulsory education really free of

tuition and fees. The change stagnated after 2008, however, with the percentage of Dropouts³ increasing. This phenomenon echoes the concern that material support is not a panacea. In a 2003 survey covering nine Chinese provinces, 52.8% of rural households selected 'school-weary' as the main reason for their children's dropout, while only 29.4% selected 'tuition and fees' (Jiang & Dai, 2005). If financial concerns are no longer the primary reason for dropouts, then material support lacks momentum, and it would be wise to look at non-material factors such as attitude, self-discipline, self-affirmation, and educational aspiration. These have been demonstrated as responsive to purposive personal assistance and support, and they have an impact on educational decisions (Almlund et al., 2011; Yeager & Walton, 2011).

Currently, it is the grassroots nongovernmental organizations (NGO) that are taking the lead in non-material PCED intervention, but NGO is still a weak sector in China. Many NGOs fail to register with the Civil Affairs Bureau due to the harsh governmental regulations, and of those registered, the majority have managerial problems, such as unstable personnel and budget deficits (Xie, 2004). NGO may have a role in affecting PCED, but there has not yet been a rigorous evaluation of this role.

1.2 Statement of the Problem

The radical change in PCED distribution throughout the 2000s (Figure 1-2) has created a gap in knowledge. There are many studies about why Chinese students choose Dropout or Work, which is a reasonable response to the late 1990s/early 2000s PCED distribution, but studies of China's schooling track (AHS vs. VHS) determinants are very limited, let alone studies concerning the four PCEDs together. There are only five papers on rural schooling tracks, all in Chinese, and three of them are Master's theses (Zhu, 2006; Fang, 2007; Zhang, 2009). Given the importance of a PCED for rural students, it is necessary to understand a list of its determinants. Accordingly, this study attempts to

³ This group also includes student entered primary school in mainland but than transfer to outside mainland before finishing the nine-year schooling. However, the number of this group can hardly twist the trend shown in Figure 1-2..

identify and estimate the determinants of both intended and actual PCED in rural China, using appropriate estimation techniques that correct for common data problems.

Other than filling the knowledge gap, studying PCED determinants is about suggesting corresponding measures to advance education in rural China. Some potential interventions are straightforward and easily measurable. For example, if economic status is believed to have an influence on dropout decisions (Sun, 2004; Brown, 2006; Liu, 2007; Yi et al., 2011), then the intervention could be a cash transfer conditional on class attendance (Mo et al., 2011), or simply an elimination of tuition and fees (as in the 2006 Amendment of Compulsory Education Law). There are also determinants calling for fuzzy solutions, such as non-material interventions (e.g. teaching, informal discussions, games, counseling). There have been studies (Jiang & Dai, 2005; Wang, 2005; Hannum & Adams, 2007, 2008; Hannum & Park, 2007; Hannum et al., 2009) connecting a student's personality/attitude and their PCED, but this proposed study will be the first impact evaluation of a specific intervention.

More specifically, this study will evaluate the intervention used by The Lighthouse Project (Lighthouse), which is the oldest survived GNGO for rural education in China. It was established in 2001 by a group of middle-class businessmen and college students in Guangdong, the southern province with a large rural-urban gap. Each year, Lighthouse trains and sends college volunteers to one of six to eight rural schools for a one-month long summer camp that is tailored to the local environment, mostly for current or soon-to-be lower secondary students. Participation in the program is voluntary. Schools assist in the publicity, and in some cases the volunteers go straight to local communities for recruitment. Activities in the Lighthouse program include, but are not limited to, the following: informal courses, psychological counseling, household visits, team building, the cultivation of local student organizations and specific projects such as 'Model Mayor Election' and 'Life Auction'. Most of these activities aim to change student attitudes towards life, such as making them more confident, ambitious, organized, and social (Lighthouse, 2004). Appendix A gives samples of the Lighthouse volunteer training schedule, teamwork division, and summer camp curriculum.

This study could uncover how the Lighthouse-style intervention changes rural students, as well as how those changes affect their PCED.

1.3 Key Research Questions

Given the existing problems, the key research questions of this study are:

- 1) What are the current PCED determinants for China's rural students? More specifically, what are the PCED determinants for lower secondary students in rural Guangdong province? Given the current trend of PCED, the assumption here is that subjective factors, especially the student's own attitude toward education, are at least as important as traditionally recognized factors like economic status and academic performance.
- 2) Does Lighthouse intervention affect the choice of PCED? If so, how does it work? The assumption here is that Lighthouse indirectly affects PCED by boosting certain subjective factor(s).

1.4 Structure of Dissertation

Following the introductory chapter, Chapter 2 reviews the theory, methodology, and empirical evidence of the PCED in China. In theory, rural households select the PCED that maximizes their utility given the information they possess. Such a decision process is influenced by characteristics of the household, non-household (school, community, policy), and student. These factors could be monetary and non-monetary, short-term and long-term. Because household members have their own preferences, the final decision could be a product of intra-household bargaining. Previous PCED studies have utilized a decent pool of data and approaches in their methodology. The datasets in these studies are of various structures, sizes, and sources, but are less satisfactory regarding variable selection and geographical balance. In terms of empirical tools, researchers have made various

attempts either to approximate the real determinant–PCED association or to uncover the causal relationship. Overall, there is rich evidence of PCED determinants, although little of it considers the four PCEDs altogether. Over the 2000s, the discussions became more sophisticated, and they help to clarify the theory by presenting possible mechanisms for the PCED process. Since it takes time to respond to the changing state of rural PCEDs, there is still inadequate evidence for some of the potential determinants. This chapter concludes with a discussion of the knowledge gaps regarding PCED, including those related to the influence of GNGOs.

Chapter 3 is an exploratory review of China’s incipient grassroots NGOs for rural education. It was conducted at three levels. At the macro level, it presents the theories of triple-failure from the field of public management, and the more politically-oriented theories of pluralism, civil society, and corporatism. At the meso-level, it describes the status quo of China’s grassroots educational NGOs, calling for attention to voluntary failure and the corporatism of the Chinese government. Finally, the micro level review examines the development and operation of the Lighthouse, a pioneering grassroots NGO for rural education. At this level, concerns generated from previous levels become more specific.

Chapter 4 presents and discusses the research design and the data collection of this study. This study employs a sequential mixed model of Delphi-Multinomial Logit (MNL)-Propensity Score Matching (PSM). The Delphi survey supports questionnaire design for data collection, as well as causal interpretation after quantitative analyses. MNL is used to answer Research Question 1, and PSM, which deals with the selective bias generated from voluntary Lighthouse participation, is used to answer Research Question 2. In terms of data collection, I organized two waves of surveys in eight towns before and immediately after summer 2012. Data was collected from students, households, homeroom teachers, principals, and the Lighthouse volunteers.

Chapter 5 presents non-imputed descriptive statistics mainly related to the research question about PCED determinants, starting from the expected and actual PCED, and then the independent variables of different classification, highlighting comparisons between full and treated samples, plus

one section on additional variables for treatment outcomes or determinants. The full valid sample size was 6298, and the treatment group sample size was 678.

Chapter 6 evaluates potential PCED determinants based on the multiple-imputed MNL model adopting all independent variables, those in Table 5-5 to Table 5-15. For succinctness, only relative risk ratios (RRR) and asterisks for p-values are presented. One asterisk is used for estimates that are statistically significant at the 10% level, so we may know what variables may be significant at 5% when we alter the sample or specification (for robustness), or when we apply the model to a subgroup (for heterogeneity). The interpretation will focus, however, on those variables that actually have p values smaller than 0.05. Detailed MNL outputs can be found in Appendix E. Following the presentation of the main-model results, the chapter also tests robustness by offering results from other samples and specifications, and heterogeneity tests focusing on how the PCED determinants vary across gender, wealth, and academic performance. Finally, scatter graphs are used to visually compare the standardized coefficients and absolute z values, with all potential determinants generally classified as subjective, traditional, and localized determinants. This chapter ends with a summary of findings, plus a discussion about how these findings differ from those in previous literature.

Chapter 7 analyzes the PSM results regarding Lighthouse impact for the six surveyed Lighthouse schools. It starts with the determinants of Lighthouse participation for those participating in the most recent program, in summer 2012, and those who have participated in any Lighthouse program. In Section 7.2, nearest neighborhood (NN) matching results are presented for all of the five imputations. Because the control group has a much larger sample size than the treatment group, NN control cases could be quite sensitive to different specifications and imputations, and this is therefore the most rigorous PSM method for screening effects that are really caused by Lighthouse program. Educational aspiration turns out to be the only solid outcome. Further analyses, including adjusted propensity score estimates, other PSM methods, by-background analyses, and by-site analyses, are conducted on educational aspiration. The chapter provides a discussion of causal

mechanisms based on qualitative findings, which suggests that the role-model effect could explain why the Lighthouse program mainly affects educational aspiration. It ends with a summary of findings, plus a discussion of technical issues that may affect PSM quality

Chapter 8 concludes by summarizing the key findings, discussing the significance and limitations of the study, suggesting directions for further research, and proposing policy implications for education policy and educational NGOs.

Appendices A to G provide examples of Lighthouse operation, the English versions of the student, household, teacher, principal, and volunteer questionnaires, Delphi ratings, summary statistics for the Lighthouse six school sample, detailed MNL outputs, detailed PSM results with an adjusted list of variables for propensity score calculation, and the main statistics regarding Lighthouse volunteers.

1.5 Definition of Key Terms

The following are key concepts that need further explanation.

(1) Rural Students

In this study, rural student are students living in areas that are defined as “rural” by the National Bureau of Statistics of China (NBSC).⁴ This is based on current location rather than the household registration (户口 *hukou*) system. The latter categorizes people into “agriculture” and “non-agriculture” no matter where they live. According to NBSC, China’s urban population exceeded its rural population in 2011. This definition of “rural students” also indicates that this study is not going to include migrant students in urban areas.

Migrant parents tend to bring their children to urban migrant schools, which has become a new topic for educational research in China.

(2) Intended and Actual PCED

⁴ <http://www.stats.gov.cn/english/>

This study mostly considers intended PCED, the PCED that the surveyed students believed they are going to make. Actual PCED, or PCEDs that were realized during the survey, could only be recorded for graduating (Grade 9) or dropout students, and intended PCED involves students that are still in school. There is a much larger sample of Grade 7 and Grade 8 students, and therefore the analysis of their intended PCED should be more convincing. Unless specified as “actual”, the term “PCED” in this dissertation refers to intended PCED. It is worth mentioning that this study establishes a sub-sample that allows a test of how intended PCED relates to the actual PCED. It is desirable to identify links. The determinants of intended PCED would thus also be potential determinants of actual PCED.

(3) Academic High School Assignment

The High School Entrance Exam (HSEE) is the major mechanism that determines whether a student can get into AHS, followed by government policies that promote rural-urban equity or serve the welfare of minority Chinese. AHS have their own HSEE cutoff, however passing the cutoff does not necessarily mean enrollment. Of the schools surveyed in this research, 25.2%⁵ of students who passed the cutoff did not register. More often than not, rural students need to go to the county city for AHS (as for VHS).

(4) Grassroots Nongovernmental Organizations

The common definition of an NGO is “a unit that is organized, private, non-profit-distributing, self-governing, and voluntary” (Salamon & Anheier, 1997). This study distinguishes GNGOs from international NGOs (INGOs) such as the Ford Foundation, and government organized NGOs (GONGOs) such as the China Youth Development Foundation. INGOs and GONGOs usually offered material support for China’s rural education, such as instructional supplies, books, facilities and scholarships.

(5) Social-emotional, Subjective Factors, and Personality

⁵ While the study covers eight schools, this is calculated from the data provided by five schools. Two school refused to provide the data, and one school offered the wrong figures.

The socio-emotional process consists of variations that occur in an individual's personality, emotions, and relationships with others during their lifetime (Santrock, 2007). In this study it is included in the group of subjective factors, which involves not only social-emotional factors, but also the perspectives that different stakeholders have of others, and of PCED. Among the social-emotional elements, personality has received relatively more attention in economics-of-education literature. It is defined as the relatively enduring patterns of thoughts, feelings, and behaviors that reflect the tendency to respond in certain ways under certain circumstances (Roberts, 2009). According to the literature, conscientiousness (e.g. self-discipline and ambition) best predicts overall attainment and achievement, followed by emotional stability (e.g. depression level and confidence) (Almlund et al., 2011). Personality, together with the other determinants and circumstances, affects a student's attitude towards different PCEDs.

Chapter 2 Determinants of Post-Compulsory Education Decision: A Review

This chapter reviews the theory, methodology, and empirical evidence about PCEDs in China.

2.1 Theoretical Explanation

The purpose of this section is not only to reveal the theoretical side of PCED study, but also to display their potential determinants and the ways they reveal their influences.

In family economics, the standard neoclassical framework is used to explain the choice of PCED (Becker, 1981); that is, rural households select the PCED that maximizes their expected utility, subject to a series of constraints. The basic model is simple, but there can be different versions in accordance with the complexity of the research questions. Utility and production in the following functions are assumed to satisfy the standard assumptions.

2.1.1 The Basic Neoclassical Model of Schooling Decisions

The PCED can be treated as a subtopic of schooling decisions. The basic theoretical explanation of schooling decisions involves the application of standard consumption theory to the field of education.⁶

We start by defining a household utility function, which depends on total consumption X in the household, and also on the child's years of schooling S_C :

$$U = U(X, S_C) \quad (1)$$

This utility function may be that of the head of the household, but it may include the input of other household members. S_C is obtained from a standard educational production function:

$$S_C = S(h^s, q_s, AP_C) \quad (2)$$

⁶ The early literature contributing to this model includes Becker and Lewis (1973), de Tray (1973), and Rosenzweig and Evenson (1977). Here I use a version revised from Rivera-Batiz's presentation in the course Education and Economic Development: Advanced Topics in Teachers College, Columbia University, Spring 2011.

where h^S is the time the child dedicates to schooling, q_s is the schooling quality, and AP_C stands for the child's (academic) ability and personality, or in other terms their cognitive and non-cognitive skills.

The household maximizes U subject to budget constraints

$$V + I + Wh^{LM} = pX + f \quad (3)$$

where V is the fixed assets (e.g. land and savings) of the household, I is the adult labor income in the household, W is the market wage for the child, and h^{LM} refers to the time the child dedicates to the labor market. The sum of fixed assets, adult income, and child income is supposed to be equal to the price of education (mainly the tuition and fees), f , and the spending on consumption, shown as X times the average price level p .

A trade-off takes place between h^S and h^{LM} ; and so we also have

$$h^{LM} + h^S = T \quad (4)$$

(3) and (4) yield

$$X = (V + I - f)/p + (W/p)T - (W/p)h^S \quad (5)$$

In the short term, only X and h^S are changeable, so with (1) to (5) we obtain

$$dU = (\partial U / \partial X)dX + (\partial U / \partial S)(\partial S / \partial h^S)dh^S = 0 \quad (6)$$

This can be translated into the statement that a household maximizes its utility when the marginal utility of child schooling is equal to the marginal cost of schooling.

We may return to q_s and AP_C , which are assumed to be exogenous in the short term. In the long term, q_s is determined by both household factors F_h (e.g. parental tutor, distance to the school) and non-household factors F_{nh} , which comprise school factors, community factors, and policy interventions; AP_C depends on these factors plus the child's innate ability and personality AP_I .

$$q_S = q(F_h, F_{nh}) \quad (7)$$

$$AP_C = AP(AP_I, F_h, F_{nh}) \quad (8)$$

The basic model has very limited power in describing real life. It only looks at the short term and treats education as merely consumption, and it reports nothing about the decision between AHS and VHS. There are further complications.

2.1.2 Extensions of the Basic Model

Considering Additional Factors

With a small adjustment, the basic model predicts the effect of birth order. Assume that there are n children in the household:

$$U = U(X, S_1, \dots, S_n) \quad (9)$$

In this case, the household may have n children to join the labor market, or bear multiple f . (5) can be rewritten as

$$X = (V + I - \sum_{i=1}^n f_i) / p + \sum_{i=1}^n (W_i / p) ((T - h_i^S)) \quad (10)$$

In the same period of time, older children are studying in a higher grade that requires greater input, and they are supposed to be more productive in the labor market than their younger siblings. It is reasonable to assume that $f_i \geq f_j$ and $W_i \geq W_j$ if $i < j$; the household is more eager to compromise the educational opportunities of older children on this condition.

The inference above only considers the consumption side of education but education is also an investment. Poor households treat education more as investment than as consumption (Schultz, 1973). Consequently, we take two small steps further, considering gender and the return to educational investment.

$$U_{X,N,S} = U(X, N_B, N_G, S_B, S_G, N_B R_B + N_G R_G) \quad (11)$$

subject to the budget constraint

$$V + I + N_B W_B h_B^{LM} + N_G W_G h_G^{LM} = pX + f_B S_B N_B + f_G S_G N_G \quad (12)$$

where B and G identify boys and girls and R is the discounted lifetime return to a level of education.

For girls, the return to education is

$$R_G = f \{W_G h_G^{LM} [(1+r)^{L_G} - 1]/r\} \quad (13)$$

where r is the interest rate and L_G is the number of years the daughter can work. Also,

$$W_G = f(S_G, q_s) \quad (14)$$

The human capital equation serves as another popular constraint on the maximization problem in the education decision. The equations for sons are the same, with the G replaced by B . According to (2), (4), (7), (8), and (11) to (14), we obtain a simplified expression of the schooling determinants

$$S_G = F(V, I, p, r, f_B, f_G, L_B, L_G, N_B, N_G, AP_B, AP_G, F_h, F_{nh}) \quad (15)$$

Daughters will get married and leave, so for a household R_G is probably smaller than R_B .

Holding all other factors as fixed, the household may thus be more eager to invest in sons. The fact that the characteristics of girls and boys are both included in (15) suggests a trade-off of educational opportunities between the two groups, depending on the household preference parameter. Some might question whether modeling “boy vs. girl” and “number of children” is necessary under China’s Birth Control Policy, or the One-Child policy. The answer is “yes” in the case of rural China. The “One-Child” policy actually allows rural households to have two children. People also manage to have additional children. In the 2010 Chinese Census, the NBSC identified 13 million citizens who were born in non-compliance with the policy but never reported to the government.⁷

So far in this section, the utility function disregards interactions and different preferences among household members. The Nash bargain enables an exploration of these issues. It can be considered a

⁷ <http://politics.people.com.cn/GB/14524435.html>

more general form of the neoclassical model (McElroy, 1990). For a household utility function involving the interaction between mother (m) and father (f), we have

$$U_{Nash} = [U^m(X, S_C) - U^{m\text{forgone}}(f, p_m, V_m, \alpha_m)] \times [U^f(X, S_C) - U^{f\text{forgone}}(f, p_f, V_f, \alpha_f)] \quad (16)$$

$$\text{subject to } I_m + I_f + V_m + V_f + Wh^{LM} = pX + f \quad (17)$$

Here $U^{m\text{forgone}}$ and $U^{f\text{forgone}}$ are utilities that were forgone due to the marriage, and within them the newly added α^m and α^f indexes the out-of-marriage opportunities. A relatively larger α^m implies that more bargaining power is possessed by the mother. It is empirically difficult to identify the bargaining powers. Parental education is a convenient proxy.

A more general Nash model also helps explain the peer effect. The utility function below is altered from Falk and Ichino (2006):

$$U^i = G(S_i, Y^e, \theta_i) - L(S_i, \bar{S}_i^e) \quad (18)$$

In this function, S_i refers to the PCED for student i . The gain (G) from making a decision depends on individual preference θ and local environmental characteristics Y^e . \bar{S}_i^e denotes the average schooling level of peers or favorite PCED. L will be negative since more people making the same decision will lower the cost of making that decision for i . If no peer effect is present, L equals zero. Such an argument can be expanded to explain the effect of choices made by people in the same community. De Brauw and Giles (2008) applied this idea to discussing how the size of a migration group affects the enrollment/working decisions of rural students —as the network increases, the cost of migrating falls.

Returning to the consideration of bargaining, what about the case between the parents and the child? Middle-school students in rural China are old enough to participate in the decision process, however the child's opinion will be ignored in function (16) because they have no out-of-family resources for bargaining. Here the concept of altruism needs to be introduced.

$$U = U(X, U_C) \quad (19)$$

The PCED in this case is made not based only on the utility function of the parents, but also on their child's utility function, U_c . Parents either respect the child's own decision or take into account the child's future prosperity that will not be transferred to the household. For example, even if a girl is expected to leave the family one day, her parents may still provide the best education for her because they think it would give her a higher bargaining power in her future family.

In their study of education and poverty in rural China, Brown and Park (2002) incorporated altruism into intra-household bargaining. They also touched on the topic of credit constraint. Assuming a zero interest rate and the perfect enforcement of lending contracts, they have

$$U = V + I - fS_C + \alpha R(S_C) + A(1 - \alpha)R(S_C) \quad \text{where } \alpha \in [0,1], A \in [0,1] \quad (20)$$

$$\text{subject to } fS_C \leq V + I + \bar{b} \quad (21)$$

Here α is the share of the return to the PCED transferred from the child to the parents through future financial support and care; \bar{b} is a credit limit that is equal to or larger than zero. The altruism parameter A is defined as follows:

$$A = \beta A_m + (1 - \beta) A_f \quad (22)$$

$$A_m = a_1 Sex + a_2 S_m \quad (23)$$

$$A_f = b_1 Sex + b_2 S_f \quad (24)$$

(22) to (24) state that altruism toward a child is jointly determined by the preference of the mother and father who possess the bargaining power of β and $(1 - \beta)$. The preferences are also the weighted combination of the child's sex and the father/mother's education. If they are not bound by credit constraints, the first-order condition for (20) will be

$$\partial R / \partial S_C = f / [\alpha + A(1 - \alpha)] \quad (25)$$

It is debatable what determines R , A , and α . The unconstrained schooling decision can be expressed as

$$S_C = S_C[A_C, F_h, F_{nh}, A(Sex, S_F, S_M, \beta), \alpha(Sex)] \quad (26)$$

If the credit constraint is binding, the optimum will then be simply

$$S_C^C = (y + \bar{b})/f \quad (27)$$

That is, schooling decisions are solely determined by income and credit limits.

As admitted by Brown and Park (2002), income and credit constraints are hardly exogenous; they are under the influence of F_h and F_{nh} , and therefore this parsimonious modeling does not convince us that the discussion of PCED can become simpler with credit constraints. Sawada and Lokshin (2001) developed a much more complicated model, which confirms that household income affects schooling decisions only when the constraint binds, but indicates that almost all the above-mentioned determinants have an impact on credit constraint. Their modeling has been omitted to keep the discussion concise.

So far, three constraints have been covered: income, human capital, and credit. These are conventional constraints in the literature. According to the Chinese education system (Figure 1-1), we might also take into account the score constraint specific to the choice of AHS. In modeling, it can be treated as a condition that “if failed, the number of PCED options drops from AHS/VHS/Work to VHS/Work.” The score constraint is exogenous, but the student’s academic performance, which decides whether they will be affected by the HSEE cut-off, relies on many factors.

Considering the High-School Track

The schooling track has not been discussed explicitly in the above modeling, but the way to achieve this is not difficult. Two recent studies introduce modeling specifically for the choice between AHS and VHS, one for Britain (Yang, 2008) and the other for Spain (Lopez-Mayan, 2010). These two studies compare the utility functions of different choices. Students are supposed to select the option that brings about the greatest lifetime reward given the existent constraints. The two studies use similar modeling processes since they share the same source of ideas from structural models (Willis and Rosen, 1979; Keane and Wolpin, 1997). Both modeling processes stress the impact of the expected lifetime monetary reward, which has already been mentioned in (13). Yang

(2008) made an additional contribution by incorporating non-monetary utility. For simplification, I focus on a single student instead of the whole household.

$$U = E\left\{\sum_{l=1}^T [(1+d)^{-1}(U(Y_{ikl}) + \alpha_i U^1(S_{ck}))] | I(t)\right\} \quad (28)$$

where d is the discount rate. $U(Y_{ikl})$ stands for the utility for individual i , which is determined by i 's profit Y in the period l . k indexes the four alternatives. $I(t)$ refers to the information set, which contains all the information available to i that can affect the utility.

$U^1(S_{ck})$ is the non-monetary utility, such as job stability, happiness, and the peer effect. α measures the preference towards non-monetary utility in the decision, S_{ck} . This is supposed to be relevant to the student's academic ability and socioeconomic status (SES).

To explain the schooling track decision further, let us simplify (28) to assume the utility is determined only by the lifetime monetary benefit and cost. In China, the purpose of AHS participation is to be admitted to post-secondary education; not much human capital accumulation occurs in AHSs, and the largest benefit is realized only when the student graduates from college. For example, using a 1% sample of the 2005 Chinese Census, Wang (2009) found that for rural Chinese people the marginal return to high school is only 0.1%, while for college it is as high as 7%. More recent studies, such as those by Li et al. (2012) using twin data, and Yao et al. (2012) using a 20% resampling of Wang's data, achieve similar findings. Higher education also means the chance to become an urban resident (Zhao, 1997). Thus, assuming that a student does finish compulsory education (no Dropout), we have⁸

$$P_{Work} + P_{AHS} + P_{AHS\&PS} + P_{VHS} = 1 \quad (29)$$

$$b = b_1 P_{Work} + b_2 P_{AHS} + b_3 P_{AHS\&PS} + b_4 P_{VHS} \quad (30)$$

$$c = c_2 P_{AHS} + c_3 P_{AHS\&PS} + c_4 P_{VHS} \quad (31)$$

⁸ (29) to (32) are altered from the theoretical explanation of additional return to primary education by Appleton et al. (1996).

Here P is the probability of Work, finishing AHS, finishing post-secondary education (PS), and finishing VHS. b_1 to b_4 are the corresponding monetary benefits. c_2 to c_4 are the corresponding opportunity costs. Work does not impose an opportunity cost.

(29) to (31) yield the additional benefit and cost of further education:

$$b - b_1 - c = (b_2 - b_1 - c_2)p_{AHS} + (b_3 - b_1 - c_3)p_{AHS+PS} + (b_4 - b_1 - c_3)p_{VHS} \quad (32)$$

This attributes the high-school track decision to the probability of entering higher education as well as how tempting a profit higher education is, compared with VHS. On the other hand, not everybody who is admitted to an AHS can continue to higher education, and there is a large variation in quality and labor market opportunities among higher education institutes and majors. Thus, AHS might be the most risky PCED.

Risk, or uncertainty has been considered by Sawada and Lokshin (2001) and Yang (2008). Sawada and Lokshin assumed a constant absolute risk-aversion specification to the utility function, while Yang used wage fluctuation for different educational tracks to express their instability of returns. Their discussions constitute not so much modeling but finding a proxy in the empirical specification.

A general way to consider the risk is to use the expected utility function. In the simplest form, the expected utility function will be

$$U(C_{k1}, \dots, C_{kn}) = \sum_{i=1}^n \pi_{ki} U(C_{ki}), \quad k \in 1, 2, 3, 4 \quad \text{and} \quad \sum_{i=1}^n \pi_{ki} = 1 \quad (33)$$

where π measures the possibility of state C , such as being unemployed or earning a low level of wages after graduating from VHS, or failing to attend college after graduating from AHS. π can be a function of objective indicators (e.g. the unemployment rate for an educational level or a community) and the student's ability and personality (AP_C in equation (2)). The alternative that wins over the other three will be the best one.

Finally, it is worth noting that the standard theory has little meaning unless we can find a way to measure utilities. For the PCED, the importance of treating utility as the function of more than just

monetary factors is known. In the PCED study for Britain, Yang (2008) found that prediction of the vocational track is sensitive to a student's background (which contributes to $U^1(S_{ck})$) compared with the academic track. Li's study for China (2011) also found a higher non-monetary return for VHS graduates than for AHS graduates. She did not link the findings to the PCED, but called for attention to be paid to the complexity of the utility function.

2.2 Methodology

For policy purposes, researchers are also interested in the magnitude of PCED determinants, as well as how interventions change the PCED through changing those determinative factors. In this section, I will consider the data and methods adopted by PCED studies of rural China. A shortlist of PCED studies is presented in Table 2-1. They were selected based on three criteria: relevant to the PCED, using at least one regression, and not sharing identical datasets.

Table 2-1 Shortlisted Post-2000 Studies on the Determinants of PCED in Rural China

Article ^a	Model	Data source				Dependent variable		
		Survey year	Location	Age Group	Sample size	Academic performance	Enrollment decision/ Education Attainment	Schooling track
Han (2001)	OLS	1996	Beijing, Gansu, Guangdong, Hubei, Liaoning, Sichuan, Zhejiang	16-20	297		✓	
Brown and Park (2002)	OLS, Hazard Model and Conditional Logit	1997	Gansu, Guizhou, Henan, Jiangxi, Shaanxi, Sichuan	5.5-17	472	✓	✓	
Connelly and Zheng (2003)	Logit with Fixed effects	1990	whole nation (Census)	10-18	100975		✓	
Li and Tsang 2003	OLS	1995	Gansu, Hebei	7-15	424		✓	
Sun, 2003	OLS	2002	Inner-Mongolia	15-30	444		✓	
Sun, 2004	Probit and Order Probit	2000	Gansu	7-19 (mostly 7-16)	3976		✓	
Song et al., 2006	Logit	1995	19 provinces (CHIP) ^b	7-18	8104		✓	
Liu, 2007	2-level HLM with 1 st level Logit	2004	Yunnan	8-19	1067		✓	
Hannum and Adams, 2007	OLS	2000 & 2004	Gansu	13-16 in 2004	1817		✓	
Ding and Li, 2007	Logit	2005	Anhui, Beijing, Gansu, Guangdong, Guizhou, Heilongjiang, Hubei, Liaoning, Shaanxi, Shanxi, Sichuan, Zhejiang	14-20	1029	✓		✓
Fang, 2007	OLS	2006	Inner-Mongolia	High school age	549	✓	✓	✓

de Brauw and Giles, 2008	IV-GMM	1986 to 2003	Shanxi, Jiangsu, Anhui, Henan	High school age	3160		✓	
Hannum et al., 2009	OLS	2000 & 2007	Gansu	16-19 in 2007	1806	✓	✓	
Sun and Du, 2009	OLS and Probit	2007	Guangxi	16-55	1765		✓	
Yu, 2009	OLS	2002	Jiangsu	Young/ finished schooling	130		✓	
Li, 2009	Probit	2007	Hunan	High school age	2491			✓
Li and Cheng, 2009	Probit	2007	Hunan	High school age	437			✓
Mo et al., 2011	Probit (after randomized experiment)	2009 & 2010	Shanxi	Grade 7	300	✓	✓	
Song et al., 2011	Logit	2008 & 2009	Unnamed western province	Grade 8 in 2008	2216			✓
Yi et al., 2011	OLS	2009 & 2010	Shanxi, Shaanxi	Grade 7-8 in 2009	7801		✓	
Lu, 2012	OLS with Fixed Effects	2000, 2004, & 2006	Guangxi, Guangdong, Heilongjiang, Henan, Hubei, Hunan, Jiangsu, Liaoning, Shandong	7-18	885		✓	

a. These studies were selected based on three criteria. First of all, they are relevant to PCED, which also means the sample needs to include lower secondary students in rural areas. Second, they apply quantitative methods that contain at least the OLS. Third, they do not share a totally identical dataset.

b. The 19 provinces are Beijing, Hebei, Shanxi, Liaoning, Jilin, Jiangsu, Zhejiang, Anhui, Jiangxi, Shandong, Henan, Hubei, Hunan, Guangdong, Sichuan, Guizhou, Yunnan, Shaanxi, and Gansu.

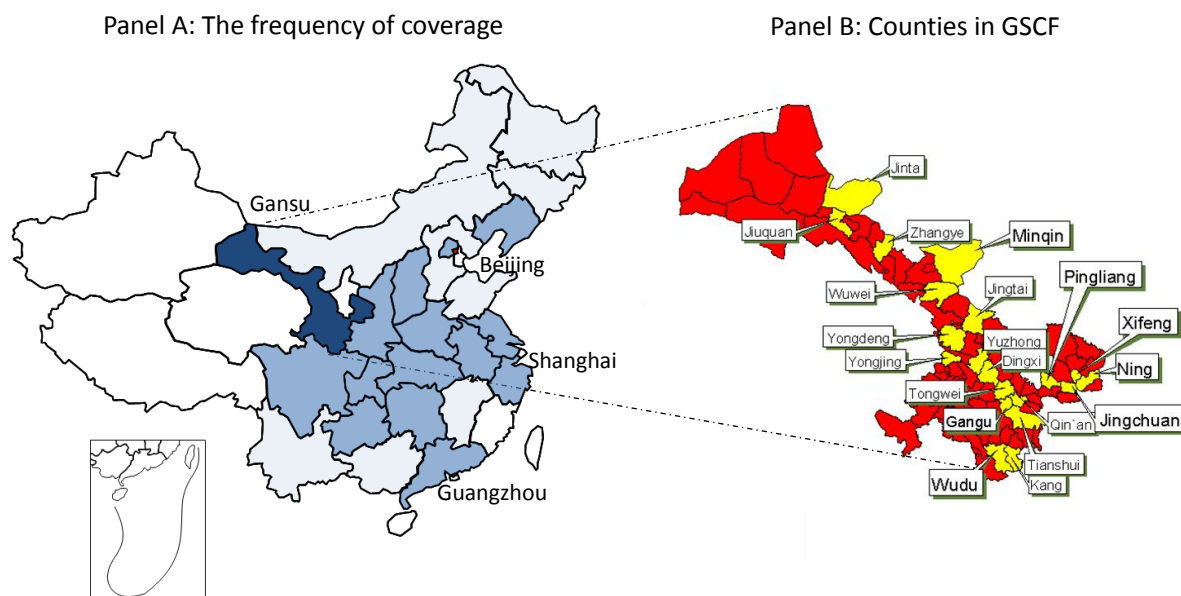
2.2.1 Data

Studies of rural China's PCED have taken advantage of a range of data. While the majority of datasets are cross-sectional, there are studies using panel structure datasets (e.g. Hannum and Adams, 2007; de Brauw and Giles, 2008; Hannum et al., 2009), which helps researchers capture unobserved individual effects as well as general shocks. In terms of the sample size, most datasets have 1000–4000 effective observations, sufficient to guarantee statistical power.

There are two groups of PCED data, categorized by sources. The first group consists of national datasets, such as census data (in Connelly and Zheng, 2003) and the China Household Income Project (CHIP) (in Song et al., 2006). These datasets have large sample sizes, but are too general for an in-depth PCED exploration as they were not specifically designed for this purpose. The second group comprises surveys conducted for rural regions at the village, county, or provincial level. Most of these surveys were undertaken with rigorous sampling processes, ensuring the representation of the targeted populations. Although studies using this data do not guarantee external validity, they offer more accurate and comprehensive results. The Gansu Survey of Children and Families (GSCF) is the most widely cited dataset (in Park and Hannum, 2002; Hannum and Adams, 2007; Hannum et al., 2009; Zhang, 2011, etc.).⁹ It is a longitudinal, multi-level study of rural children's welfare outcomes, including education, health, and psycho-social development. It follows 2000 children aged 9–12 in 2000 in 20 randomly selected counties of the Gansu province (Panel B of Figure 2-1). The most recent wave of GSCF surveys was conducted in 2009. The Rural Education Action Project (REAP) is another data source worthy of attention. At the time of writing this review, REAP is operating several randomized experiments in rural China. It might offer high-quality data and studies in the near future.

⁹ For details, please refer to <http://china.pop.upenn.edu/>

Figure 2-1 Geographical Coverage of PCED Literature



Note: Panel A is based on Table 1. I divide the frequency of coverage into 4 categories: only covered by the census, 2–3 times, 4–6 times, and more than 6 times. The deeper colors mean a higher literature coverage. Before 1997, Chongqing was a city in Sichuan province. In my review, Chongqing has been covered only once, while Sichuan has been covered 5 times, however, 4 of the 5 data sets for Sichuan are pre-1997, and therefore, I do not differentiate Chongqing from Sichuan in the mapping. Information for Taiwan is unavailable. Panel B is cut from GSCF papers. <http://china.pop.upenn.edu/>.

Although the data is of various structures, sizes, and sources, it is less satisfactory in its variable selection and geographical balance. To begin with, most variables in previous studies are case-specific, and mainly comprise student and household characteristics, however as the theories imply, alternative specific variables, like the cost, quality, or expected future earnings of each PCED, should also be considered. Fewer studies used the high-school track as the dependent variable. Three of the five studies identified in Table 1 are actually Master's degree theses.

The final problem is geographical imbalance. Panel A in Figure 2-1 displays the frequency of literature coverage as suggested by Table 1, in which a darker color means a higher frequency. With the operation of the GSCF, Gansu province has received overwhelming attention in the literature. Gansu is far from the coastal cities that are popular destinations for migrant workers (i.e. Beijing, Guangzhou, and Shanghai), and 70% of its population lives in rural areas where vocational education

is hard to flourish¹⁰ These factors contribute to higher opportunity costs for the Work or VHS options, and therefore the Gansu data may be ideal for testing hypotheses about educational attainment and achievement (as in the literature), but are less appropriate in the case of the 4-alternative PCED.

2.2.2 Analytical Approaches

Researchers have used two general groups of approaches in PCED studies. One focuses on seeking and measuring the relationship between determinant candidates and PCEDs, mainly the discrete choice model, survival analysis (for Dropout), the pricing model, and the hierarchical model. The other group focuses on the causal identification of interventions, mainly the instrumental variable, regression discontinuity, difference in differences, and propensity score matching. I will start with a relatively detailed introduction to discrete choice models as they are fundamental approaches for the exploration of PCED determinants.

Discrete Choice Models

Discrete choice models (DCMs) are regressions used to predict the probabilities of the different possible outcomes of a categorically distributed dependent variable (here the PCED), given a set of independent variables. Eleven out of the twenty-one shortlisted studies in Table 1 employed DCMs. There are two sorts: logit and probit. As indicated by the name, the error term of the logit model has a standard logistic distribution, while that for the probit model has the standard normal distribution. The two groups of DCMs yield similar results. I will focus on the logit models, which involve multinomial logit (MNL) when dependent variables are categorical instead of dichotomous.

MNL specifies that:

$$P_{ij} = \frac{\exp(x_i' \beta_j)}{\sum_{l=1}^m \exp(x_i' \beta_l)}, \quad j = 1, \dots, m$$

¹⁰ According to the 2005 Census 1% sample. <http://www.stats.gov.cn/tjsj/ndsj/renkou/2005/renkou.htm>

That is, the probability that the outcome for individual i is alternative j depends on factors x_i .

Both relative-risk ratios (RRR) and marginal effects (ME) are calculated, but only RRR will be reported. The RRR of choosing alternative j rather than alternative 1 is given by

$$\frac{\Pr(y_i = j)}{\Pr(y_i = 1)} = \exp(x_i' \beta_j)$$

in which e^{β_j} gives the proportionate change in the relative risk of choosing alternative j rather than alternative 1 when x_{ir} changes by one unit.

The ME can be shown to be

$$\frac{\partial p_{ij}}{\partial x_i} = p_{ij} (\beta_i - \bar{\beta}_i)$$

where $\bar{\beta}_i = \sum_l p_{il} \beta_l$ is a probability weighted average of the β_l .

MNL relies on the independence of irrelevant alternatives (IIA) assumption that the relative probability of choosing between two alternatives is unaffected by the presence of additional alternatives. The seemingly unrelated estimation (SUE)-based Hausman test can be used to test the IIA assumption.

As an extension, there are also conditional logit (CL) and nested logit (NL) models. CL specifies that

$$P_{ij} = \Pr(y_i = j) = \frac{\exp(x_{ij}' \beta + z_i' \gamma_j)}{\sum_{l=1}^m \exp(x_{il}' \beta + z_i' \gamma_l)}, \quad j = 1, \dots, m, \quad i = 1, \dots, N$$

That is, the probability that the outcome for individual i is alternative j depends on alternative-specific factors x_{ij} and case-specific factors z_i . In the case of the PCED, factors such as family income and parental education belong to x_{ij} , while factors such as expected lifetime income and high-school costs could belong to z_i . m equals 4 as we have four alternatives.

The effect of a change in the value of x_r for individual i and alternative l is

$$\frac{\partial p_{ij}}{\partial x_{ril}} = \begin{cases} p_{ij}(1-p_{ij})\beta_r & j = l \\ -p_{ij}p_{il}\beta_r & j \neq l \end{cases}$$

A positive β_r means that if a regressor increases for one category, then that category is chosen more, and other categories are chosen less, and vice versa.

The effect of a change in the value of z_r for individual i is

$$\frac{\Pr(y_i = j)}{\Pr(y_i = 1)} = \exp(z_i' \gamma_j)$$

in which $e^{\beta_{jr}}$ gives the proportionate change in the relative risk of choosing alternative j rather than alternative 1 when z_{ir} changes by one unit.

Like MNL, CL is also conducted with the IIA assumption. If MNL/CL fails the test, then one can refer to the NL. While under IIA the alternatives are required to be independent, and NL splits the alternatives into groups, or “nests,” allowing the IIA property to be violated within each group. The probability that individual i ends up with alternative j is the product of the probabilities that nest k is chosen and that alternative j is chosen within k . Correspondingly, the regressors are classified as the regressors that influence the choice between groups and that influence the choices both between and within groups.

In the most parsimonious form of NL,

$$P_{kj} = P_k \times P_{j|k} = \exp \left(- \sum_{k=1}^K \left(\sum_{j \in Nest_k} \exp \{ -\varepsilon_{ij} / \lambda_k \} \right)^{\lambda_k} \right)$$

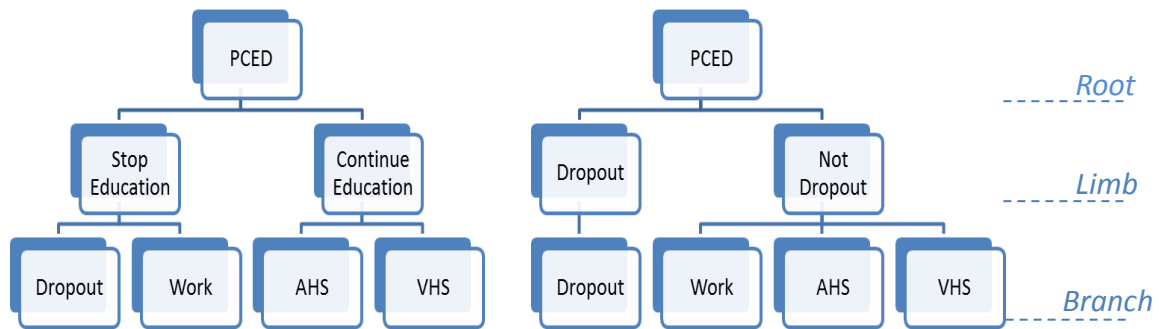
where the error term ε_{ij} has Gumbel’s multivariate extreme-value distribution and λ_k are dissimilarity parameters ranging from 0 to 1. When λ_k equals 1 for all k , NL reduces to CL.

Previous studies have mostly used binary dependent variables, and so no alternative grouping can be made for an NL,¹¹ but this is necessary if we intend to look at a four-alternative PCED. The alternatives may be classified into either education vs. non-education, or dropout vs. not-dropout

¹¹ The nested structure of PCED was considered by Lopez-Mayan (2010) for Spain’s PCED.

(Figure 2-2), and not-dropout could be further divided into AHS vs. VHS/Work depending on whether the student passes the HSEE. These classifications may be different for different parts of China.

Figure 2-2 Possible Nested Structures of PCED



Other DCMs—order probit, multinomial probit, and random-parameters logit— may also be appropriate for PCED study. For details of these models, please refer to Train (2003).

Survival Analysis

Survival analysis is about the probability that the time of an event T is later than some specified time t . In PCED, this event refers to dropout.

$$S(t) = \Pr(T > t)$$

The Cox model is a popular model in survival analysis. It allows the baseline hazard rate for each community to vary (Cox and Oakes, 1984). Brown and Park (2002) used this model to study the hazard (risk) of dropout in rural China. In the Cox model, the hazard is

$$h(t) = h_0(t) \exp(X_i \beta)$$

where $h_0(t)$ is a baseline hazard function that we do not need to know. The hazard ratio will be

$$Hr = \frac{h(t)}{h_0(t)} = \exp(X_i \beta)$$

In the case of dropout study, the interpretation could be as follows: “conditional on having remained in school until the current time, the probability that student i who experiences X_i will drop out is Hr times that of other children.” The likelihood function will be used to calculate the parameter β .

Pricing Model

Since education is believed to be an investment, just like stocks, futures, and options, it is reasonable to consider models from the field of finance. Some researchers in the economics of education have taken this initiative (e.g. Hartog and Vijverberg, 2007; Hogan and Walker, 2007; Yang, 2008). Among them, Yang (2008) specifically talked about the educational track. Her model alters the Black–Scholes option-pricing model, in which educational decisions are treated as options that will be realized each year from graduation to retirement, as follows.

$$T(Y_{im}) = \sum_{l=0}^N (Y_{im(l+1)}^e - Y_{i(m-1)(m+1)}^e)(1 + \lambda_m - r)^l N(x_1) - LN(x_2)$$

where

$$N(x) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{\infty} \exp(-\frac{1}{2}x^2) dx$$

$$x_1 = \frac{\ln[Y_{im(l+1)}^e - Y_{i(m-1)(l+1)}^e](1 + \lambda - r)^l / L] + \sigma^2 \tau / 2}{\sigma \sqrt{\tau}}$$

$$x_2 = \frac{\ln[Y_{im(l+1)}^e - Y_{i(m-1)(l+1)}^e](1 + \lambda - r)^l / L] - \sigma^2 \tau / 2}{\sigma \sqrt{\tau}} = x_1 - \sigma \sqrt{\tau}$$

Here $Y_{im(l+1)}^e$ is the expected start wage for individual i who has an education degree m . λ_m denotes the increase rate of wages and r the interest rate. Ranging from 0 to 1, σ measures the fluctuation rate of λ_m . L is a very low exercise price, set to be 1, and N is the year in which i can stay in the labor market given a m , which can be calculated by subtracting the expected graduation age from the expected retirement age. Finally, τ indexes the contract length, which is

also set to be 1 since the option (the education investment) will be realized every year. By comparing T and the cost of a degree m , one can determine which degree is the rational choice.

Elements in this model can be estimated in various ways depending on the data possessed by the researchers. Non-monetary utility can also be incorporated into the equation by adjusting $Y_{im(l+1)}^e$ with non-monetary variables. Again, this is an arbitrary process that largely depends on data availability. In Yang's study, considering non-monetary factors significantly increased the accuracy of predicting a choice on the vocational track.

Hierarchical Model

Data in educational research usually has a hierarchical structure. Students belong to a class, a school, a school district, and so forth. For an individual-level regression, non-individual factors are assumed to have constant effects on students, while this is usually not true. For example, a school policy of improving teacher communication skills should have different impacts on students in a 20-person class from those in a 50-person class. A hierarchical linear model (HLM) is used to address the hierarchical structure problem. A simple two-level HLM is presented below:

$$\text{Level 1} \quad Y_{ij} = \beta_0 + \beta_{1j}X_{ij} + r_{ij}$$

$$\text{Level 2} \quad \beta_{0j} = \gamma_{00} + \gamma_{01}W_j + \mu_{0j}$$

$$\beta_{1j} = \gamma_{10} + \gamma_{11}W_j + \mu_{1j}$$

Assuming level 1 to be the students and level 2 the schools, this group of equations is for student i nested within school j . We firstly run a regression for students within each school, then use the obtained constant and coefficients as independent variables for regressions at the school level. X denotes student variables and W school variables.

In the case of the PCED, the level-1 equation could be a logit or probit equation. Liu (2007) employed the two-level HLM to examine the determinants of dropout in a rural county of Yunnan province, and his level-1 function is a logit one. HLM results often differ very little from those

obtained by OLS. The greatest difference between the HLM and the OLS is that the HLM reports a “reliability” index for the coefficients for each group.

Instrumental Variable and Regression Discontinuity

The models presented above help to find and measure the associations between the determinant candidates and the PCED, however they suffer from common econometric problems, such as omitted variable bias, measurement error, and the endogeneity of explanatory variables, lacking the power of causal identification. The instrumental variable (IV) has been a standard method for causal inference.

$$\begin{aligned} S_i &= Z_i\pi + U_i \\ y_i &= \hat{S}_i\beta + \varepsilon_i \\ \beta_{iv} &= \text{cov}(Z, y) / \text{cov}(Z, S) \end{aligned}$$

In the second equation, the predicted value of \hat{S} is used. Assuming that Z is correlated with S but uncorrelated with ε , or in other words the IV is correlated with the determinant of interest but affects the outcome only through that determinant, then we establish a causal inference between the determinant and the PCED. Several PCED studies have used IV. Brown and Park (2002) instrumented expenditure per capita and credit limits using cultivated land and the share of cultivated land that is irrigated¹²; de Brauw and Giles (2008) identified the cost of migration using exogenous variation across counties in the timing of national identity card distribution, which made it easier for rural migrants to register as temporary residents in urban destinations; and Lee and Park (2010) instrumented changes in migration status with labor market shocks to village-specific migration destinations. In a schooling track study, Chen (2009) instrumented the possibility of attending a VHS with the specific type of school supply in the community, which could be a potential IV for future studies in China.

¹² They did not report the results because they found no substantial difference in the coefficients compared with those from normal regressions.

Regression discontinuity (RD) is a special and more recent form of IV design. Arbitrary program rules/ procedures create jumps, and RD focuses on the jump around this cut-off. More often than not, an RD is a fuzzy one because not all units follow the cut-off rule. Park et al. (2010) presented an RD study focusing on the determinants of the schooling decision in rural China, however it concerns the way that higher schooling quality influences the college entrance examination scores and college admission. The cut-off in this study is the HSEE threshold that determines the admission to magnet AHSs. The class-level version of this study can be found in the study by Ma and Shi (2010), which compared experimental classes with regular classes. For lower-secondary schooling, there is no longer an entrance examination, and due to the school merger movement, many rural towns now have only one lower-secondary school. It is therefore difficult to design a similar RD to evaluate how lower-secondary schools of higher quality influence the PCED. Nevertheless, RD is still a potential tool for intervention evaluation. For example, we may use the eligibility cut-off to measure the impact of vocational secondary school subsidies on students schooling track decisions.

For either IV or RD, the greatest challenge is to find a convincing instrument. They also only look at a subgroup of the sample, measuring the local average treatment effect. For a detailed introduction to IV and RD, please refer to Angrist and Pischke (2008) or Murnane and Willett (2011).

Difference in Differences and Propensity Score Matching

Difference in differences (DID) and propensity score matching (PSM) are another set of common approaches to causal identification. It is convenient to combine DID and PSM. Chen et al. (2009) used them to study the impact of parental migration in Shaanxi province, and Liu et al. (2010) used them to test the effect of primary school mergers in Shaanxi and Ningxia provinces, however both studies focused on the academic performance of rural students rather than PCED.

DID has been used in some classic economics-of-education works, such as that by Duflo (2001) on the impact of the INPRES program in Indonesia, and Skoufias and Parker (2001) on the impact of

the PROGRESA program in Mexico, providing evidence of how some programs changed children's education decision in developing countries. A typical DID is as follows:

$$y_i = \beta_0 + \beta_1(post_i) + \beta_2(treat_i) + \beta_3(post_i * treat_i) + \varepsilon_i$$

It is called "difference in differences" because it firstly take the pre/post-treatment differences within each individuals, then takes the difference of those differences between individuals. By doing so, confounding factors are captured by β_1 and pre-treatment differences by β_2 . β_3 measures the treatment effect.

PSM is also self-explanatory according to its name—it matches units that have the same or similar propensities of treatment participation (D_i). Suppose that the conditional independence assumption holds, then

$$p(X_i) = E[D_i | X_i] = p[D_i = 1 | X_i]$$

The application of PSM is as follows. Firstly, a logit or probit regression should be run using a dummy variable for participation (1=participation, 0 otherwise) as the dependent variable, and potential participation determinants as independent variables. Then, substitute the value of each variable for each individual in the obtained equation. The result is a figure measuring the individual's propensity to participate, their propensity score. There are various ways to use this score, the most straightforward being to compare the PCED between each pair of participants and non-participants with the closest propensity scores, or to make a comparison of people within a range of propensity scores, say 0.5 to 0.7. If the researchers fail to obtain a good overlap of the two groups, they can weight them by the inverse of the propensity scores to utilize more data.

DID requires individuals to follow a trend that can be predicted by pre-treatment information if otherwise untreated; PSM assumes no unobserved difference between the treated and the untreated groups—both make assumptions that are often implausible, which could lead to bias in their results. For a detailed introduction to DID and PSM, please refer to Murnane and Willett (2011).

2.3 Evidence regarding the Determinants of Post-Compulsory Education Decision

There is a huge archive of information about the determinants of educational attainment¹³ for rural teenagers in developing countries like Indonesia (Deolalikar, 1993), Tanzania (Al-Samarrai and Peasgood, 1998), Turkey (Tansel, 2002), Guinea (Glick and Sahn, 2000), Mexico (Lopez-Acevedo and Salinas, 2000), Pakistan (Sawada and Lokshin, 2001), and India (e.g. Sipahimalani, 1999; Kochar, 2004), etc. Sun (2004) classified the determinants into seven categories: household economic status and credit constraints, parental education, number of siblings and birth order, gender, direct cost of education, school factors, and opportunity and wage in the labor market. These factors have been confirmed in studies for China, which will be introduced in this section.¹⁴

China experts, mostly in sociology, have further extended exploration to subjective factors such as educational aspiration, confidence (self-affirmation), and affiliation to school, with strong impacts confirmed (Hannum and Adams, 2007, 2008; Hannum and Park, 2007; Hannum et al., 2009).

Research on rural China suggests that governmental policy (e.g. Liu et al., 2009; Liu et al., 2010), academic ability (e.g. Brown and Park, 2002; Hannum et al., 2009), network/peer effect (de Brauw and Giles, 2008; Hu and Du, 2008), parents' political status and ethnicity (Liu, 2007), and parental health (Yi et al., 2011) are additional PCED determinants.

In comparison with the literature on attainment, there are much fewer discussions of high-school track determinants. A number of studies of the high-school track exist for developed countries, such as Britain (Yang, 2008), France (Goux et al., 2014), Germany (Dustmann, 2004; Heineck and Wölfl, 2011), and Spain (Lopez-Mayan, 2010), and for developing countries like Thailand (Moenjak and Worswick, 2003) and Turkey (Aypay, 2003). They demonstrate the same problem of not looking specifically at the rural population. This problem is understandable. Rural areas usually lack the industrial basis to nurture vocational education, so the research priority was given to discussions about value, development, or problems rather than determinants. In China, vocational education has

¹³ For this review, that will be Dropout vs. Work vs. AHS/VHS.

¹⁴ They are also comparable to findings in US studies; see Haveman and Wolfe (1995) for a review.

been treated as a tool for rural–urban equalization following the Promotion of Vocational Education Act of 2005. It is still taking time for updated and rigorous schooling track studies to emerge, but some surveys have already been conducted (e.g. Zhu, 2006; Fang, 2007; Zhang, 2009; Song et al., 2011). Both the Chinese and the non-Chinese literature have tended to focus on the impacts of parental background and the expected return to schooling track. They have also talked about high-school quality, but few have offered detailed measurements of this factor.

In this section, I reclassify the determinants into six case-specific determinants that vary by student, and four alternative-specific determinants that vary by PCED. There is rarely a perfect classification. Some of the factors are tangled together when reporting on their impact (e.g. gender and household economic status; parental background and student age), or are highly correlated with each other (e.g. school quality and direct cost; direct cost and policy intervention). The classification I use is a balanced one that also reflects the rationale of the CL model. For each group of determinants, I will start by recapping the theoretical explanations, and then I present the empirical results for educational attainment¹⁵ and schooling track. When mentioning the term “coefficient,” “association,” or “correlation,” I refer to those that are statistically significant at the 5% level. The results of the major studies are briefly summarized in Table 2-2.

¹⁵ For the PCED that is Dropout vs. Work vs. further education including AHS and VHS.

Table 2-2 Determinants Suggested by the Shortlisted Studies in Table 2-1

Article ^a	Variable with coefficient that is significant at 5% level in the full model
Han, 2001 ^b	age (+), mother's education (+), average schooling year of the 20-35 population in the county (+)
Brown and Park, 2002	<i>For dropout:</i> male (+ for lower secondary school), older siblings (-), women's empowerment (-), women's empowerment*male (-), poor and credit constrained (+), distance to school (- for primary school), rainproof classrooms (-) <i>For performance:</i> male (-), male (+ for primary school), older siblings (+), women's empowerment (-), log expenditure per capita (+)
Connelly and Zheng, 2003	% of village peer in school (+), number of younger brothers (-), number of younger sisters (-), younger sister * boy (+), older sibling dummy (-), older sibling dummy * boy (+), parents attended primary school (+), parents attended middle school (+), Non-Han (mixed), Non-Han * boy (-), per capita rural income (+), per capita rural * boy (+), hill county (-), hill county * boy (+), mountain county (-), mountain county * boy (+), region * boy (+), boy (+)
Li and Tsang, 2003	economic burden (-), gap between parent's desired level of schooling for child and the economically attainable level of schooling (-)
Sun, 2003	age (+), number of siblings (+), household size (-), distance to the nearest middle school (-), father's schooling year (+), expenditure per household member (+)
Sun, 2004	<i>For all:</i> household expenditure per capita (+), household land per capita (-), father's education (+), household size (+), number of children older than 7 (-), home-school distance (-), middle school fee (-), elementary school fee (+), gender, number of county/town- owned enterprise (+), wage for farming (+), non-agriculture wage for female (+), non-agriculture wage for male (-) <i>For girls:</i> household expenditure per capita (+), household land per capita (-), household consumption goods value (+), father's education (+), household size (+), number of children older than 7 (-), home-school distance (-), elementary school fee (+), wage for farming (+), non-agriculture wage for female (+), non-agriculture wage for male (-)
Song et al. 2006	mother's education (+), father's education (+ only for upper secondary enrollment), proportion of men in the household (- for boy's enrollment)
Liu, 2007	<i>For dropout:</i> village-level income per capita (-), age square (+), older siblings (+), younger siblings (+), father is Han (-), mother's education (+), mother is a member of the Chinese Youth League (-), household possess index (-), male*household possess index (+)
Hannum and Adams, 2007	age(- <i>for enrollment</i>), male (+), log wealth (+), mother's years of schooling (+), mother's expectations for child's schooling in year 2000 (+), child's math achievement in year 2000 (+), teacher's expectations for child's schooling in year 2000 (+), log wealth*child's gender (+)
Ding and Li, 2007	<i>For VHS instead of AHS:</i> the stratification of father's occupation (-), father's education attainment (-)
Fang, 2007	<i>For VHS instead of AHS:</i> the level of father's occupation (-), the level of mother's occupation (-), family income (-), father's educational level

	(-), mother's educational level (-), student's academic performance (-) <i>For performance:</i> the level of father's occupation (+), the level of mother's occupation (+), family income (+), father's educational level (+), mother's educational level (+), parental expectation (+)
de Brauw and Giles, 2008	number of migrants from village/10 (-), first born (-), first born in household was male (-), father's years of schooling (+), mother's years of schooling (+), number of male potential migrants in the household (-), father is professional (+), number of migrants/10*father had off-farm work (-)
Hannum et al., 2009	male (+), age (+), schooling is useless for girls since they marry and leave home (reference=disagree) (-), educational expenditure last semester (+), parents help child with homework (reference=never) (+), mother's aspiration for the child in year 2000 (+), alienation from school (reference=strongly disagree) (-), child education aspiration (years) (+), self-concept as a good student (reference=no) (+), family wealth quintile (reference=bottom quintile), parent's total education (years) (+), elder sisters (+), younger brothers (+)
Sun and Du, 2009	5-4-3 system (reference=5-3-3 system) (-), 6-3-3 system (reference=5-3-3 system) (+), male (+), male*6-3-3 system (-)
Yu, 2009	gender, number of siblings (-), gender of the household head (+ for girl and - for boy), education attainment of the household head (+)
Li, 2009	<i>For VHS instead of AHS:</i> Hukou status as non-agriculture (-), HSEE score (-), father's educational level (-), father working off-farm (-), mother working off-farm (-), household durable goods index (-)
Li and Cheng, 2009 ^c	<i>For VHS instead of AHS:</i> lower tuition (+), increased subsidy (+), increased expected earnings (+)
Mo et al., 2011	<i>For dropout:</i> conditional cash transfer (-), commuting time between home and school (+), plan to continue education after junior high school (-), homeroom teacher's experience (-), availability of award based on academic performance to homeroom teacher (-), pre-treatment math score (-), age (+), has sibling (+), living with family/not living in boarding facilities of the school (-)
Song et al., 2011 ^d	<i>For VHS instead of AHS:</i> academic performance (-), household income (-) <i>For VHS intention:</i> academic performance (-), mother as migrant worker (+), knowing policy incentives (+) <i>For Work instead of high school:</i> academic performance (-), father's educational level (-)
Yi et al., 2011	<i>For dropout:</i> consumption asset value located the lowest 10% (+), math score (-), age (+), father's education (-), parental health (+), accumulated time that parents stayed at home in the past 3 years (-)
Lu, 2012	Living in labor migrant household (+), sibling migrant (+), age (+), household's highest education level is some high school or more (+)

a. When unspecified, the dependent variables are for attainment or enrollment to a high level.

b. This study also considers the return to education for different type of work, but the coefficients are all insignificant.

c. This study is for impacts of changing VHS cost or benefit heterogeneous to student characteristics including gender, political status, academic performance, SES, and location.

d. This report controls a number of out student and household characteristics, but the results for them cannot be found from the current released version.

2.3.1 Case-Specific Determinants

The case-specific determinants are gender/age/ethnicity, parental background, number of siblings and birth order, peer/school/community factors, household economic status and credit constraints, and subjective factors. Health is a potential case-specific determinant; studies have merely pointed out its impact on performance in elementary schools (e.g. Luo et al., 2012), so I will not discuss health in this review, however we should keep it in mind since performance matters for the PCED.

Gender, Age, and Ethnicity

Gender, age, and ethnicity are individual characteristics that can hardly be altered by intervention. Based on the theories in Section 2, girls in rural China are likely to have fewer educational opportunities, since they contribute less to the household in the long term. Although older students may be more mature and gain better academic performance, which increases their chance of further education, they also bear a greater opportunity cost than their classmates. Age may influence the weight of student utility in the household utility function—older students have more autonomy in their PCED. Minority Chinese people, who make up less than 10% of the Chinese population and mostly live in remote regions, are likely to bear a greater cost related to language, transportation, and network than the Han Chinese, and therefore they might face a higher risk of dropout, however there are also more schooling incentives for them, such as extra subsidies and lower entrance scores.¹⁶

Hunnam and Adams (2007) summarized the detailed reasons for the gender difference in educational attainment. There are parental perceptions that girls are unlikely to succeed in the labor market. Marriage norms dictate that parents live with sons, making sons the primary source of old-age support, while girls typically marry out of households. Culture might lead directly to parents'

¹⁶ http://www.gov.cn/banshi/2005-06/21/content_8243.htm

discriminatory attitudes and practices, regardless of rationality. Song et al. (2006) added a fourth explanation that households may face a higher opportunity cost in enrolling girls because they take on more housework than boys do.

Early research on developing countries suggested that the monetary cost of return to education is higher for boys than for girls, and that the opportunity cost of education is lower for boys (Schultz, 1993; Psacharopoulos, 1994; Behrman, 1999), however at least for China, the gender gap has narrowed. Given the dramatic rise in migration to urban areas by young women and men seeking informal work, the perception of an employment disadvantage for females has become debatable (Li and Tsang, 2003). Using GSCF data, Hannum and Adams (2007) showed that the enrollment advantage of males might only be modest, and a more recent survey in Shanxi and Shaanxi (Yi et al., 2011) showed no gender impact at all.

What has remained unchanged is that the demand for female schooling has become more income-elastic than that for male schooling (Sun, 2004; Song et al., 2006). Girls are also more sensitive to their own performance. Brown and Park (2002) found that academically weak girls are more likely to drop out than academically weak boys. In the case of the schooling track, girls appear to be more cost- and earning-elastic than boys (Li and Cheng, 2009), but gender itself does not predict the high-school track (Li, 2009).¹⁷

Studies have pointed out that within the same grade older students are more likely to drop out (Mo et al., 2011; Yi et al., 2011) or be less likely to enroll (Hannum and Adams, 2007). These findings conform to the argument of opportunity cost. Note that age has been used as a control variable in many other studies. When the grade is not controlled, the coefficients for age may simply describe the fact that older people had already finished more schooling, or that older people have less education because the educational requirements for their schooling age was not as good as it is contemporarily, or that the probability of dropout increases as the grade rises. Outside China, age

¹⁷ Li (2009) also looked at the impact of students' political status (being a Youth League member or a class leader), but found no impact. There may be a selection to political status that is easily captured by other variables. This review will not involve discussion of student political status.

has received serious attention in Germany's schooling track literature. The studies by Dustmann (2004) and Heineck and Wölfel (2011) showed that parental preference efficiently predicts a child's schooling track. The authors attribute this to the fact that students do not participate in the household decision because they are only 10 years old when they need to decide their track.¹⁸ This phenomenon fits the theoretical prediction.

Unlike the US, where evident ethnic stratification of educational achievement and attainment exists (Kao and Thompson, 2003), China presents a mixed picture. Based on the 1990 census data, Connelly and Zhang (2003) found that although it is easier for non-Han children to quit primary school, non-Han girls are more likely to attend middle school and all non-Han youths are more likely to complete middle school if they attended. Using more recent data from Yunnan province, Liu (2007) detected a lower probability of dropout for minority students. These results suggest that ethnic-specific incentives may outweigh the cost concern, especially in the later stage of compulsory education. It is also possible that the two factors offset each other—Li and Tsang (2003) found that ethnicity made no difference to primary education.

Parental Background

Another popular grouping in PCED determinants is parental background. The most widely discussed parental variable is education. The theory section of this review offers two ways to explain the impact of parental background. PCED may result from a unified household utility function (usually the father's) or intra-household bargaining. Empirically it is hard to make a distinction between these two mechanisms. In addition to parental education, there are also discussions on occupation, political status, migrant status, and parental health (parental economic status will be discussed separately).

The finding on parental education varies in regard to whose education weighs more. For example, Brown and Park (2002) found that a father's education has a much greater influence on educational

¹⁸ Also, being streamed to the vocational track at a younger age may have a negative impact on future achievement (Hanushek and Woessmann, 2006).

investment decisions than a mother's education. An additional year of paternal education reduces the likelihood of dropping out by 12–14%, however the probability of lower-secondary school dropout falls dramatically for sons when the mother has greater empowerment (measured by a 0–1 index). Brown (2006) found that the educations of both parents have a positive association with educational expenditure on their children, but the coefficient for mothers is about 30% higher than that for fathers. Lu (2012) suggested that the highest education level in the household has the strongest association with attainment.

There is also a study in which no impact of parental education was found (Li and Tsang, 2003), and a study that suggested that the effect of maternal education diminishes as the child's educational level rises (Song et al., 2006). Some researches raise the concept of matched marriage. Using data from Gansu and Inner Mongolia, Sun (2003, 2004) found that husbands tend to seek wives of similar education attainment. If the impact of parental education is true, then the matched marriage catalyzes the attainment disparity within rural regions.

de Brauw and Giles (2008) found that having a father who is a village leader or enterprise manager increased the chance of high-school enrollment. Ding and Li (2007) demonstrated that not only the father's education but also the hierarchy of the father's job is significantly associated with the decision about schooling track. Students of a lower parental job class are more likely to enter a VHS.¹⁹ This is also supported by the sociology literature, which supports social stratification (Fang, 2005), however Ding and Li's sample consisted of 14- to 20-year-old urban students, so the results may not be applicable to rural students. Finally, the matched-marriage phenomenon also exists in occupations (Fang, 2007). If the influence of occupation is true, then matched marriage also catalyzes the consolidation of the educational track in rural regions.

Researchers have also considered parental political status. De Brauw and Giles (2008) identified a positive association between a father's communist party status and children's enrollment in high

¹⁹ The finding for Germany is similar to the finding for China. Other than the above-mentioned age factor, Dustmann (2004) attributed this phenomenon to a deep tradition of professionalism whereby parents might prefer their children to follow their schooling track. This seems unlikely in the case of China.

school. The authors treated the party status as a proxy for household wealth. In another study, Liu (2007) used parental Communist Youth League status as a measurement of the household political resources. He found that children were more likely to drop out if the mother had never been a youth league member. The author explained that youth league status could be a proxy for mother's capacity of mobilizing resource to the children.

Parental migration status is another important determinant. Migration was used by Liu (2007) to explain his finding that only a mother's education level has an impact on children. Because in his sample fathers spent less time at home than mothers did, he attributed the correlation to better communication between mothers and children. Time spent at home is relevant to the migrant worker status. In 2010, there were about 23 million left-behind compulsory-education-age children in rural China.²⁰ There is a growing body of studies discussing how family separation affects education. The conclusions vary. Lee and Park (2010) found that a father's migration reduces enrollment by sons and has significant positive effects on the academic outcomes of daughters, but has negative effects on the psychosocial well-being of both boys and girls. Their data came from the first two waves (2000 and 2004) of the GSCF. Chen et al. (2009) used 2006 data from Shaanxi province and detected a positive impact of a father's migration on academic performance, however this study only included primary school students and did not take enrollment into consideration. Based on a survey carried out in Shanxi and Shaanxi, Yi et al. (2011) included a negative association between parents' time spent in the household and the likelihood of dropout, or in other words a positive association between the parental migration time and the dropout decision. Finally, using the longitudinal data from the China Health and Nutrition Survey, Lu (2012) found at the national level that neither the mother's nor the father's migrant status may affect attainment.

Health is the final parental background factor that influences attainment. Yi et al. (2011) found that rural students are 3.4% (0.034 at 1% level) more likely to drop out if they come from a family in which one or both parents are chronically sick or permanently handicapped. It is worth noting that

²⁰ http://www.gov.cn/test/2011-10/31/content_1982280.htm

the coefficient is greater than the coefficients for “whether the accumulated months that parents stayed at home for less than 12 months in the past 3 years” (0.023 at the 5% level) and “whether the consumption asset value located the lowest 10%” (0.029 at the 5% level).²¹ It is possible that the students need to sacrifice some time for housework and taking care of their parents.

Since 2005, there have also been discussions on the relationship between parental background and high-school track. Based on a survey in two rural schools in a central province, Zhu (2006) found that all kinds of parental background variables have an impact on the schooling track decision, however this study had a small sample (200–300 in various tests), and the author only used basic chi-squared tests, in which she was unable to control for other factors.

Some more specific and reliable evidence follows. There are mixed results on how parental education impacts the schooling track. Based on the 2007 survey data from Hunan province, Li (2009) found that a father’s education level is negatively correlated with the possibility of VHS, but a mother’s education level has no impact. Contrary to Li, Fang (2007) found that a mother’s education level is more relevant to the schooling track. The most recent study, conducted by Song et al. (2011), found that neither a father’s nor a mother’s educational level has an impact. For other findings in the literature, Li (2009) suggested that students whose father and/or mother are off-farm workers are less likely to end up attending a VHS, and that the “agriculture” Hukou status is linked with a higher probability of attending a VHS. Despite the emerging research, it can be reported that studies about how parental background affects the high-school track still lag far behind those on attainment.

Finally, it is worth noting that the parental background is simply an indirect (but easily attainable) determinant of the PCED. What is of interest is the parental effort, such as the frequency with which parents discuss coursework or school events with students, or their involvement in school activities. At least in the US, parental effort is believed to be more influential than school resources, and is not well captured by parental background variables (Houtenville and Conway, 2008). In the case of Turkey,

²¹ The authors used home-stay time to proxy for parental care. This is not a good specification. Parents with health problems are supposed to stay at home. The authors did not include an interaction term of health status and home-stay time, which could seriously bias the estimates. In addition, the dummy designs are too general.

a higher frequency of parent–child discussions about school (e.g. help with homework, limiting the hours spent watching television) proved to be correlated with a lower likelihood of attending a VHS (Aypay, 2003).

Number of Siblings and Birth Order

The theory predicts that the number of siblings and birth order usually have a joint effect on the PCED, or more specifically educational attainment. Holding other factors constant, older children in a larger family bear a higher opportunity cost, and therefore they might have less education and they will work earlier to subsidize the younger children.

There is not much controversy about this in the literature. Sun (2003), Liu (2007), and de Brauw and Giles (2008) all confirmed that older siblings are less likely to be admitted to high school. Using the hazard model, Brown and Park (2002) showed that the presence of siblings, especially older siblings, reduces the likelihood of dropping out. Their explanation is that siblings can increase the desirability of educational investments by substituting for each other's labor contributions to the household, economizing on costs. They also argued that having a sibling can promote school performance because the children help each other with schoolwork. In this explanation, the help from other siblings can be treated as a household input for the quality of schooling (Function (7)).

There is also indirect evidence of the impact of birth order. Lu (2012) found that the migration of siblings (rather than parents) increases attainment. Presumably, the migrant siblings are also the older ones; thus, this finding actually confirms the simplest theoretical illustration.

Although unable to consider birth order, the survey of Life Histories and Social Change in Contemporary China (Lu and Treiman, 2008) showed a negative association between sibship size and educational attainment, which conforms to the intuition that having more siblings dilutes household resources. The same study also suggested that the sibship size is very “politics elastic” because the statistically significant coefficient was only detected for the cohorts of early years after liberation and the economic reform era, during which Chinese politics was more efficiency/less equality oriented.

The number of siblings and birth order are also nested with gender. Connelly and Zheng (2003) found that girls are equally disadvantaged by having a younger brother or sister, but boys are less disadvantaged by having a younger sister than by having a younger brother. This finding was confirmed by Yu (2009) with data from a rural Jiangsu province. They both suggested that the gender inequality is revealed through the number of siblings and birth order.

Neither theory nor empirical study involves a specific discussion on sibship size or birth order regarding schooling track.

Peer, School, and Community Factors

The next group of determinants includes common non-household factors (F_{nh}); the school (at the compulsory-education stage), peer, and community factors. School input affects both the academic achievement and the PCED. The peer and community effects can be treated as a cost factor in the Nash model (Function (18))—if a large proportion of peers or community members choose one PCED, then the cost of that PCED drops, making it a tempting option for the student.

School input can be categorized into teacher/pupil ratio, teacher education, teacher experience, teacher salary, expenditure/pupil, administrative inputs, and facilities (Hanushek, 1989). The evidence of how school inputs affect student attainment in rural China is not particularly straightforward. Hu and Du (2008) looked at detailed school factors in west China, but their study was about the determinants of middle-school performance. Since academic achievement could be a mediating variable for the PCED, the findings are still meaningful. First, teacher quality matters. The percentage of certificated teachers was associated with better performance, while the percentage of minority teachers had the opposite effect. Unlike the results suggested by the US literature, the teacher/student ratio appeared to be negatively correlated with student performance. This could be an issue of inefficiency, or just a reflection of the fact that remote areas have smaller classes. Student school and classroom area had positive associations with performance, but student dorm building area and number of library books did not. The authors explained that the former group directly

benefits students, while the latter has a higher management cost. Fourth, a negative association exists between school per student expenditure and test performance. This could be due to inefficiency in the use of budgets.

Brown and Park (2002) found that school quality matters more for primary education than for lower-secondary education (no coefficient significant). Higher school fees and distance to school could both be proxies for quality, resulting in lower probabilities of dropout. The percentage of rainproof classrooms also increases the primary schooling. The association between the percentage of teachers with post-secondary education and schooling is in the opposite direction, which is probably due to the trade-off between education and experience. Unlike Hu and Du (2008), Brown and Park did not find an effect on learning. This is similar to the findings of Hanushek et al. (2008) for Egypt, where school quality has a positive effect on primary education enrollment with student ability and achievement held constant, suggesting that academic performance is not the only channel through which school quality affects the PCED.

Another group of evidence came from Park and Hannum (2002). The authors looked at an extensive list of teacher variables using the first-round GSCF data. It emerged that higher quality rank, experience, and stipends paid to teachers are better for student learning. However, the coefficients for teacher college degrees and their interaction terms with years taught are both negative. They also found that teachers who were government employees or local villagers had a positive impact on student learning, which conveys the importance of commitment to, and trust from the local community.

Note that quantitative discussions of the curriculum are missing from the PCED literature. This is because China has a unified curriculum for rural education. Despite dissatisfaction (Wang, 2005; Hannum and Adam, 2008), the curriculum is supposed to be the same for every student. It can still have impacts that are heterogonous depending on other factors, such as leading to the anti-study attitude of some students, discussed in 4.1.6.

In comparison with school factors, peer and community factors are less visible. Hu and Du (2008) used the average educational attainment of classmates' parents as a proxy for the peer effect. They found a positive association with student test performance. Han (2001) used the average schooling years of the 20–35 age group to proxy for the community PCED. She also identified an effect that fits the theory prediction. Connelly and Zheng (2003) found that rural students are more sensitive to county terrain and wealth. De Brauw and Giles (2008) detected a robust negative relationship between high-school enrollment and migrant opportunities, measured by the number of migrants from the village or in the household. The mechanisms behind the negative relationship are suggested by observed increases in subsequent local and migrant employment of high-school-age teenagers as the size of the current migrant network increases. This is a supply-side factor.

In the case of the schooling track decision, the evidence is mostly qualitative, and mainly comes from interviews (Fang, 2007; Zhang, 2009). Parent and student preferences for AHSs are due not only to their own perceptions of the lower quality of and return to VHS, but also to peer pressure from the community: some households make the schooling track decisions largely based on a sense of satisfaction gained from peer and community approval. Rural or low socioeconomic status (SES) households tend to be more practical (i.e. more economic-oriented) than urban or high SES households (Fang, 2007) when choosing the high-school track.

There has been no specific discussion of how primary or lower-secondary school quality influences the schooling track decision in rural China. Nevertheless, assuming that school quality matters for academic achievement, it is safe to say that better quality leads to a higher probability of attending an AHS.

Household Economic Status and Credit Constraints

Household economic status and credit constraints are traditional elements of PCED modeling. The literature did not challenge the view that a better economic status allows a PCED that bears a larger opportunity cost, and that rigid credit constraints have the opposite impact.

The greatest challenge noted in the research is not about finding an effect, but about measuring the factors precisely, especially economic status. For attainment study, measurements included the farming/off-farm wage and household consumption goods value (Sun, 2004), log value of household durables (Brown, 2006), index revealing the possession of 24 household goods (Liu, 2007), and index revealing the possession of electric appliances (Mo et al., 2011; Yi et al., 2011). Except for Mo et al. (2011), they all pointed out a wealth effect.

The magnitude of the wealth effect varies, however. For example, in the study of Gansu by Sun (2003), a 1000 RMB²² rise in expenditure per household member only increased student educational attainment by 0.2 years. Sun's survey was conducted in 2002, when the GDP per capita for Gansu was only 4294 RMB. In another study at the national level, Lu (2012) found no impact of per capita household income under every specification she tried. In Brown and Park (2002), conversely, the effect is sizeable. They found that holding expenditures per capita fixed, children from households that are both poor and credit constrained are three times as likely to drop out of school. A more recent study by Mo et al. (2011) also found a strong impact when the economic burden is relaxed. From 2009 to 2010, they conducted a randomized experiment in Shanxi province and found that a conditional cash transfer of 500 RMB per semester reduced dropout by 60%.

Almost all the available studies suggest that students from poorer households tend to end up with a VHS instead of an AHS. The sole exception comes from Thailand, where Moenjak and Worswick (2003) found that a well-to-do family is more likely to undertake vocational education. In China's case, Li (2009) identified a negative association between household economic status and VHS selection. To proxy for economic status, she used the durable goods index, which is the weighted sum of the possession of nineteen household durable goods.

Subjective Factors

The final group of case-specific determinants is subjective factors, personality, attitude, and perceptions, which have received increasing attention in the educational literature. The economic

²² 1 USD=8 RMB during the time the survey was conducted. Since 2005, the exchange rate has declined toward 6.

model does not specify how subjective factors influence the PCED. It is more involved in the empirical findings than theoretical prediction.

Personality is the first component of subjective factors. It is defined as “the relatively enduring patterns of thoughts, feelings, and behaviors that reflect the tendency to respond in certain ways under certain circumstances” (Roberts, 2009). Almlund et al. (2011) concluded that conscientiousness (e.g. self-discipline and ambition) best predicts overall attainment and achievement, followed by emotional stability (e.g. depression level and confidence). In China’s case, the evidence is less straightforward. The links between personality and education have been evaluated. Wang et al. (1999) found that most personalities influence academic performance, however these tests were mainly conducted with urban students. In another study, Lee and Park (2010) found that a father’s migration was linked with externalizing problems such as destructive behavior, impulsivity, aggression, and over-activity, but not with internalizing problems such as anxiety, depression, and withdrawal. Since the authors also found a negative correlation between a father’s migration and children’s enrollment, the adjusted personality traits serve as potential mediators. It is also notable that socio-psychological interventions can alter personality traits and can have a lasting effect on education (Almlund et al., 2011; Yeager and Walton, 2011), however so far no quantitative study has focused on China’s rural students.

Another type of subjective factor is a student’s attitude towards schooling. Qualitative and descriptive surveys suggest that a student’s negative attitude towards schooling is the major reason for dropout. Jiang and Dai (2005) interviewed 392 households with dropout children in nine rural provinces. For households of different SESs, 45.1%–69.2% chose an “anti-schooling (厌学 *yanxue*)” attitude as the reason for dropout, and 15.4%–35.4% stated that the family could not afford tuition and fees. The other two factors, the family’s labor demand and the parental attitude toward children’s schooling, appeared to be less important. Jiang and Dai (2005) attributed the anti-schooling attitude to the school environment and direct cost. Wang (2005) suggested additional reasons, including a curriculum foreign to rural life, low teacher quality, and the community idea that

education is useless. Hannum and Adams (2008) had similar views. To some extent, attitude is a mediating factor. Based on these surveys, we can say that attitude matters, but we cannot say that attitude matters the most.

The probit regression of the dropout decision by Mo et al. (2011) showed that randomly receiving conditional cash transfers has an impact smaller than that of the “plan to continue education after junior high school” (0.53 vs. 0.64). Nevertheless, the magnitude for being treated, 0.53, is still large. The author conjectured that the “heretofore neglected” students (those who performed worse in tests) were actually encouraged by the cash transfer beyond the mere receipt of the payment. This constitutes indirect evidence that attitude matters.

Perceptions among students, teachers, and parents also have an impact on PCED. Hannum and Adams (2007) found that student perceptions that “the teacher pays attention to them and likes them” have no impact on secondary school enrollment, but a mother’s and teacher’s expectations for the student’s educational attainment do matter. In turn, teacher perceptions also count. Zhang (2011) revealed that teacher evaluations of the importance of children’s SES are closely associated with the evaluations and educational expectations of the students, beyond the students’ academic achievement and actual SES. Teacher expectations at an earlier period help predict children’s later school persistence. Both Hannum and Adams (2007) and Zhang (2011) used the GSCF data.

Based on the three-round GSCF, Hannum et al. (2009) incorporated the gender concern into their perception discussion. It seems that parental educational attitudes and practices toward boys and girls are more complicated and less uniformly negative for girls than is commonly portrayed. They found that boys received a small advantage in schooling years although parents did believe that a girl’s education is less rewarding than a boy’s education for the household.

Student attitude or parental expectation alone might not be a strong determinant. Li and Tsang (2003) found that school attendance can be predicted by the gap between the parents’ desired level of schooling for their child and the economically attainable level of schooling. In other words, parental expectation gives way to the economic burden. In Hannum and Adams (2007), most of the

secondary students had high aspirations of education attainment, but the aspirations were not likely to be fulfilled due to the cost of post-compulsory schooling. Parents' expectations for their children's future education are chiefly shaped by their own wealth.

Perception factors are also accountable for the schooling track. Parents are risk-averse. For example, a study in Germany suggested that risk-averse parents, particularly mothers, are more likely to enroll their children in the vocational track. Again, the daughter's educational track is more sensitive to this factor (Heineck and Wölfel, 2011).

In China's case, there has been little change in the preference for AHSs over VHSs. Dong and Shen's survey of 1571 rural students in the mid-1990s showed that satisfying parental expectations and gaining a place at college are the dominant reasons for choosing AHS (Dong and Shen, 1997),²³ while the motivation for VHS is mostly to secure a job: a risk-averse behavior. Such a finding is similar to the findings from other developing countries like Turkey (Tunali, 2005) and Egypt (El-Hamidi, 2006). The finding has also been confirmed by post-2005 studies that mainly relied on interviews (Fang, 2007; Zhang, 2009). More evidence was presented by a 2004 survey held by the China Youth & Children Research Center, in which more than half the students said they would not choose a VHS, 49.8% said that even if they wanted to attend a VHS, their parents would not allow it.²⁴ In this survey, the top four perceptions regarding VHSs were "low wage," "cannot get into government sector," "only bad students go there," and "can only become a low-class worker."

2.3.2 Alternative-Specific Determinants

The alternative-specific determinants are the direct cost of each PCED, the reward in the labor market, policy intervention, and the score constraint for AHS. These vary by PCED. When discussing the schooling track, upper-secondary school quality can also serve as an alternative-specific determinant, however the previous studies did not apply direct measures of VHS or AHS quality. The same situation exists for other quality-related determinants, such as curriculum and subject major

²³ This is also true for students in urban areas, such as Beijing (Jiang, 2002).

²⁴ http://news.xinhuanet.com/edu/2005-11/07/content_3742896.htm

(for VHS). The above student/parental perception and the opportunity and wage in 4.2.2 can be regarded as proxies for the quality factor.²⁵

Direct Cost of Each Post-Compulsory Education Decision

Direct cost refers to the cost borne by the household, and more specifically the cost of non-dropout, entering an AHS, or entering a VHS. Holding other factors constant,²⁶ the basic model explicitly suggests that a higher cost lowers the attractiveness of a PCED.

In terms of the attainment determinant, Liu et al. (2009) presented two explanations for the low enrollment rate in upper-secondary schools. One is the barrier erected by the examination system (discussed in 4.2.4). The other reason is the cost–benefit consideration by students and their parents. They argued that the cost issue is the main barrier to upper-secondary enrollment. Two pieces of evidence were offered. The first was their survey of rural public high-school tuition rates in 41 countries, which showed that China’s tuition, 160 USD, is the highest. For a rural family living on the poverty line or with a net income of around 100 USD, paying for three years of high-school tuition is equivalent to almost 5 per capita incomes. The second piece of evidence is from their survey of 1100 randomly selected students in 20 high schools in rural Shaanxi. Their calculation suggested a direct cost of 1659 USD for a three-year high-school education.

If we focus only on Dropout, Sun’s study reported that school fees have a negative association with lower-secondary school enrollment, but a positive one with primary school enrollment (Sun, 2004). Since school fees can be a proxy for school quality, such a result suggested that the price concern outweighs the quality concern when the educational level becomes higher.

Discussions about the schooling track are less straightforward. Using a resampling of 2007 data for Hunan province’s Grade 9 students, Li and Cheng (2009) examined the change in the VHS preference under different scenarios of cost change. They found that 27.6% to 37.8% of students who preferred an AHS at the beginning would switch to a VHS if it reduced the tuition to half the

²⁵ To put it another way, this phenomenon could suggest that the quality gap is too evident to need evaluation.

²⁶ The quality that can be proxied by cost in particular.

original or to zero, or if a subsidy of 50 RMB was provided per student per month. Students with lower academic performance who are female, or come from poorer families will be more sensitive to the change, while the effect of the parental background diminishes. However, this was just a study of intention, which does not guarantee the change in the final PCED. Song et al. (2011) found that the awareness of policy intervention (mostly about lowering cost) did increase student preferences for a VHS, but the effect on the actual track is statistically insignificant.

Reward in the Labor Market

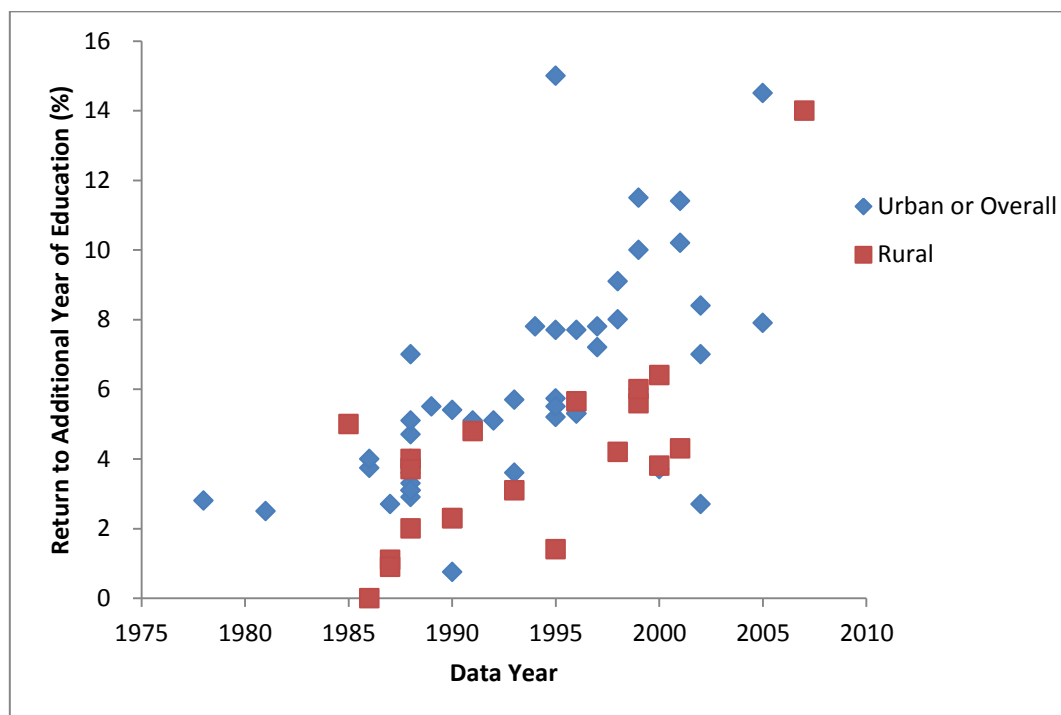
Reward in the labor market is the human capital constraint for the PCED optimum. Opportunity and wage are the major forms of reward. For AHS, the reward for higher education also matters. As indicated at the end of the modeling section, non-monetary return can also be influential.

The economic (non-)reason for dropout in rural China constantly catches people's attention. For example, based on data from 23 rural counties, Wei et al. (1999) found that the rate of return to lower-secondary education is 6.87%, which is not low compared with 4.84% overall. They also estimated the cost of schooling and calculated the internal rate of return. For lower-secondary education the unadjusted internal rate of return is 11.2%, demonstrating that such investment was quite profitable, however the data they used may be too old to shed light on the current PCED distribution. Applying data from Chifeng city in Inner Mongolia, Sun and Du (2004) offered more recent support for non-dropout: they found that lower-secondary education could be the most cost-beneficial educational level if the household income is mainly from agriculture. The type of labor market opportunity also matters. Sun (2004) found that the development of county- or township-owned business encourages additional schooling, but the development of private business discourages it. The former group imposes strict educational requirements, while the latter group prefers the cheaper labor of less schooling.

If we expand the discussion from dropout vs. non-dropout to educational attainment, empirical studies have found consistent lower returns to education for the rural population than for the urban

population (Figure 2-3). I am cautious about over-reliance on these findings. First, both the rural–urban segregation system and the fact that the country is in transition to a real market economy could lead to distortions of returns. Secondly, the reason for the previous low estimates might be the inappropriateness of the methodology, such as not controlling for endogeneity or sample selection bias. More recent studies dealing with these issues (de Brauw and Rozelle, 2008; Chen and Hamori, 2009; Sun and Du, 2009) detected higher returns. For example, Sun and Du (2009) found that the real rate of return could be over three times the old ones (the upright dot in Figure 6). They used the variation in the education system as an instrumental variable for educational attainment. De Brauw and Rozelle (2008) conducted a survey of 1199 households in 60 villages, detecting higher-than-average returns among younger people and migrants and for post-primary education, which implied that being a migrant worker with enough secondary education could be a reasonable choice for rural teenagers.

Figure 2-3 Pre-2010 Estimates of Return to Education in China



Note: Obtained from a union of the literature listed in Sun (2004) and Guo (2010), plus two studies that are mentioned here but not cited by them (Chen and Hamori, 2009; Sun and Du, 2009). For panel data, I take the median year as the data year. When the coefficients are presented separately for males and females, or there are several coefficients for the same year, I take the mean.

The debate, however, continues. A recent argument comes from Li et al. (2012), in which the rate of return is as high as 8.4% in OLS, but shrinks to just 3.8% in the within-twin fixed-effects model. More specifically, the authors found that high-school education serves as a mechanism to select college students rather than a human capital investment per se. This finding is supported by Yao et al. (2012), using a resampling of the 2005 census. They found that the marginal returns to upper-secondary education were negative for East, North, and Northeast China, but these returns then jumped to twice the return to lower-secondary education if the individual finished higher education.

Regardless of what the return looks like, the consensus lies in Chinese people tending to treat AHSs as a channel towards college. An AHS is necessary input in order to secure the rate of return to a complete education that includes post-secondary education. A similar logic also applies to poorer countries like Côte d'Ivoire and Uganda (Appleton et al., 1996).

When it comes to the relationship between work and attainment, the findings are more subtle. A number of studies have been undertaken on the effect of migrant work, mostly using Mexican data and identifying either a brain drain (e.g. McKenzie and Rapoport, 2006) or a brain gain effect (e.g. Boucher et al., 2005). Applying a hazard model to the CHIP 1995 data, McGuire et al. (2007) found that better off-farm employment opportunities increase the likelihood of dropout. Their study also suggested that educational attainment has a stronger association with off-farm work than with farming. This is a Chinese analog of a Mexican case. In another case in point, applying a household-time fixed-effect model to a 1986–1995 dataset of rural Sichuan, Yang (2004) found that schooling enhanced the ability of farmers to devote more labor and capital to non-farm production, resulting in income growth.

All the above “reward” studies did not differentiate schooling tracks, yet reward is a frequently discussed determinant of track studies. Rich discussions can be found internationally. El-Hamidi’s (2006) study in Egypt suggested that the educational choice generating the most benefit is general

education followed by on-the-job training. Moenjak and Worswock (2003) held a contrary view. In their study of Thailand, VHSs result in higher earnings returns than AHSs. It appears that there is no unique answer regarding the returns from the high-school track. In Turkey's case, Tunali (2005) found that vocational education offers some protection against unemployment for males in rural areas. Using two waves of the Indonesia Family Life Survey, Chen (2009) demonstrated that attendance at a VHS results in neither market advantage nor market disadvantage in terms of employment opportunities and/or earnings premium. In a more recent study of Spain, Lopez-Mayan (2010) confirmed that lifetime earning is important for the PCED. Two of this study's findings may be applicable to China's case. Raising the annual wage of vocational college graduates can reduce the dropout rate in VHSs, but not in AHSs. In China, this suggests the benefit of building a strong connection between VHS and vocational college. The relevant increase in lifetime wage from compulsory schooling discourages participation in post-compulsory education. For China, that implies that students might choose the migrant worker option if they perceive a low wage premium resulting from upper-secondary and/or higher education.

Due to the shifting policy focus on VHSs and rural students, the number of studies of China's high-school track determinant has grown, with a geographical emphasis on rural regions. I will introduce them one by one according to when the data was obtained.

Min and Tsang (1990) conducted probably the first comparison of productivity between VHS graduates and AHS graduates. They used Beijing Auto Industry Company data and concluded that VHS graduates were more satisfied and productive than AHS graduates. Based on a survey of 1433 employees in two cities, Yang (1998) concluded that pre-employment education gives better work performance, but vocational education does not lead to better performance than general education. Both studies focused on urban residents, while the following studies concern both urban and rural graduates.

After the 2005 policy document, it has been claimed that VHSs are a better choice than AHS with regard to employment opportunities. The reported employment rates of graduates from VHSs are

usually higher than 90%, although as mentioned at the beginning of this review, the reliability of the official figures is questionable. Be that as it may, the survival analysis by Li and Ding (2008) confirmed that graduates from vocational high school take a shorter time to obtain jobs than their academic counterparts. The sample they used was from a 2004 survey of 12 provinces. In a more comprehensive study based on the same survey, Ding and Li (2007) found that there is no great difference between graduates of the two school tracks in terms of wages. They attributed this finding to the academic-like curriculum of VHSs, which fails to differentiate vocational students from the academic students in the job market. However, they also found that students going to VHSs came from households with lower SES, so it seems that VHSs work for equalization. In another study using 2007 data for Hunan province's Grade 9 students, Li and Cheng (2009) found that when the expected monthly wage for VHS graduates rises, about 50% of Grade 9 students who preferred AHS at the beginning will switch to VHS. Again, just like cost change, this effect is not heterogeneous to parental background.

Finally, Li (2011) contributed a discussion on non-monetary returns. Her study found that VHS graduates enjoy higher non-monetary benefits than AHS graduates in terms of job satisfaction, frequency of job change, length of time unemployed, and perceived working environment. Two areas for caution should be raised however. First, the study focused on the 1993 VHS cohort from Hunan province, which has limited implications for today's VHSs. Second, the findings may reflect the more conservative attitude toward the labor market held by VHS participants. For example, they might be more easily satisfied with a job, and thus be able to work longer and become a senior employee who feels comfortable with the working environment. In short, there could be selection bias.

Policy Intervention

Policy interventions aim to change some factors in the utility function, especially the direct cost. There are mild and less-PCED-specific interventions, such as changes in the resource allocation for different levels or schooling tracks, or purposive and dramatic interventions such as the current wave

of China's vocational policy, which eliminates VHS tuition for some rural students. Let us start with the non-dramatic ones.

Before the mid-1980s, when the Chinese government imposed a restrictive policy on labor migration from rural to urban areas, the sizeable urban–rural income difference provided a strong incentive for AHSs because it raised the accessibility of urban formal employment to rural people (Zhao, 1997). Since then, however, rural–urban segregation has been relaxed, so the motivation for post-compulsory education is no longer as powerful as before.

In more recent literature, Sun (2004) found that when local governments increased the education budget, the impact of the household income shrinks. The government budget varies widely among rural schools. In fact, although the Chinese public tends to focus on the urban–rural gap, Theil decompositions showed that the great majority of spending inequality resided within the two groups instead of between them (Tsang and Ding, 2005).

The change in the education system is another case of gradual policy intervention. Before the debut of the Compulsory Education Law in 1986, there had been different types of education system in rural China, including 5-3-3, 5-3-2, 5-2-2, 5-4-3, and 6-3-3. Of these, 6-3-3 eventually became today's dominant system. Using a dataset from rural Guangxi province, Sun and Du (2009) found that the gender education gap was minimized under the 6-3-3 system.

Some other studies provide indirect evidence. For example, based on a survey in Western China, Liu et al. (2009) suggested that teacher incentives and student education performance, which seem to be associated with students' schooling decisions, are unlikely to benefit from the 2001 “to the county” (以县为主 *yi xian wei zhu*) fiscal centralization. In another study, Liu et al. (2010) demonstrated that when students are older (e.g. the fourth grade), their grades rise after merging, but the effect is reversed for younger students. School mergers are a controversial policy. Arguments against them include the longer distance for schooling, the lack of a nutritional diet and family emotional support at boarding school, and the safety issue of school buses.

As indicated at the beginning of this review, radical national policies toward compulsory education and vocational education were instituted during the 2000s. The 2005 fiscal reform was one of them. In this reform, the central government transferred the budget from richer schools to poorer rural schools. Sun et al. (2010) applied DID to analyze its effect in the provinces of Guangxi, Hubei, and Zhejiang. They discovered an equalization effect in school budget. If an equalization of investment leads to an equalization of academic performance across schools, then it is reasonable to believe that the fiscal reform has an influence on students' PCED.

No rigorous analysis is available about the free VHS for rural students, but a comparison of per student public expenditure can shed light on possible impacts of this policy. Since VHSs are designed to prepare students for work, they have a higher requirement for laboratory facilities than AHSs. Yao (2007) summarized the reasonable VHS/AHS ratio of per student expenditure in the Chinese literature. They are 2.5:1, 3:1, 5:1, 6.8:1, and 8:1. In 2001, the actual ratio was 2.53:1, which was acceptable, but since then it has been approaching 1:1.²⁷ It is true that the elimination of tuition has attracted more students to VHSs, but its quality could be compromised by the declining investment.

Looking more closely at Figure 1-2, the distribution of PCEDs between AHS and VHS was quite volatile throughout the 2000s. The descriptive statistics alone imply the great impact of drastic policy interventions, such as higher-education expansion, which have increased new enrollments from 1.08 million in 1998 to 6.62 million in 2010,²⁸ the end of secured job allocation for VHSs in 2001, and the ongoing Promotion of Vocational Education. Of these, the short-term effect of higher-education expansion is becoming apparent. There are reports (Wang, 2010) and working papers (Xing and Li, 2010) that report the decline in job opportunities and wages for college graduates, and an expanding urban–rural gap of enrollment, which could discourage AHS enrollment, or even encourage dropout for rural students. It may be too early to evaluate the long-term outcome of these sharp policies. Malamud and Pop-Eleches (2008) offered a hint. They used RD to evaluate a 1973 reform in Romania

²⁷ <http://www.shszx.gov.cn/node2/node4810/node5183/node5189/userobject1ai45359.html>

²⁸ From the Educational Statistics Yearbook of China.

that shifted a large proportion of students from VHSs to AHSs. They concluded that the differences in labor market returns between the two tracks are largely driven by selection.

Other than government policies, there are also school policies affecting different factors. Based on a randomized controlled trial in suburban Paris, Goux et al. (2014) showed that low-achieving students' aspirations can be made more realistic through collective meetings on track choice in school, and more realistic aspirations are followed by a significant reduction in grade repetition and high-school dropout. They also found spillover effects to untreated students that are close friends to the treated ones. China's school managements are more centralized, but school-level innovations do exist²⁹, yet not well evaluated.

Score Constraints: The High-School Entrance Examination

The last group of determinants involves the HSEE cut-off. The HSEE cut-off varies by school. Unlike urban students, rural students have fewer AHS options, and therefore, failing a cut-off usually means they have to choose Work or VHS. To some extent, the determinant is the student's own academic performance rather than the exogenous HSEE cut-off.

Academic achievement is actually a mediating factor. In rural China, many factors that influence achievements also influence the PCED (e.g. Brown and Park, 2002; Hannum et al., 2009). Lower achievement can lead to a negative attitude towards education (Jiang and Dai, 2005; Wang, 2005; Zhu, 2006; Hannum and Adam, 2008), which is another mediating variable for the PCED. I will not proceed much further with the discussion of HSEE on educational attainment since it overlaps with the previous discussion in this review. However, there are also cases in which the factors that affect PCED have no impact on performance. These include teacher experience (An, 2005), parental education and family income (Hannum and Sargent, 2007), per student expenditure (Xue and Min, 2008), and the availability of a cash incentive (Mo et al., 2011). We cannot take for granted the direction of the impact on the factors that influence both performance and PCED. Parental migration

²⁹ For example, one school surveyed by this dissertation was developing its mentoring program for left-behind (parents away in cities) children during this research.

is a case in point. As discussed above, most studies (Chen et al., 2009; Lee and Park, 2010; Yi et al., 2011) found that parental migration has a negative impact on attainment, but a positive impact on the performance of enrolled students.

The literature all agrees about the importance of the HSEE for the high-school track. Despite a rising status in the second half the 2000s, vocational education is still treated as inferior education to the general academic-track education, both in China (Wang, 2005) and in other countries with a similar streaming system (Bertocchi and Spagat, 2004; Brunello and Checchi, 2007). Chinese studies that include academic performance or HSEE score as an independent variable all suggested a negative association between them and the student's potential for attending a VHS (Fang, 2007; Li, 2009; Song et al., 2011).

The HSEE cut-off could be "cruel" for high-school tracking. In some parts of China, there was a huge gap between hope and reality. In a 2006 survey in Chifeng city in Inner Mongolia (Fang, 2007), 85.1% of graduating students said they wanted to get into a magnet AHS, and only 30% did so. As one more example, in a 2009 survey of 41 counties in a western province (Song et al., 2011), 70.3% of graduating students expected to attend an AHS, but only 53.7% of this group did so, with 20.3% ending up in a VHS. There were 22.7% students who expected a VHS, but only 37.1% achieved this, with 30.7% ending up opting for Dropout or Work. Of course, with increasing study opportunities and decreasing school-age population, such "cut-off" effect of HSEE is supposed to be now much weaker.

Finally, it is worth noting that relative academic performance might matter more than the absolute one for determining post-compulsory-education decisions. Park et al. (2010) showed that students in magnet high schools are less likely to attend a college entrance exam than students of the same initial academic performance in regular high schools, even though the former do develop higher academic performance because of the higher school quality. This finding indicates that students are more confident about further schooling if their performance is better than average

within the school, and vice versa. Such an argument may also be applicable to students in lower-secondary schools.

2.4 Summary

2.4.1 Major Findings from the Literature

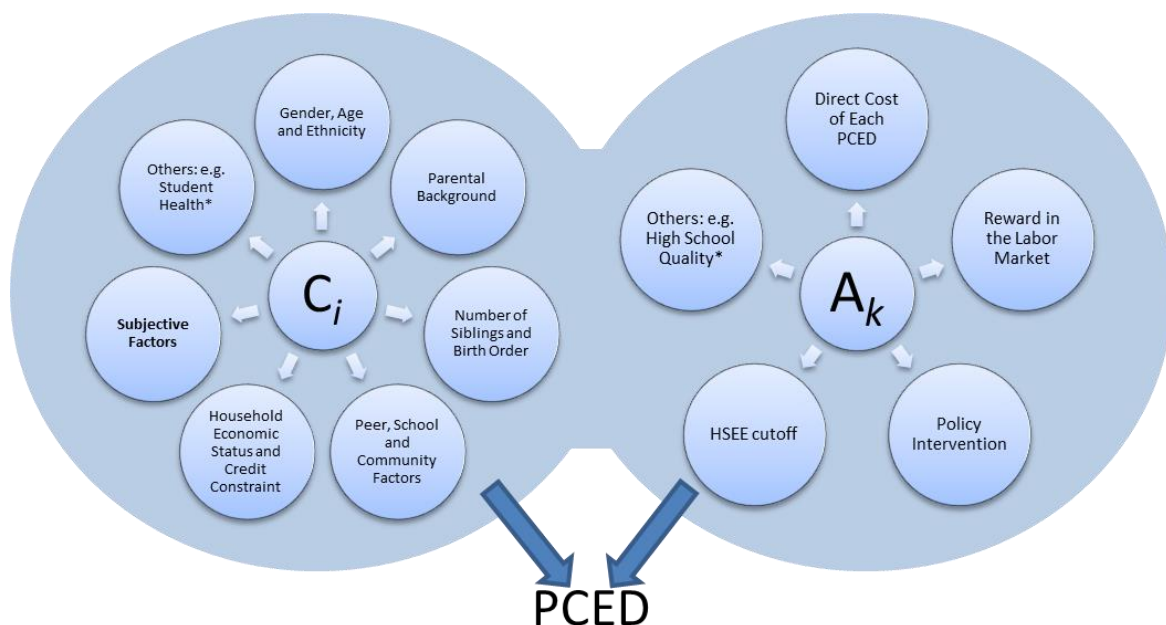
The PCEDs faced by China's rural students have become more subtle than ever before. While national policies and supply factors are no longer the dominant concerns in this process, this review summarizes two groups of possible determinants. It also introduces the economic theories and methodologies. Theoretically, the PCED process relies on the calculation of costs and benefits for the household and for the students themselves. Methodologically, researchers have applied a wide range of methods to measure the determinants in several parts of the countries, either for the accuracy of associations or for causal identification. It turns out that the empirical evidence supports the theoretical explanations, although the causal interpretation could be subtle.

Figure 2-4 summarizes the PCED determinants reviewed. C_i and A_k stand for the case-specific and alternative-specific factors. Since some of the PCED determinants are heterogeneous to other determinants or highly correlated with each other, the two groups are not totally separate.

The first group of determinants is case-specific. First, girls are more income, performance, and cost elastic than boys in the PCED, being older (in the same grade) leads to a higher probability of dropout, and being an ethnic minority is not necessarily a disadvantage in post-compulsory education. Second, parental education, occupation, political status, migrant worker status, and health status are also influential in most cases. More specifically, a "better" parental background leads to greater attainment and a higher probability of attending an AHS. Third, an older child with more siblings tends to have lower attainment, but it is still unclear whether sibling size and birth

order affect the schooling track. Fourth, the effect of school quality, peer, and community are mostly indirect because research has mainly focused on performance, but it is safe to say they are influential on the PCED in a predictable way. Fifth, coming from a richer and less credit-constrained family helps attainment and/or entering the AHS track, although the magnitude varies. Finally, subjective factors such as personality, attitude, and perceptions of or between the PCED players (students, parents, and teachers) help account for the final PCED.

Figure 2-4 PCED Determinants Suggested by the Literature



Note: Student health only appeared as performance determinant in the literature. High school (especially VHS) quality has been frequently mentioned, but not rigorously measured.

The second group of determinants is alternative-specific. First, as predicted, a lower further-education cost of one PCED leads to a greater preference for that PCED when other factors are held constant, however preference does not necessarily lead to real choice. Second, a larger reward makes a certain PCED more attractive, but the sizes of monetary rewards to different PCEDs is still debatable. Multiple forms of reward are linked with the calculation of risk, such as college enrollment, non-agriculture status, job security, and job satisfaction. Third, both dramatic and gradual policy interventions can alter the PCED. For dramatic policy interventions, there could be

mid- to long-term side effects, which require more time for observation. Fourth, the HSEE is still a mechanism to decide the chance to attend an AHS. This is to some extent a concern of the student's academic achievement, which is also influenced by other PCED determinants.

Different factors are more or less intertwined. For example, based on a randomized controlled trial in suburban Paris, Goux et al. (2014) showed that low-achieving students' aspirations can be made more realistic through a series of meetings facilitated by the school principals and that more realistic aspirations are followed by a significant reduction in grade repetition and high-school dropout. They also found spillover effects to untreated students that are close friends to the treated ones.

2.4.2 Gaps in the Knowledge

This literature review also identifies several gaps in the knowledge. To begin with, since the majority of studies have just applied multivariable regression for non-randomized samples, it is hard to generate explicit interpretations of causal inference. Take, for instance, the relationship between "home-school distance" and attainment" (e.g. Brown and Park, 2002; Sun, 2003; Sun, 2004). When it is negative, the explanation is that the distance reflects the transportation cost, but when it is positive, the explanation becomes that a longer distance is a proxy for a better school quality—the more comprehensive the variable list, the less likely it is that the researchers need to rely on this kind of arbitrary judgment.

The body of studies about schooling tracks is much smaller than that for attainment. There is no literature in English specific to the schooling track determinants in rural China, and no relevant Chinese literature uses methods more advanced than logit or probit. While VHS quality has been frequently cited in the literature, it has been kept as a black box.

Most studies have focused on inland rural provinces (e.g. Gansu, Shaanxi) without sufficient consideration of the rural part of coastal provinces, such as northern Jiangsu, western Fujian, and northwest Guangdong. The weights of PCED determinants could be very different in these areas.

Compared with the students in inland China, the students who live close to coastal metropolitan areas face a lower opportunity cost of migration. They also have a clearer perception of the rural–urban disparity, and more accurate information on the urban opportunities.

The existing studies have not caught up with the changing PCED distribution. As stated at the beginning of this review, during the late 2000s there was resistance to evolution of the PCED distribution even with the presentation of mighty policy interventions and the reduction of competition. The statistics suggest that most rural students in contemporary China need to deal with four choices when approaching the end of their compulsory education. The PCED is no longer simply about “drop out vs. continue” or “AHS vs. VHS.”

Last but not least, while there are arguments that conventional determinants (e.g. gender, SES, performance, cost and reward) are becoming less influential on PCED, and there is a move in research focus towards subjective factors, investigations of how subjective factors could be formed or changed are scarce. It is after all harder to conduct and measure socio-emotional interventions that are supposed to alter expectations, perceptions, or even personality.

Accordingly, the pool of literature could be enriched in four ways. A more comprehensive list of variables is required to make more convincing interpretations of quantitative results. More work should be devoted to studying the schooling track. It is advisable to bring in-depth surveys to the less-included regions. An informative study should use updated data and set a PCED-distributed dependent variable for lower-secondary students. Finally, it will be a strong addition to the literature to test how socio-emotional support affects PCED through changing subjective factors. In today’s China, such support is mainly provided by educational grassroots NGOs.

Chapter 3 China's GNGOs in Education and the Case of Lighthouse

Since the mid-1990s, there has been a constant growth in educational support programs offered by nongovernmental organizations (NGOs) in rural China. During the late 1990s, most of these programs were conducted by international or officially organized development organizations/foundations, but later indigenous grassroots NGOs (GNGOs) began to play an increasingly important role in China's rural educational development (Liang, 2009). As GNGOs for China's rural education are relatively new, there are a limited number of studies of them. Those that exist are mostly introductive without empirical evaluation (e.g. McCabe in Sutton & Arnove, 2004; Zhu, 2004). It is necessary to make a rigorous examination of their contribution so that we are able to answer the questions of whether they are successful, and how they can be improved.

Due to the lack of comprehensive studies, an exploratory review of literature is required before further study of GNGO impact. This review will be conducted on three levels. From macro to micro level, these are theories of NGOs, the state of educational NGOs (ENGOS) in China, and the case of the Lighthouse Project (Lighthouse), which was the first GNGO for rural education in China, and also the GNGO evaluated in this study.

I begin with the "common definition" of NGO: a unit that is organized, private, non-profit-distributing, self-governing, and voluntary (Salamon & Anheier, 1997). This concept will be further explained in the review, and is exchangeable with that of nonprofit organizations (NPOs)³⁰, the third sector, and social groups or voluntary organizations although technically there are nuances.

³⁰ People prefer the use of NPO to NGO in China, probably for two reasons. First, it sounds less "anti-government" (Hsia & White, 2002), and second, it reminds people that some Chinese NGOs have strong governmental backgrounds so they are not really non-governmental (McCabe in Sutton & Arnove, 2004). This study still uses the term 'NGO' because it is more popular internationally and because there will be a specific category for government-organized (quasi) NGOs.

3.1 Theories about NGOs

There are two major tracks of theoretical studies for NGOs³¹, one that belongs to the public management school, mainly including the theories of market failure, government failure, and voluntary failure; and another more politically-oriented, including pluralism, civil society, and corporatism. While voluntary failure and corporatism should be more appropriate for discussing the current development of Chinese NGOs, a simple exploration of Chinese literature shows that most studies do not connect theory with practice. There is a huge lag in corporatism study in mainland China compared to the “abuse”³² of civil society study.

3.1.1 Market Failure, Government Failure, and Voluntary Failure

While there can be specific reasons to justify the existence of NGOs, they mostly boil down to market failure or government failure. On the other hand, NGOs are also imperfect, which is stated as voluntary failure.

Market failures are scenarios where an individual’s pursuit of pure self-interest leads to results that are not efficient, and there are three main reasons why this might happen (Krugman & Wells, 2006). Agents in a market can gain market power, allowing them to block other mutually beneficial gains from trade. Monopoly is a market failure of this kind. The actions of agents can have externalities, such as pollution from manufacturing. Finally, some markets can fail due to the nature of certain goods (e.g. national defense), or the nature of their exchange. Accordingly, NGOs bring about diversification, impose supervision and provide services regarded as unprofitable by the market sector, which might help to prevent market failure.

³¹ Here I refer to macro theories, not micro-level management theories that are either too specific or too general for western NGOs or indigenous NGOs in other developing countries. Other major macro theories for NGO studies include contract failure, modern governance, transaction cost, social capital, and public choice (Wang, 1999; Tang, 2006; Li, 2009).

³² This term was used by Shaoguang Wang in his conversation with the other two well-known Chinese NGO researchers. <http://xzf1950.blog.sohu.com/134872163.html>

For many countries, government policy intervention is still the most popular response to market failure, but this could also be a failure in itself. The term “government failure” was first used by McKean (1965) when discussing “the unseen hand in government”. Despite a government’s advantage over market, such as its offer of public goods, governments may create inefficiency and inequity in any of its provision, subsidy and regulation (Le Grand, 1991). There are many types of government failure (e.g. rent seeking, market distortion). Of these, the fact that government interventions usually try to raise the average welfare at the expense of certain communities, or simply fail to consider how some communities profit due to imperfect information, are arguments for the existence of NGOs, which work more closely with communities (Salamon, 1995).

Voluntary failure is a theory raised by Salamon (1981, 1987) to replace the prevailing “market failure- government failure” theories. While admitting that the “double failures” are convincing arguments for advocating NGOs, he suggests that NGOs may fail too for four reasons. NGOs usually have insufficient resources for achieving optimal service outcome. NGOs may still fail to serve the interests of all groups, which is called ‘particularism’. There might be strong paternalism within an NGO. The fourth reason is amateurism, which refers to the fact that many NGO members are not professional at all. Rather than downgrading NGOs, however, Salamon argues that government-NGO partnership should be built to avoid these failures (Salamon, 1987). Sharing similar views with Salamon, Wang (1999) regards some frequently quoted NGO characteristics, such as their being voluntary, independent, and ‘saintly’ as mere “myths”.

Salamon’s voluntary failure does not receive as much application as the other two “failures”. In a review of this theory, Hamilton (2004) invalidated all four types of failures. For example, no evidence shows that paternalism is more likely to exist in NGOs than in other sectors. The government-NGO partnership can be a good idea to offset each other’s shortcomings and strengthen the advantages, but is difficult to really establish since it means combining the role of beneficiary and watchdog. In

some sense, the value of voluntary failure is that it reminds people to pay attention to an NGO's capacity despite the rhetoric surrounding them.

3.1.2 Pluralism, Civil Society, and Corporatism

From progressive to conservative, the political theories of pluralism, civil society and corporatism all involve the role (power) of NGOs.

Pluralism is a widely used concept. In political theory, it refers to the situation where many interest groups (including NGOs in this case) compete in the political sphere, and the government's role as the mediator between these groups (Dahl, 1961). Three of the major tenets of the pluralist school are that resources, and thus potential power, are widely scattered throughout society; that at least some resources are available to nearly everyone; and that the amount of potential power at any time exceeds the amount of actual power³³.

'Civil society' is another widely-used academic term, but less progressive compared with pluralism. All theories of civil society are based on the presumption that there is a public sphere within a society that is separate from the government. According to the Centre for Civil Society at the London School of Economics and Political Science, "Civil society refers to the arena of uncoerced collective action around shared interests, purposes and values... commonly embraces a diversity of spaces, actors and institutional forms, varying in their degree of formality, autonomy and power. Civil societies are often populated by organizations such as registered charities, development non-governmental organizations..."³⁴

In NGO studies, corporatism is to the opposite of pluralism. It refers to the situation where the state tends to coopt organization leaders, to preempt the articulation of demands by establishing organizations in certain key issue areas, to engage in 'clientelistic and patrimonialist practices', and to use 'physical repression and anticipatory intimidation' (Schmitter, 1979 cited in Whiting, 1991, p.20).

³³ Note of pluralism from H. T. Reynolds <http://www.udel.edu/htr/Psc105/Texts/pluralism.html>

³⁴ http://www.lse.ac.uk/collections/CCS/what_is_civil_society.htm

Whiting (1991) argues that corporatism is better than pluralism for understanding the role of NGOs in the Chinese case because of the predominance of mechanisms undermining the autonomy of associational groups. A quantitative study of the Communist Party and government's influence on NGOs in three Chinese provinces (Shen, 2005) showed results favorable to the corporatism argument. For example, 66.9% of the 2597 surveyed NGOs said they undertook activities required by the party/government in the year 2000. It is also worth noting that corporatism has been used to analyze not only the government-NGO relationship, but also many political issues in China³⁵.

3.1.3 NGO Theory Studies in China

Since this review is about China's NGOs, it is necessary to take a look at Chinese NGO literature on the above theories. A simple count of journal articles from Mainland China was conducted. The database searched was the Full-text Core Journal of China Academic Journals (CAJ), from 1994 to 2009. The search terms were 'NGO/NPO' in the title and the name of the theories in the full text³⁶. The results included 106 articles for market failure, 96 for government failure, 25 for voluntary failure, 18 for pluralism, 210 for civil society, and 13 for corporatism. According to further exploration of these articles, there are three findings concerning the state of NGO theories in Chinese literature.

In China, the allocation of NGO theory studies does not match the reality of NGO development. The more common presence of market/government failure studies over voluntary failure studies is understandable, because the latter is a relatively new and narrow concept; it is also understandable that only 18 articles mention pluralism, since this theory can hardly explain Chinese society, but the ratio between the number of civil society and corporatism articles, 210 to 13, is problematic. A reversed ratio would be much more reasonable based on either the reality of China's government-NGO relationship or the allocation of relevant international literature. There are several

³⁵ A fresh collection of corporatism-China literature could be found in Panel 178 of the 2010 annual meeting of the Association for Asian Studies. <http://www.aasianst.org/absts/2010abst/area-toc.asp?Code=1&Year=2010>

³⁶ The Chinese search terms are “非政府组织/非营利组织” for “NGO/ NPO”, “市场失灵” for “market failure”, “政府失灵” for “government failure”, “志愿失灵” for “voluntary failure”, “多元主义” for “pluralism”, “公民社会/市民社会” for “civil society”, and “社团主义/法团主义” for “corporatism”.

possible reasons for this strange inclination. It could be the herd effect of research, or the fact that the concept of civil society is more multidisciplinary. It is also possible that this is a tactic for publication. ‘Corporatism’ is a relatively sensitive term (for both government and readers) because, although neutral, it could be linked with despotism or even fascism, but ‘civil society’ suggests an ideal society about which few people would disagree, so can be more easily accepted.

The second finding from Chinese NGO literature is that the overwhelming majority of studies are about the introduction of theory, with little critique, application or examination. All 25 articles that mention voluntary failure, for instance, merely explain what voluntary failure is. As will be introduced in the following section, studies of the operational failure of China’s NGO do exist— studies of theory and studies of reality seem to be separate. One more example is that while in the Chinese context the emergence of NGOs should be chiefly a response to government failure, there are more articles mentioning market failure than government failure, 106 versus 96 with 84 overlapped, which indicates that most studies are still introductory.

There are clear cut-offs for publication times, suggesting that the development of NGO research might largely depend on the government’s will (a form of corporatism). Although the time period for the search was 1994-2009, the articles mentioning market failure, government failure or civil society were only found after 1998, and those that mentioned voluntary failure, pluralism or corporatism were available only after 2002, except one for mention of pluralism in June 2001. 1998 was the year that two national NGO-related policies were introduced. 2002 is also three years after the 1999 Falun Gong incident³⁷, which led the Chinese government to tighten NGO registration and supervision (Lu, 2007). In total only 18 papers were published in 2000 and 2001, out of 545 papers published over the whole time period.

³⁷ Falun Gong was a movement based on Qigong (a Chinese system of physical and mental training) in mainland China. Its teaching was questioned by the public media, which lead to a 10,000-person silent protest in front of Zhongnanhai, where the national leaders live, on 25 April 1999.

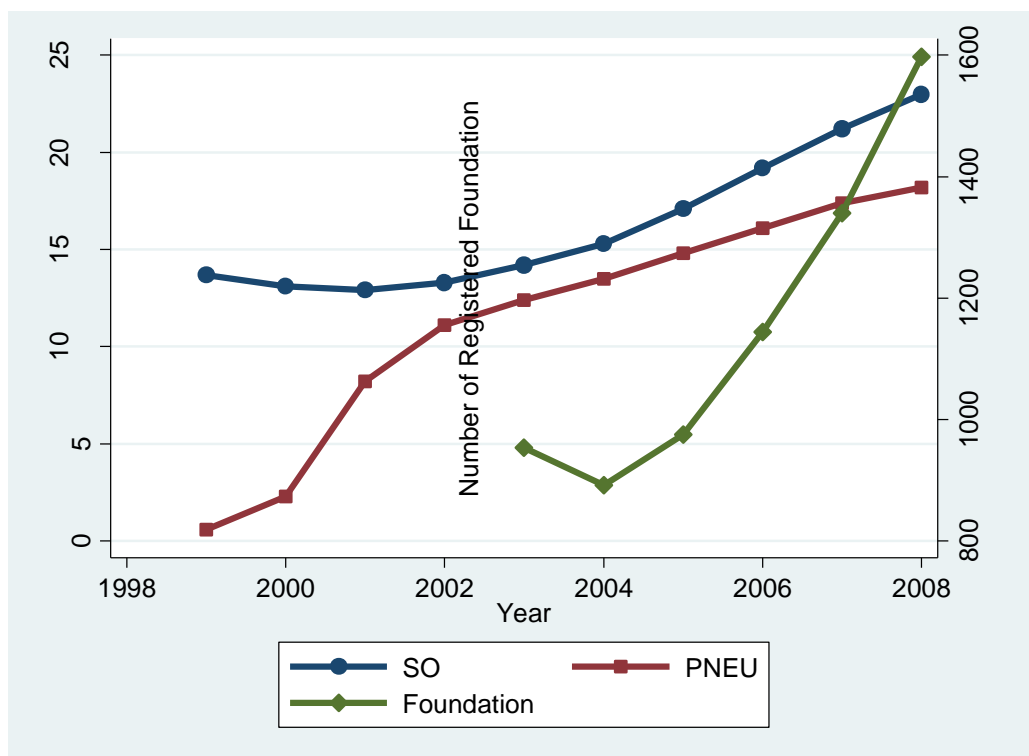
3.2 NGOs in China

While abstract theories are useful for guiding research, detailed information is required to fully understand “the motivations of Chinese NGOs, the way they operate, their vital relationships, and the impact they make” (Lu, 2007). There is a rich set of literature on actual NGO behavior and situations in China. Certain leading academic works (e.g. Wang & Jia, 2002; Deng, 2004) come from the NGO Research Center (NGORC) of Tsinghua University and other researchers in Beijing (e.g. Kang, 1999; Wang, 1999; Yu, 2006). There are also more thorough and up-to-date studies from overseas Chinese scholars (e.g. Lu, 2008; Ma, 2009). The review in this section confirms to the notions of voluntary failure and corporatism.

3.2.1 Classifying NGOs in China

The official Chinese term for Chinese NGOs is “popular organization” (民间组织). This comprises three subcategories, “social organization”, “private non-enterprise unit” (PNEU) and “foundation”. Figure 3-1 shows their growth. This official classification system was criticized as vague, a self-contradiction, and difficult to implement (Yu, 2006).

Figure 3-1 Number of NGOs Registered in the Government Sectors for Civil Affairs



Source: Ministry of Civil Affairs of the People's Republic of China

Note: SO stands for Social Organization and PNEU stands for Private Non-Enterprise Unit.

In practice, Chinese researchers and practitioners often divide Chinese NGOs into “government organized NGOs” (GONGOs) and “popular NGOs”. The former are initiated by the government and receive government subsidies. Their staff are often on the government’s payroll, and their leadership positions are often held by government officials. By contrast, popular NGOs are initiated by private citizens and receive no government subsidies. Their staff are not government employees, and they do not have officials occupying their top management positions. Government organized NGOs are also frequently called “top-down NGOs”, while popular NGOs are referred to as “bottom-up NGOs” (Lu, 2008).

In order not to cause confusion by using “bottom-up” or “popular”, the term ‘grassroots NGOs’ (GNGOs) will be used for non GONGO Chinese NGOs (Zhu, 2004). In addition to domestic NGOs, there are also international NGOs (INGOs) working in China, despite less attention from researchers,

and therefore NGOs could be classified into INGOs, GONGOs, and GNGOs. Note that NGOs based in Hong Kong, Macau and Taiwan are usually treated as INGOs.

In addition to the above classification, there are other classifications of China's NGOs, which have been summarized by Yu (2006). For the convenience of further discussion, this review follows the INGO-GONGO-GNGO system³⁸.

3.2.2 Regulations Regarding NGOs

In China, in order to have a legal identity for activities, NGOs are required to register with the Civil Affair Bureau. Before 1989, the only code governing registration or activities was the State Council's 1950 "Interim Provisions on the Registration of Social Organization" (社会团体登记暂行办法). After the Tiananmen incident, however, the State Council issued new rules to monitor NGOs on 25th October 1989, with the goal of maintaining political stability by tightening the reins. Two further regulations came from the State Council in 1998 to update the previous guidelines: "Regulations for the Registration and Management of Social Groups" (社会团体登记管理条例) and "Provisional Regulations for the Registration and Management of Private Non- Enterprise Units" (民办非企业单位登记管理暂行条例).

The April 1999 Falun Gong protest led to a new round of restrictions. The "Interim Measures for Banning Illegal Non-Governmental Organizations" (取缔非法民间组织暂行办法) was issued a year after that incident. Other laws were established or updated to standardize the NGO operations. The first Chinese law specifically for NGOs, the "Welfare Donations Law" (公益事业捐赠法) was passed in August 1999. In 2004, the "Regulations for Foundation Administration" (基金会管理条例) were issued to replace the 1988 "Methods of Foundation Administration" (基金会管理办法).

³⁸ There is a small number of NGOs that are domestic but register outside the mainland. This is a risky way to attain legal status.

The consensus on the Chinese government's NGO regulations, especially the one in 1998, is that they are very unfriendly to GNGOs (e.g. Wang & Jia, 2003; Xie, 2004; Yu, 2006; Lu, 2008; Ma, 2009). Barriers including double-sector supervision, harsh requirements, hindering competition, and constrained locations mean formal registration is almost impossible for most GNGOs³⁹.

Before registering with the government sector for civil affairs, an NGO needs to accept management by an organization which is either an administration unit or an organization empowered by the administration unit, however no statement clarifies what type of unit is responsible for supervising which type of NGO. Such requirements create a barrier impossible to overcome in the registration of many NGOs.

The regulations require that social organizations must have at least 50 members, an official office, full time staff, and funding of thirty thousand RMB⁴⁰ (for local organizations) or one hundred thousand RMB (for national organizations). It is not easy for newly established GNGOs to conform to these requirements, so they have to start their operations as illegal organizations.

The regulations also clearly claim that if there is a NGO with a similar service in the same administrative region (city or provincial level), then extra NGOs are unnecessary and their registration could be rejected, however no definition of "similarity" has been made. This gives the Civil Affairs Bureau, Department of Civil Affairs (on the provincial level) or the Ministry of Civil Affairs (MOCA) the discretionary power to dissolve applications. Since there are GONGOs in many social service areas, such requirements greatly lower the possibility of legal identity for GNGOs.

Finally, to control the expansion of NGOs, current law does not allow registered social organizations to have regional branches. If an organization registers in City/Province A, then it cannot have activities in City/Province B. To have multi-region programs, one GNGO has to register in MOCA. Such national level application could be time-consuming.

³⁹ I thank Siqing Yan for contributing this summary of the barriers in his reflection on the environment for NGO development. Siqing Yan is the former secretary of Lighthouse, which is the organization of interest in this review.

⁴⁰ RMB(人民币) is the Chinese currency unit which equaled about 0.158 US dollar in 2011.

3.2.3 The State of NGOs in China

Although the focus of this study is GNGOs and most existing NGO studies are about GNGOs, it is necessary to also take a look at the state of INGOs and GONGOs because research indicates that they have interactions with or influences on the state of GNGOs.

International NGOs

According to the China Development Brief (CDF)⁴¹, there are over 200 well known INGOs operating in China, 38 working on education.

Hsia and White (2002) provide a comprehensive review of the state of INGOs in China, with an emphasis on government- INGOs relationships. The Chinese government tends to treat INGOs as the “bridge” between people and itself, or a path of transmission for its policies rather than as autonomous social actors who can monitor the government and ensure that disadvantaged groups are not ignored (Hsia & White, 2002). On the other hand, despite the strong inclination of corporatism from the Chinese government, the lack of specific regulation for the operation of INGOs and the fact that central government no longer has total control of local governments in the reform era (Saich, 2000; Saich, 2004) allows a more sophisticated expansion.

The development of INGOs confirms such suggestions; in a more recent study by Li (2006), the usual link with the government was considered an important feature of INGOs in China. Other than INGO- government interaction, Li takes a further step in the discussion of the INGO-GNGO relationship. INGOs need the assistance of local GNGOs for program operation. For example, from 2004 to 2008 the Lighthouse Project assisted the Lions Club with voluntary teaching in Hunan province. GNGOs also receive funding and technical support from INGOs.

Government Organized NGOs

⁴¹ <http://www.chinadevelopmentbrief.com/dingo/>

Well-known Chinese NGOs such as the National Woman's Union and China Youth Development Foundation (CYDF), and also most higher education institutes, the national industrial associations and labor unions, all belong to the category of GONGOs. Their organizational structures are usually parallel to those of government sectors. Officials in the Labor Union, Woman's Union and Youth League are even treated as government officials according to the Civil Servant Law, while in the definition of Chinese NGO regulations they are working in "social organizations".

Research (e.g. Wang & Jia, 2002; Cui, 2003; Lu, 2007; Lu, 2008) tends to focus on the consequences of GONGO affiliation to the government, which are usually negative. Compared to INGOs and GNGOs, GONGOs are less independent since both their funding and leadership come from the government. "This dependence on the government has limited NGOs' usefulness as champions of interest and values that are different from those of the government" (Lu, 2007). The problem of bureaucracy is more likely to be found among GONGOs. GONGOs are closer to the government than to the public, which makes them less able to respond promptly to the public. The staff of GONGOs are usually serving or retired government employees receiving stable salaries from the government system. Their well-being is not tied to better services. Corruption is also facilitated within GONGOs due to the lack of transparency. An early example is the 2002 Project Hope⁴² scandal involving CYDF, in which CYDF was accused of the illegal appropriation of over one hundred million RMB⁴³ in funding. A more recent and probably the best-known scandal is the 2011 online scandal of "Guo Meimei (郭美美) Baby". Meimei Guo was a twenty year old girl who showed off her Lamborghini and Maserati and titled herself as the President of the Chamber of Commerce at Red Cross China. She created a trust crisis for the country's largest charity.

There are also positive views of GONGOs, however. According to Deng (2005), a trend of independence seeking has been encouraged among some GONGOs. The increasing interaction with

⁴² Project Hope (希望工程) is a Chinese public service project organized by the China Youth Development Foundation (CYDF) and the Communist Youth League (CYL) Central Committee. Started in October 30 1989, it aims to bring schools into poverty-stricken rural areas of China, to help children whose families are too poor to afford it to complete elementary school education.

⁴³ One RMB equaled to about one eighth USD in 2002.

international organizations requires major GONGOs to expand their non-governmental side, and at the same time local governments count on these GONGOs to bring to them more resources. As funding sources become larger and more diverse, some government organized foundations are also able to seek independence by working on public relations internationally, and via mass media. Industrial associations are another class of GONGOs seeking independence, and their moves have obtained approval from the government. Some GONGOs register with the Civil Affairs Bureau in order to have their own systems of human resources, budgeting and decision making.

Grassroots NGOs

In 2009, there were 413660 registered NGOs in China⁴⁴, but even the most conservative estimate of the actual number could still be over three million⁴⁵, most of them GNGOs. More than 80% of GNGOs are illegal and of the legal GNGOs, the majority are still facing problems such as bad management and budget deficiency (Xie, 2004). At present, only about 300 GNGOs are well known to Chinese citizens, mostly in the fields of environmental protection, hotline, anti-poverty, and children (Deng, 2005).

Studies of China's GNGOs can be divided into two types. One focuses on the environment in which the GNGO grows, the other tends to look at how they operate.

Issues concerning the developmental environment for GNGOs mainly involve government influence, which have been discussed repeatedly. Due to double-sector supervision, harsh requirements, hindering competition, and the constrained location of the government regulations, some GNGOs are registered in industry and commerce government sectors, some build affiliation with GONGOs, and some just keep operating without any legal identity. The good news is that as long as those GNGOs do not work against the government, nothing happens even if they are unregistered. The actual space for China's GNGOs is far larger than the institutional space (Yu, 2006). An interview of GNGO leaders in the fields of the environment, HIV/AIDS, and gay/lesbian rights (Hildebrandt,

⁴⁴ <http://www.chinanpo.gov.cn/web/showBulletin.do?id=40004&dictionid=2201&catid=>

⁴⁵ The 2006 estimate is two to two point seven million (Yu, 2006).

2011) explicitly showed that organizations that are less politically-sensitive (environment vs. HIV/AIDS or gay/lesbian), further from Beijing, older, or larger are more likely to register. The interview also suggested that local government may prefer GNGOs to remain unregistered. Politically unregistered GNGOs are easier to control because they occupy a legal grey area, and economically the economic resources from the central government will have to go through the local government first if the sponsored GNGOs remain unregistered.

Views of GNGO operation are quite similar to those presented in the theory of voluntary failure. Zhu (2006) suggests that China's GNGOs are facing a shortage of high quality staff although they might be devoted; of funding, even though they do not need much; of trust from both the public and among the members; and of professional knowledge, technique and development strategy. The trust crisis is caused by many issues, such as low efficiency, unclear effect, low transparency (these are similar to GONGOs), unstable personnel, an extreme governance style that is either too relax or too dictatorial⁴⁶, selfish motivations for engagement, the path dependence of Chinese who are used to accepting governmental service, and so forth (Lu, 2008). It is also worth noting that these embarrassments of GNGOs are to some extent the side effects of government regulations. For example, when GNGO development is seriously restricted by government, little career future can be seen, and thus many candidates might ultimately choose jobs in other sectors, resulting in instable personnel.

In a nutshell, China's GNGOs share some problems faced by other sectors, but at a more serious level. A combination of corporatism and voluntary failure describes their state.

⁴⁶ Quoted from the article "Worries on the development of grassroots organizations" by Dajia(daojia11@gmail.com) on <http://www.ngocn.net/?action-viewnews-itemid-20708>

3.3 Educational NGOs (ENGOS)

Narrowing the review from China's NGOs to China's ENGOS, we are able to further the discussion with specific examples, but nevertheless, the meso-level conclusion stays the same— voluntary failure, corporatism, and NGO interactions describe the state of China's ENGOS.

3.3.1 NGO Functions in Education

The NGO contribution is generally to respond to the market/government failure, as discussed in this section more specifically. Jia (2004) from the Tsinghua NGO Research Center summarizes four functions of NGOs on education that are applicable to practices in China. The first function, and also the most straightforward, involves financial aid. The second function is non-financial service. This is a vast category, including support such as voluntary teaching, book donation, vocational training, law consultancy, information support, and so on. The third function is to provide suggestions for and reflections on education. Organizations like the 21st Century Education Research Institute and the Tao Xingzhi Institute are working on topics such as the educational institution required by China. The Blue Book of Education (annual report on China's education) is produced by the 21st Education Research Institute, "A popular storehouse of wisdom" (He, 2006).

In addition to the three above functions, Jia (2004) also suggests that China's ENGOS should have a role not only in service but also in supervising and urging⁴⁷ both the government and the market to fulfill their responsibility for educational development. Currently NGOs, especially GONGOS, cannot do much about this in China.

⁴⁷ In international NGO literature the term used for this function is "Watchdog"

3.3.2 Educational NGOs in the World

“One of the clearest impacts of globalization upon education has been the increasing prominence of civil society organizations in the provision of schooling around the world” (Sutton & Arnove, 2004). Current studies on this topic are mainly about government-NGO interaction.

Presenting eight case studies in eight countries⁴⁸, Sutton and Arnove (2004) raise the question “civil society or shadow state?” for ENGOs around the world. The interaction between government and NGO has been shown in several forms. In regions where the government is relatively weak and unstable, NGOs have either preceded effective state intervention in educational provision at all levels or have substituted where the state is unable or unwilling to act. At some point when NGOs become too closely identified with the state, however, their own legitimacy is undermined. They almost invariably have to form some type of partnership with the state if they wish to expand or “go to scale”, and their activities are less progressive, and do not attempt to touch topics like democracy or human rights directly. There does not seem to be a big difference between China and the rest of the developing world in terms of the government-NGO relationship.

3.3.3 Educational GNGOs in China

In China, only 3% of NGOs are ENGOs, while a comparative study of twenty two nations shows that ENGOs are the most active and leading NGOs in most nations⁴⁹. ENGOs in China are receiving increasing attention however, and, as a less-controversial type of NGO, they face relatively small barriers. On 27th August 2004, the “NGOs and the Development of Chinese Education” symposium was held in Beijing, which for the first time highlighted the terms “education” and “NGO” as well as the connection between them (He, 2006). This section will briefly introduce the status quo of China’s educational GNGOs, setting the context for the micro-level review in the next section.

⁴⁸ Papua New Guinea, Peru, Mali, Estonia, Palestine, China, Kenya and India.

⁴⁹ Speech by Xijin Jia from Tsinghua NGORC in 2009 Beijing Educational GNGOs forum <http://learning.sohu.com/20091127/n268549666.shtml>. Note that this figure should be all NGOs in China. If focusing only on NGOs registered in government sectors for civil affairs, about one fourth NGOs are ENGOs, calculated from <http://cws.mca.gov.cn/article/tjbg/>.

Although China's ENGOS are overall less developed than other NGOs, its grassroots NGOs actually face a relatively friendly policy environment. For instance, in the province of Yunnan, over 70% of registered GNGOs are for education⁵⁰.

Xiaoyan Liang (2009) summarizes the state and problems of seven types of Chinese grassroots ENGOS⁵¹. The first kind is for policy advocacy, and lead up-to-date policy discussion on education. For example, the 21st Century Educational Research Institute was working on policy for school construction as a response to school safety issues revealed by two recent earthquakes in China⁵². This kind of GNGOs is new to China. Their bottle neck is the lack of professional researchers.

The second, and also the largest, group of educational GNGOs is for designing and providing multiple educational resources. They are involved in a huge range of topics such as the perseverance of tradition, cultivation of democracy, art, mental health, personal financial management, life appreciation, and so forth. The main problem of these GNGOs is that they are usually small, scattered and less organized, which makes it difficult for them to receive wider support from society or exert a wider influence.

The third group is about supporting educational careers. These GNGOs offer training for teachers, principals and school managers on different topics using diverse techniques. Just like the first group, this kind of GNGO is still too new to offer sophisticated services. They face problems regarding resources, public relations, and recruiting professional staff. It is hard to evaluate their performance.

The fourth type of educational GNGO is for voluntary educational support. This is another huge and influential group, including organizations that go to the rural schools for educational support and those using the internet to share relevant information with other organizations or individuals. The

⁵⁰ <http://www.chinanpo.gov.cn/web/showBulletin.do?type=pre&id=29086&dictionid=1940&catid=> Originally reported in Yunnan Daily, 01/08/2008.

⁵¹ In her speech, Liang mentioned six types at the beginning but the written version of that speech has a seventh types, the private educational foundation. Later in her article in the *Blue Book of Education 2010* (Yang, 2010: 132-141), she mentioned the six types when discussing the classification of China's ENGO and the seventh type when discussing their development.

⁵² Wenchuan Earthquake in 2008 and Yushu Earthquake in 2010

detailed activities could be a mixture of financial support, material support, short/long term teaching, household visits, field surveys and so on. They may sometimes be overlapped with organizations for multiple educational resources. While these GNGOs are relatively mature and influential, they may not have a concrete theme for their activities and their operations are usually less organized. They are also over-reliant on volunteers, a group that is not stable as a full time group, which makes these organizations less sustainable. The Lighthouse organization belongs to this group.

The fifth group are schools founded by NGOs, funded by charitable foundations, and aimed at children from vulnerable groups. These GNGOs are still new but have great potential for development since there are many children in need of this kind of schools (e.g. migrant children) in China. Whether the schools are really nonprofit is uncertain in the eyes of many people. Many of these schools are still in search of an appropriate operational institution, and they have a shortage of qualified teachers.

The sixth is called the socialized learning group. These NGOs are based on the specific interests of small groups and are attractive to youth and white collar workers. People can even tell their specialty from their names, such as 'Science Squirrel Club' and 'Learn to be Parents'. They are small in number and their effects are unknown yet, but they are very easily spread among people of similar interests.

The last group of educational GNGOs is private educational foundations. Unlike most other educational GNGOs, this category has less worry about legal identity, and they have enough funding to ensure healthy operation as well as a higher reputation among the public. The largest issue for them is determining how to help to cultivate more educational GNGOs.

The problems of voluntary failure can easily be identified for Chinese education GNGOs. One example is the early development of Western Sunshine Action, a famous Beijing-based NGO that belongs to both the third and fourth type of groups. At the beginning this project could barely attract funding because the founder failed to provide a blueprint of the project's development to potential

donors. They sent students from Beijing's elite universities to offer training to local teachers in western China, but the feedback they received was disappointing, mainly because the students were either not professional or were too theory-oriented. Some graduate students joined this program at the expense of their own studies and research, leading to the question of cost-benefit to both individual and society (Jiang, 2004).

In recent years, leading educational GNGOs have become more organized. In November 2009, the first conference of leading Chinese educational GNGOs was held in Beijing, and covered a vast range of topics including conventional ones such as existing problems and more cutting edge topics such as how to make the internet work for charity⁵³. Only eight days later, another more local forum was held in the southern city Shenzhen, which included more detailed issues such as programs for migrant children and early education. The local government educational bureau, GONGOs and some INGOs from Hong Kong were also invited to that forum to share their new developments. In December 2011, the second conference of Chinese educational GNGOs was held in Guangzhou. In comparison with the first one in Beijing, this conference included more specific topics such as project design and monitoring⁵⁴.

In the field of education, in fact, both INGOs and GONGOs play a more positive role in the development of GNGOs. According to Liang (in Yang, 2010: 132-141), Education INGO activities since the mid-1990s have brought ideas, methods and financial support for development to Chinese GNGOs; and the dissemination effect of Project Hope turned the public's attention to rural and poor regions and built the foundation for the rise of GNGOs.

There are two more remarkable updates to China's educational GNGOs. One is the establishment of ambitious foundations that are connected to large enterprises. New Huadu Foundation was the first example of it. In October 2009 Fashu Chen, the chairman of the Newhuadu Industrial Group, promised to donate 8.3 billion RMB to establish this foundation, with a concentration on education.

⁵³ A collection of the speeches from this forum can be found in <http://learning.sohu.com/s2009/jyngo/>

⁵⁴ A collection of the speeches in this forum can be found in <http://gongyi.qq.com/zt2011/edungo/>

Followed by a series of accounting scandals, New Huadu's promise has not been well realized. On the other hand, Foundations back by Internet giants like Alibaba and Tencent are getting more influential, though their operating fields are not confined to education.

The second remarkable update to China's educational GNGO, is the use of media, especially the internet. Online civil society is hardly new for the Chinese (Yang, 2009), starting in 2003 with the outbreak of Severe Acute Respiratory Syndrome (SARS), but it is only very recently that activists have begun to use the internet to broadcast their action rather than simply expose social issues. The Free Lunch is a case in point. Initiated by a journalist named Fei Deng (邓飞) in March 2011, this project helps rural kids to get free school lunches. With the professional assistance of other journalists (e.g. in disseminating touching project photos) and China's Twitter, the Weibo (微博), the project soon spread across the nation, speeding up the central government's promise of universal rural free lunches.

3.4 Grassroots NGOs for China's Rural Education: Lighthouse

So far, the discussion has moved from theory to practice, and within practice from China's NGOs to its ENGOS. This section will narrow to GNGOs for China's rural education. As listed by the Rural China Education Foundation (RCEF), there are currently over 50 well known non-GONGOs working in China's rural education development, about half GNGOs⁵⁵. Programs provided by these NGOs touch all contemporary challenges to China's rural education⁵⁶.

More specifically, this section is going to introduce the first name on the RCEF list, the Lighthouse Project (Lighthouse). Although there are journal articles (e.g. Zhu, 2004; Tang & Zhu, 2007) mentioning this organization, they are very brief or include incorrect information. Zhu (2008) has a

⁵⁵ <http://www.ruralchina.org/site/resources>

⁵⁶ See the list in the Rural Education Action Project (REAP) http://reap.stanford.edu/docs/research_at_reap/. REAP is a joint project run by Stanford University and several Chinese research institutes.

book chapter introducing Lighthouse, which is so far the best reference in academia. In this review, I examine the more original sources, including the Lighthouse Brochure (Lighthouse, 2009) and The Strategy Evaluation of Lighthouse (Lighthouse, 2004). The latter is a comprehensive report.

3.4.1 Origin and Theme

Compared with other parts of China, the southern province of Guangdong is rich and open, but has serious within-region inequity. Combined with a tradition of not placing much value on schooling, the educational development in Guangdong's rural regions lags far behind that in metropolitan regions, such as the Pearl River Delta. The wealth of some Cantonese allows them to spare time for voluntary service, and the urban-rural gap in education offers a good topic to work on. In this context, Lighthouse was born.

Lighthouse was established in March 2001 by a group of middle class businessmen and college students in the city of Guangzhou. It aims to nurture student interests and ambitions in study and life. It works on Mental Poverty Alleviation (精神扶贫), or in a more familiar name the socio-emotional support.

The organization sends volunteers, who are mostly college students, to rural areas for informal teaching, encouraging communication between college students and rural communities. Regarding their core idea of "Destination Guides the Way" (方向引领一生), there are four consensuses within Lighthouse. Students need to have goals in their life. It should be the students themselves who decide their direction (destination), and volunteers are only there to help inspire these pursuits. It does not matter whether the students finally obtain their own goal, but there should at least be a desire to search. Finally, students can develop their passion and confidence in life when pursuing the destinations.

3.4.2 Operation

Organizational Structure

While Lighthouse as a whole is an organization with formal structure, it is chiefly characterized by its teams working in separate rural middle schools in northwest Guangdong and neighboring provinces, so there is not only macro-level departmentalization of the whole Lighthouse, but also micro-level work divisions of its teams in rural schools.

Lighthouse's macro departmentalization can be regarded as a triangle, with the Guangzhou office (the Secretariat), college network and team network on the three apexes. The Guangzhou office takes care of daily administrative work, training, monitoring, and public relations. The college network divides volunteers according to the universities they come from, and the team network divides volunteers according to the rural schools they serve.

Within team divisions, there are typically only 15 to 20 new volunteers per team, but the work division can be rigid. Similar to the macro departmentalization, there are two tracks of work division in a team. One is divided by place—the class. Assuming there is an 18-person team (usually with one or two former volunteers) serving 120 students, the students would be divided into four classes, each class having four volunteers as supervisors for assisting the students to create their own class styles. All volunteers except the team leader and former volunteers work as supervisors. The other means of division is by process. A typical division is instruction, supply, and public relation, as shown in Table 3-1.

Table 3-1 Example of Volunteer Roles in a Lighthouse Team

Role	Sub Role	Task
Team leader	— —	Decision making and coordination
Instruction	Head	Heading the instruction arrangement
	Course	Design curriculum
	English teaching	English teaching
	Secretary team	Dealing with paperwork and assisting in decision making
	Interest team	Setting the schedule for extracurricular interest groups
	Librarian	Managing the books brought to the students

Support	Head	Heading the support arrangement
	Medicare	Medical care for volunteers and students
	Budget	Manage the team budget
	Material	Providing and managing material for daily life and instruction
Public Relations	Head	Heading public relations
	Outside	Communication with local governors, teachers, well-known persons and neighbor volunteer groups if any
	Inside	Maintains a friendly working environment inside the team (actually not public relations)
Former Volunteer	—	Supervising and assisting the team work, maintaining connection with former lighthouse students

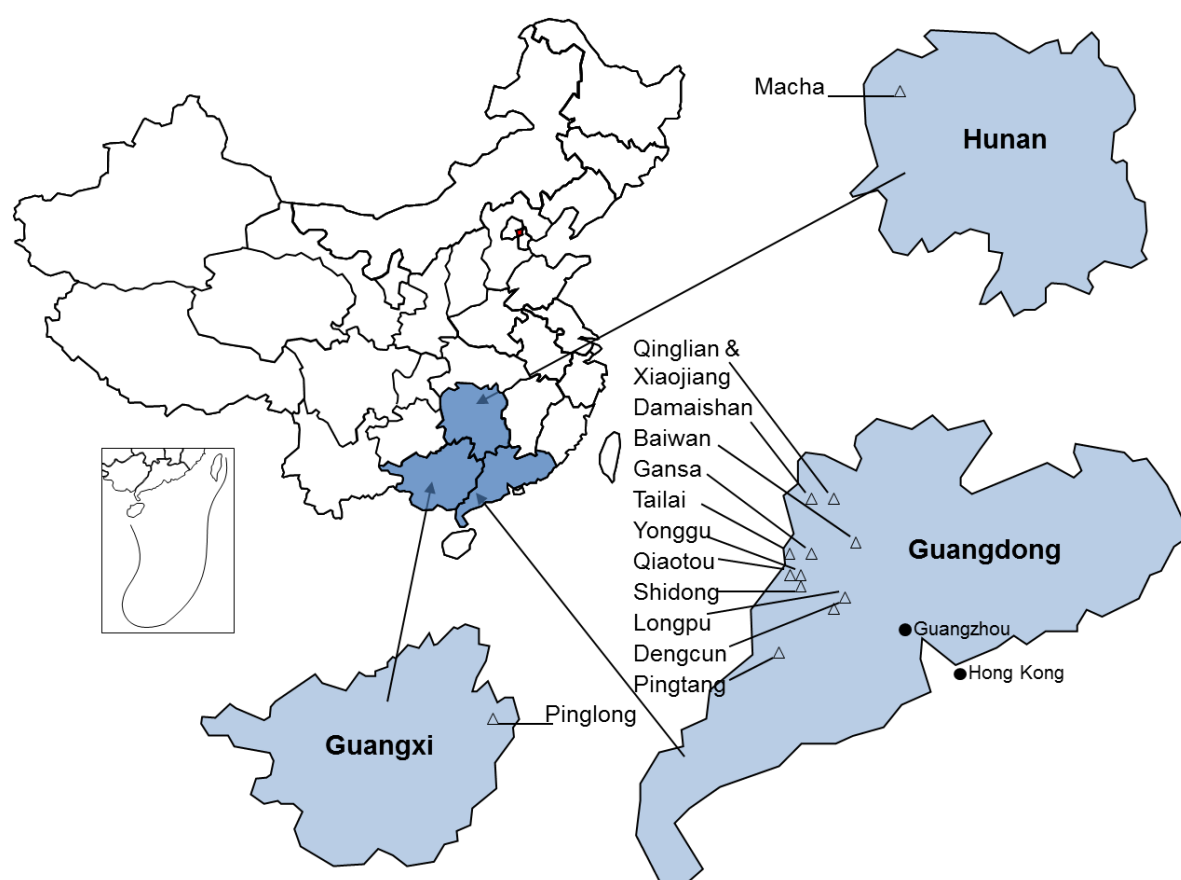
Source: Handbook of the Shidong team 2005, Lighthouse.

Activities

Between 2001 and 2012, Lighthouse has organized over two thousand college students and some in-job personnel to undertake voluntary teaching in thirteen rural schools, eleven of them middle schools (Figure 3-2), spread throughout the rural areas of Zhaoqing and Qingyuan in Guangdong province, and Guangxi and Hunan provinces. During these twelve years, the total service time the service time adds up to 735,000 hours, with over 6300 rural children assisted.

The majority of Lighthouse volunteers are college students from universities in Guangdong province; they are trained to undertake volunteer teaching at assigned rural middle schools during the summer or winter vacation. Every year there will be about 150 new volunteers serving in 6 to 8 schools. After that, they can keep contact with the place in which they served, or further their connection with Lighthouse by becoming a staff member—every member of the Lighthouse staff was first a volunteer. The organization is well known for its comprehensive training system, its emphasis on psychosocial support rather than material support, and the strong independence of its team operations, which distinguishes it from many other ENGOS in China.

Figure 3-2 Locations of Rural Middle Schools with Lighthouse Interventions (by 2012)



Note: Qinglian, Damaishan, Macha and Pinglong middle schools are in minority region; Activities in Qinglian and Macha middle schools are cooperation projects with international NGO.

Lighthouse's formal activities include summer/winter programs, the golden-week⁵⁷ revisit, long-term school programs and teacher training, and daily projects in its Guangzhou office.

The major Lighthouse activity is voluntary teaching in summer and winter vacations. The program period is one month in summer vacation, and seven to ten days in winter vacation. Courses are usually divided into two parts: indoor classes and outdoor activities. Indoor classes include science, environment protection, English, music, art, psychological counseling and so on. Outdoor activities involve military training, household visits, games, team building, and student interest groups and so on. Class construction and student supervision are also important components of the activity. Volunteers divide students into different classes, let them create names, slogans, songs and

⁵⁷ The one-week holiday for October 1st National Day or May 1st Labor Day.

institutions for the classes and provide them with team-based projects. In terms of student affairs, most volunteers will visit student families, collect and arrange student files, or serve as psychological consultants for some students (relevant background required).

In the golden-week holidays of National Day or Labor Day, each volunteer team organizes former or newly enrolled non-student volunteers to return to the sites, and invite potential donors or people interested in Lighthouse activities to take part in short-term activities such as seminars, small class teaching, household visit, or field surveys.

Lighthouse also engages with long-term school programs and teacher training. Long-term school programs include building up and maintaining student libraries, setting up student organizations, compiling student journals, and enhancing the communication between Lighthouse and local schools, as well as government officials. A long-term project could last for up to five years. By means of programs such as ‘Lectures into Countryside’, or the ‘Small Fund for Excellent Teachers’, Lighthouse also tries to create the chances and circumstances for education reform for rural teachers, so as to push forward the development of rural education practically.

The final category of activities is the daily work done by the Guangzhou office, such as website maintenance, information management, project designs, fundraising, training, and public relations.

3.4.3 The Growth of Lighthouse

The growth of Lighthouse could be roughly divided into two stages.

Establishment and Transition: March 2001 to September 2003⁵⁸

In March 2001, Lighthouse’s founders organized the first countryside investigation and chose Qiaotou Middle School and Yonggu Middle School in Huaiji, Zhaoqing, as the first two volunteer teaching schools. They recruited the first team from the South China University of Technology (SCUT)

⁵⁸ In the 2009 Lighthouse Brochure this period is called the Foundation, but in the 2004 Strategy Evaluation of Lighthouse it is divided into the period Foundation and the period Transition.

and Sun Yat-sen University. After a set of instructions and team training, they conducted the first wave of Lighthouse programs.

During the winter of that year, the second round of Lighthouse programs were held in Qiaotou, Yonggu, Longpu and Dengcun Middle School. Later the Lighthouse members established a standard recruitment procedure that has been used ever since. The organization also expanded its activities to Pinglong Middle School in Xindu of Guangxi Province.

In 2002 and 2003, Lighthouse went through several crises —some members cast doubt on the ‘purity’ of the organization due to the business backgrounds of some founder, so non-student Lighthouse members had to temporarily quit. In March 2002, volunteers in Yonggu Middle School were in conflict with the school and were forced to move to Xinxing Elementary School in a nearby village. Two months later, the volunteer teaching in Longpu Middle School and Renyi Middle schools was also rejected. After these events people in Lighthouse became aware that maintaining a good relationship with local schools is essential for Lighthouse’s survival. In September, professional social worker Bai Jin (金白) helped set up the departments of instruction, brand, and human resources, but at the same time the Lange Company, a NGO Bai Jin worked for, ended their partnership with Lighthouse, resulting in a serious budget deficit. The new team leader later prompted an institutional reform, but failed. Two of the leaders, Bai Jin and Panther, left over a disagreement about development strategy. The rest had to cancel the 2002 winter program. The organization was almost killed by budget problems, failed reform and then SARS. SARS meant that it was forbidden to have public events for several months and Lighthouse in fact did not have a full team to operate those events.

Nevertheless, the organization survived. Some former volunteers donated to the organization and helped to collect funding through yard sales. The first Lighthouse Instruction Booklet was finished in this period, and the college network was added into the old “secretary-volunteer team” system. The organization got ready to return to its original purpose.

Consolidation, Expansion, and Registration: October 2003 to the present

From March to August in 2004, Lighthouse developed its fifth cohort of volunteer teachers with three new schools, including Shidong Middle School in Zhaoqing, Damaishan Middle School and Baiwan Middle School in Qingyuan. The first comprehensive collection of volunteer teaching experiences was completed in this period. Right after the summer program, Lighthouse composed its comprehensive strategy evaluation. In November of the same year, it participated in the rural education forum held by the educational GNGO Tianxi (天下溪). This was the first time the organization officially got in touch with other Chinese GNGOs.

Lighthouse's first Volunteer Representative Conference (VRC) was held in December 2004, followed by the sixth wave of volunteer teaching, adding Gansa Middle School in Zhaoqing to its list. The organization experienced a fruitful 2005. It presented its first documentary 'Those Flowers', which was shown as a part of an exhibition in different places. The first official booklet of Volunteer Teaching was distributed to new volunteers, and a new mechanism was set to encourage each Lighthouse team to build and maintain their own program styles. The teams began to develop their team-specific trainings and compose their own handbooks. In July, training aimed at local teachers from Lighthouse schools was jointly held by Lighthouse, the Non-governmental Development Center of South China, and Guangdong Lions Club (GLC). In that summer, Macha Middle School in northern Hunan province was added to the list. The voluntary teaching in this school was a joint program by Lighthouse and GLC.

In March 2006, the second Lighthouse VRC was held, which marked the establishment of planning and supervision protocols. A series of activities for Lighthouse's fifth anniversary was launched in the same year.

Lighthouse then cooperated with the Decathlon Foundation in promoting rural school sports in 2007⁵⁹, and with Oxfam Hong Kong on popularizing developmental education in 2008. In the summer

⁵⁹ A new round of programs was in process during the writing of this review

of 2008, the organization expanded its programs to nine schools. In that year it also cooperated with The Boys' & Girls' Clubs Association of Hong Kong to start activities in Yangshan, Qingyuan.

In 2011, Lighthouse presented a series of activities celebrating its 10th anniversary. In December of the same year, it co-organized the second conference of Chinese educational GNGOs in Guangzhou, receiving leaders from over 200 GNGOs across the nation. To ensure in-depth and stable service, they incubated new ideas such as long-term boarding volunteers, curriculums that are totally tailored to local communities, and a three year cooperation contract with each school.

3.4.4 Developmental Issues

During the 2004 Strategy Evaluation, the writing group conducted a brainstorming session to list the issues faced by Lighthouse, which can be classified into seven points. Most still apply to today's Lighthouse although things have changed in a positive direction.

The first issue is the instability of the management group. Lighthouse is in need of a group of people who can devote themselves for longer periods to the organization. This team should be able to decide on a long-term strategy, and it should have the leadership to gather Lighthouse members to work on the plans. Note that this is about teams rather than individuals. Lighthouse experienced paternalism in its early years, which made the members sensitive to individual power. In 2005 the organization had its first full-time staff, who was mostly team leaders when working as volunteers—and a stable management group became possible.

The second issue involves organizational structure. Most college volunteers graduated and then left. Even though the Lighthouse management group is stable and strong, no one can guarantee stability of its front-line volunteer groups. The annual Volunteer Representative Conference is a way to maintain the volunteer network, but currently Lighthouse's organizational structure remains vulnerable to change.

The third issue is funding and the fourth is having a legal NGO identity. The organization is cautious about donations. This is a wise policy for maintaining “purity”, but the result is that Lighthouse has to give up potential company donations. Even now volunteers still need to pay for most things by themselves during their voluntary teaching. In terms of the identity problem, while the organization has been officially recognized by the governmental media⁶⁰, it had run without appropriate legal identity for over ten years, which in return impeded the further development of the organization (e.g. grant application) and made it vulnerable to crisis. The first secretary, Bai Jin, tried his best to ensure that Lighthouse would not die in its early ages. He then resigned to continue his own company. The second secretary, Siqing Yan (焉四清), helped set up today’s Lighthouse institution, but still cannot achieve registration. Instead, he led Lighthouse affiliates to a research institution at Sun Yat-sen University, so the organization could have a temporary identity. He also then resigned for the sake of his own career. The third secretary, Ning Gan (甘宁), chose a difficult path—she registered Lighthouse with the Guangzhou Industry and Commerce Bureau. In 2011, the “Uncle Kun (坤叔)” incident opened a policy window for NGO registration in Guangdong. Uncle Kun was an old man trying to register his educational GNGO for the sixth time. Yang Wang (汪洋) the Secretary of provincial Party committee noticed his story and sent out commands to loosen the restrictions. Lighthouse finally got registered with the Civil Affairs Bureau in 2012, eleven years after its establishment.

The fifth issue concerns competition and cooperation with other ENGOs. As mentioned above, Lighthouse has been accepted by local governments, and it also has programs with INGOs from Hong Kong, however there is a worry within the management group that Lighthouse might lose its independence during competition/cooperation. It may become sub-organization of well-developed NGOs, or its operation may become similar to other ENGOs, thereby losing its appeal to potential members. If the “Go-to-the-Countryside” project duplicates Lighthouse’s mode of operation, for

⁶⁰ From national media such as China Central Television (CCTV) to local media such as Southern Metropolitan Daily

instance, then, with its strong governmental background, it would recruit many college students who could otherwise be Lighthouse members.

The sixth issue is culture. Lighthouse's organizational culture is open and casual. The advantage is that this culture results in high efficiency of communication across the Lighthouse networks. The disadvantage is that individual messages that may threaten the organization, such as anti-government posts on its portal, could also spread quickly. Some members may not treat their works seriously in such an atmosphere.

Last but not least, public relations with Lighthouse schools should never be ignored. In the Yonggu case, the volunteers gave local students a perception that their own teachers were worse than the volunteers, which threatened the reputation the local teachers and made their instructions to students much less acceptable than before. Puppy love among middle school students appeared to be a side effect of the volunteer's open attitude towards each other. Unlike GONGOs which have strong governmental background or INGOs which have strong financial power, Lighthouse's activities could easily be banned by schools or local officials, due simply to the lack of political tactics. On the other hand, as long as Lighthouse does not cause trouble, it is more advantageous than GONGO or INGO programs to the schools, not only because of its content, but because it does not lead to an extra administrative burden. In GONOG or INGO programs, the schools are usually required to cooperate on reception, recruitment, safety, etc., but for Lighthouse they only need to provide the site and facilities.

3.4.5 Synthesis of Theory and State

Lighthouse offers a solid confirmation of the reviews of theory and state, which boil down to two key terms: voluntary failure and corporatism. Lighthouse has experienced all types of voluntary failure, such as budget shortages, inner conflicts, unstable and unprofessional personnel, unskillful public relationships, and so forth, but it is still one of the best-known GNGOs in China. Lighthouse

has played with the corporatism of the Chinese government. It did not register with the Civil Affairs Bureau until 2012. Even after registration, to minimize government intervention, Lighthouse's traditional programs are separated from the registered wing of the "Lighthouse Youth Development Association", which is mainly in charge of fundraising and public relations. So far the grey identity has not brought problems, but the organization will be vulnerable to any change of policy environment.

On the other hand, it is worth pointing out two encouraging lessons from Lighthouse. Time makes a difference. Before 2004, either inner crisis (e.g. budget and management crisis) or policy change (e.g. activity ban during SARS) could have stifled the organization in the cradle, but in today, although some problems still exist, they are no longer potentially fatal. A GNGO just needs time to increase its capacity and reputation. The content of service might be important. As mentioned earlier, many groups that can be categorized as GNGOs or INGOs are also undertaking "voluntary teaching", but so far they have not challenged the status of Lighthouse. When compared to average voluntary teachings, Lighthouse has an advantage in its training system, program intensity, community involvement, curriculum diversity, and the team-level independence of operation.

Chapter 4 Research Design and Data Collection

The previous chapters introduced the context for the two research questions, “What are the PCED determinants for lower secondary students in rural Guangdong province?” and “How does the Lighthouse program affect PCED by increasing certain subjective factor(s)?”, and reviewed the literature related to these two topics. My research will enrich the existing literature by exploring a comprehensive list of determinants, paying more attention to the schooling track, focusing on a location that has not yet been thoroughly researched, applying newer data to the four-option education decision, and investigating the subtle relationships between GNGO activity, subjective factors, and PCED.

This chapter will explain the methodology and data in detail. It starts with a discussion of the theoretical framework and methodological challenges, then presents the qualitative method of the Delphi survey, plus its results, which will serve as the input to quantitative methods. It explains how I will conduct multinomial logit (MNL) to answer Question 1, and propensity score matching (PSM) to answer Question 2. Since this research uses firsthand data, there will be three additional sections devoted to survey design and data collection, missing data, and variable construction. The chapter ends with a synthesis of the research components.

4.1 Theoretical Framework and Methodological Challenges

As described in Chapter 2, the standard neoclassical framework in family economics (Becker, 1981) can be used to explain PCED. Rural households select the PCED that maximizes their expected utility, subject to income constraints, human capital constraints, credit constraints and test score constraints (for AHS only). Assuming the standard assumptions are all satisfied, the parsimonious form of household utility function will be:

$$U = E[U(X, U_{1k} \dots U_{nk})], \quad k \in 1, 2, 3, 4$$

That is, in a household with n children, the PCED depends on total consumption X and the children's utility function, given the PCED they choose. Here k indexes the four PCED alternatives. Complications can be added to reflect the roles of determinants raised by previous studies.⁶¹ By including the student's own utility, this function considers parental altruism. Lower secondary students are old enough to have their own points of view. Parents either respect the child's decision, or take into account the child's future prosperity, which may not be transferred to the household. The household members work together to decide on a PCED that maximizes U .

For simplification, one can narrow the function to a single child i , assuming the complete altruism of the parents.

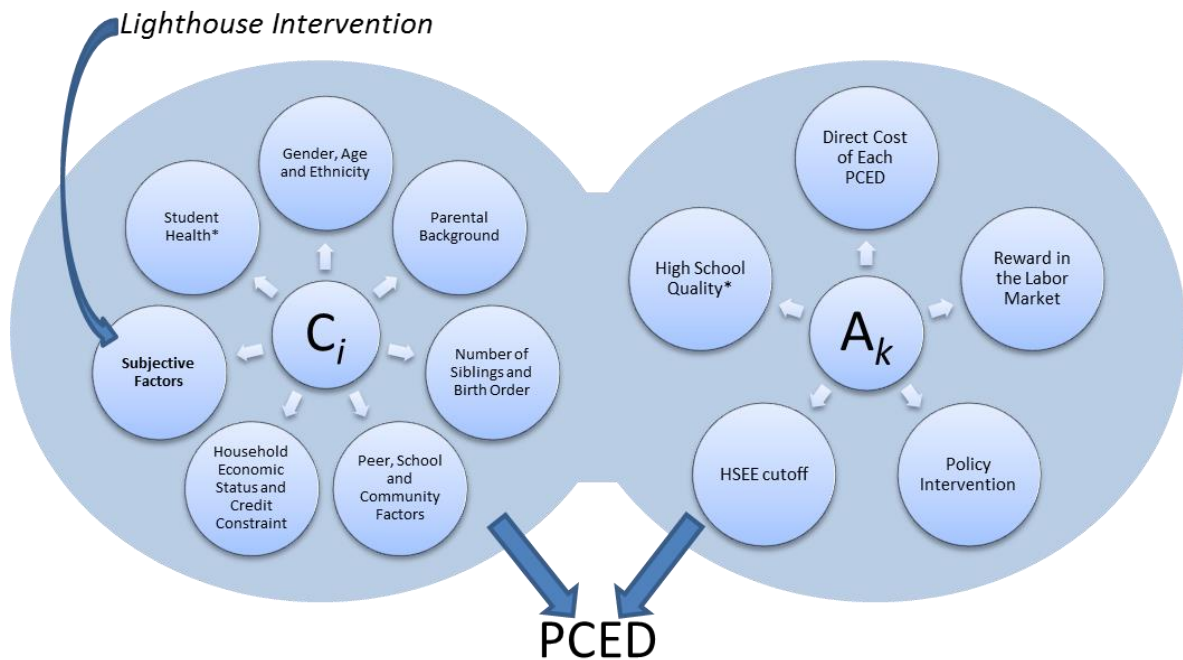
$$U_{ik} = U(C_i, A_k)$$

Here, C_i and A_k respectively stand for the case-specific and alternative-specific factors. Lighthouse is supposed to influence the PCED by altering the subjective factors in C_i . Since some of the PCED determinants are heterogeneous to other determinants or highly correlated with each other, C_i and A_k should not be completely separated. Figure 4-1 illustrates this PCED process.

The standard theory has limited meaning unless we find a way to measure utility. For PCED, what was known is the importance of treating utility as the function of a comprehensive list of variables—in the PCED study for Britain, Yang (2008) found that the prediction of VHS choice is very sensitive to student background compared with the cases for other PCED. Since we have no parallel study for China, it is advisable to then be concerned with the completeness of variables, to try getting a full list of potential PCED determinants in modeling. This turns out to be the major challenge for Research Question (1).

⁶¹ This was done in the full literature review of PCED determinants, omitted here.

Figure 4-1 PCED Process Suggested by the Literature



Note: Student health only appeared as a performance determinant in literature. High school (especially VHS) quality has been frequently mentioned, but not rigorously measured.

For Question (2), the major challenge is selection bias. It is up to the students to participate in the Lighthouse program, thus students taking the program could be very different to their non-participating peers. For example, they may be more socially oriented, or free from housework. Those differences can affect the choice of PCED, so it is inappropriate to measure Lighthouse impact by simply comparing the participating group with the non-participating group. Even controlling for an extensive list of variables cannot fully address this problem — it makes little sense to suggest an effect by comparing students who will surely participate with those who are unlikely to participate in the program, which is like weighing the value of living on a coral reef for ocean fish compared to freshwater fish. The ideal comparison would be made between students with the same propensity for participation.

4.2. to 4.4 presents three groups of methods that can together handle the methodological challenges to the research questions.

4.2 Delphi Survey as Qualitative Input to the Quantitative Design

Quantitative methods test assumptions and offers precise measurements, but they are less capable of answering questions like, ‘Are we able to identify all the potential PCED determinants?’ or ‘Do we have enough factors that matter for the propensity of Lighthouse participation?’ In some quantitative works, the list of variables is based on whatever list the first researcher happened to select (Leamer, 1983). Variable determination is the strength of qualitative methods.

4.2.1 The Delphi Process

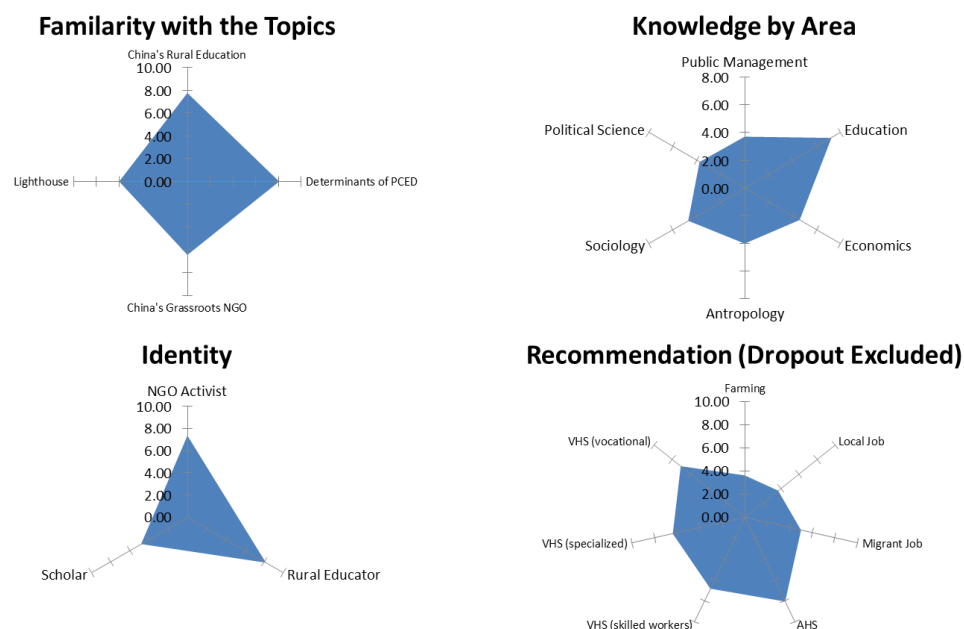
The Delphi approach was chosen here as the qualitative wing. It was undertaken in 2011 to guide the questionnaire design before data collection, as well as to inform the causal interpretation after quantitative works. Delphi is an iterative process used to collect and distill the judgments of experts using a series of questionnaires interspersed with feedback (Skulmoski et al., 2007). It is mainly used for forecasting, but the idea has been applied to any process aimed at unified decisions. The Delphi experts are separated, and they will be informed of what others think without knowing who the others are, so that they can refine opinions and achieve a final consensus without authoritative pressure and geographical confinement. The Delphi results could be unstable due to their complex application. It is more time consuming, and it relies on how the coordinator (myself) is capable of articulating the research and summarizing the opinions objectively, as well as how seriously the experts engage.

In June 2011, I gathered a panel of 17 experts on my research topics.⁶² They lived in fourteen cities of three countries (China, America, and Britain), with diverse backgrounds regarding career, knowledge structure, and PCED preference. I made use of the networks at Center on Chinese Education of Columbia University in New York, Institute for Civil Society of Sun Yat-sen University in Guangzhou, and of course Lighthouse to locate and reach these experts. Figure 4-2 shows the

⁶² Each was paid a small symbolic honorarium of 500 RMB (80 USD), sponsored by Sasakawa Young Leaders Fellowship Fund (SYLFF) Grant.

composition of these experts, in which a higher score for an item means that on average the panel members had a higher self-rating for that item. The representiveness of Delphi experts can affect the quality of Delphi results, especially their external validity. On the other hand, it is acceptable to have a less all-around panel since this research intentionally targets an area that was not well covered by literature, and that the second research question requires a good proportion of Cantonese panel members familiar with Lighthouse programs. Overall, the panel members tend to identify themselves as NGO activist or rural educators knowing more about rural education/PCED.

Figure 4-2 Structure of the Delphi Panel



It is worth mentioning that, although there is a mean preference of AHS> VHS> Work> Dropout, more than half the respondents added in the comment section that they could not make confident recommendations without having adequate background information. Such caution highlights the fact that PCED is hardly a simple process.

From July to September 2011, the panel members were surveyed via email in three rounds. For example: In the first round, I asked each to suggest five major determinants of the schooling track decision, to grade them in the 1-10 range, and to offer any extra explanation or comment; in the

second round, I summarized their answers and asked them to grade the suggestions and to respond to the judgments, explanations, and comments; in the third round, they were asked to again grade those suggestions of high average scores and wide view divergence (half the items selected), and to respond again to the new judgments, explanations, and comments. The same process was also used to identify and rank the determinants of Dropout and Work.

4.2.2 Delphi Results

There are three Delphi results that can assist not only the quantitative design but also the interpretation of empirical results. First and most importantly, 46 potential PCED determinants and 14 characteristics of Lighthouse program participants were identified (Table 4-1). The top four potential PCED determinants according to panel members are family income, parental attitudes toward different decisions, high school cost, and whether parents are migrant workers. I exclude “academic performance” and “school-weary”. Both were considered exceptionally influential in the second round, and I therefore used them as a dependent variable in the third round and found that they could be explained by other determinants. Without Delphi, this study might have missed some regional specific variables - over one third of the suggested determinants did not appear in literature. On the other hand, these PCED determinants are still within the classification system generated by the literature review. The determinants of program participation are mostly intuitive. Among them, ambition, curiosity, extroversion and the need of affiliation are related to personality, suggesting a selection bias for impact evaluation if I fail to control for the differences between participating and non-participating students.

Table 4-1 Determinants of PCED and Program Participation Suggested by Delphi

PCED Determinants (1)^{abc}	PCED Determinants (2)	Determinants of Participation to Lighthouse Program^d
Agricultural income	<i>Student attitude towards urban life</i>	Academic performance
<i>Availability of family business for inheritance</i>	Class size	Ambition
Birth order	<i>Development of local entertainment industry, e.g. internet bar, disco</i>	Attitude towards housework/farm work
Connection between curriculum and real life	Distance to high schools	Attitude towards study
Cost of high school	Family income	Availability of other activities, e.g. visiting cities
Friends' PCED	Father's migrant status	Curiosity
Gender	Housework/farm work burden	Distance to the school
Governmental investment	<i>Outreach of nonlocal enterprises in the community</i>	Extraversion
Health status of household member	<i>Outreach of VHS in the community</i>	Housework/farm work burden
Historical PCED distribution in the school	Parental education	Need of Affiliation
<i>Interpersonal relationship in the school</i>	<i>Parental marriage age</i>	Number of friends /relatives with Lighthouse experience
Mother's migrant status	Parent attitudes towards the PCED	Parent attitudes to Lighthouse
Number of siblings	Parent PCEDs	Previous Lighthouse experience
Perception of AHS-VHS gap	Perception of college cost	Size of surrounding migrant network
Perception of earning by PCED in the community	Perception of job opportunity by PCED in the community	
<i>Rate of admission to colleges in nearby AHS</i>	Perception of personal interest-high school education linkage	
<i>Rate of admission to colleges in nearby VHS</i>	<i>Relative's involvement in gambling/illegal lottery</i>	
Teacher education level	<i>Reputation of surrounding VHS</i>	
Teacher experience	<i>School violence</i>	
<i>Teacher's attitude towards each PCED</i>	<i>School work burden</i>	
<i>Teacher's care of students</i>	Schooling related fees, e.g. meals, transportation	
<i>Teacher's sense of responsibility</i>	School's hardware capacities	
<i>Urban life experience</i>	Whether both parents migrated	

a. The determinants are alphabetically presented. In the first round, all members were asked to suggest the top 5 PCED determinants. In the second round, they were asked to rate the 46 PCED determinants collected from the first round. In the third round, they were asked to rate again the 23 PCED determinants of both large average score and view divergence, listed in the first column. The other PCED determinants are listed in the second column.

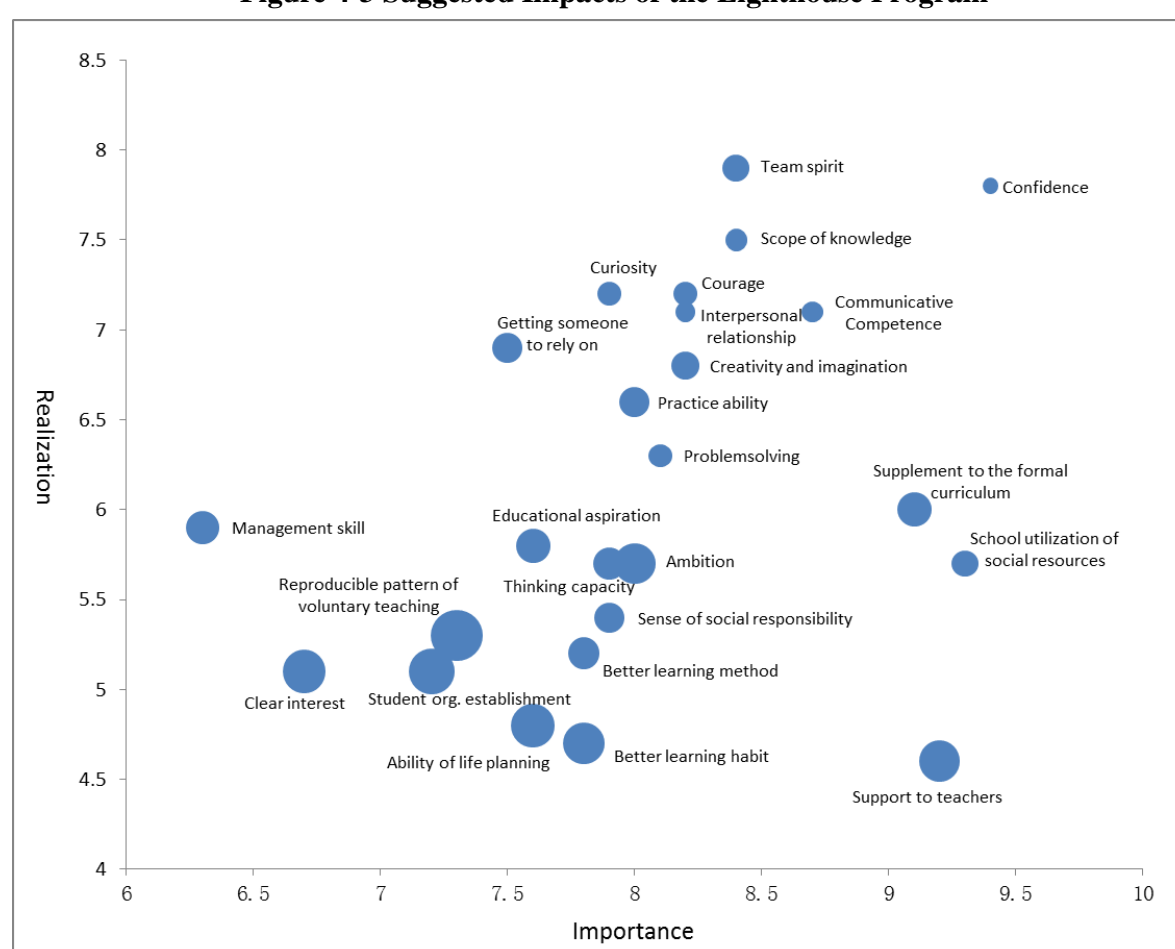
b. PCED determinants that have not been directly included in literature are underscored.

c. In the second round, both "academic performance" and "school-weary" are considered highly influential for the PCED. I therefore used them as dependent variable in the third round, excluded from this list.

d. Only asked once in the first round. Only experts with knowledge of Lighthouse were asked this.

The second valuable Delphi result is a list of possible program outcomes. I calculated 25 potential Lighthouse impacts, 20 on students and five on schools and communities, shown in Figure 4-3. They will be helpful for explaining the mechanism of Lighthouse impact. They also confirm the logical framework where subjective factors will channel Lighthouse intervention to affect PCED. Socio-emotional characteristics such as confidence and courage are uniformly believed to be important and well-realized in the programs.

Figure 4-3 Suggested Impacts of the Lighthouse Program



Note: For both importance and realization, the ratings range from 1 to 10 for totally disagree to totally agree. Bubble diameter indicates the divergence of views. It is the mean of the “standard deviation divided by mean” for importance and realization. Smaller bubbles means better consensus. Detailed data is in Appendix C1.

Finally, the Delphi survey generates a decent collection of opinions and debates over PCED and socio-emotional support. For example, there are intense debates over whether school fees and academic performance still matter, or whether volunteers really know more than students on the

advantages of different PCED. This collection will be retained for causal discussions after the quantitative analyses. They are included in Chapters 6 and 7.

In short, the Delphi survey contributes to this study by listing variables and interpretations that might be overlooked if researchers rely only on the literature. It is a qualitative input to the forthcoming quantitative analyses.

4.2.3 (In)accuracy of the Delphi Results

Although Delphi is the qualitative wing of this study, it is implemented with an attempt to be more quantitative. Items (determinants or impacts) are given grades so they could be ranked, however it is notable that Delphi, like other qualitative designs, is not convincing enough when trying to provide measurement.

Figure 4-4 shows an example of how those rankings could be misleading. The red line refers to the average ratings of 23 PCED determinants for the working decision, and the gray area expresses the divergence of views among the panel members, calculated as the 95% confidential intervals. The graph on the right ranks the determinants based on the ratings of the third round, and the graph on the left shows the ratings for the same series of determinants in the second round. We can see that the ranking changes, but the overall declining trend persists, which is a good thing, however it is less satisfying to see that the divergences have not narrowed from the second round to the third round, which conflicts with the expectation of better consensus.

Figure 4-4 Sorting the Determinants for Choosing Work in the 2nd to 3rd Rounds



Note: 1 to 23 on the x-axis stand for the 23 determinants of relatively large divergence. Detailed data is in Appendix C2.

It is thus more confident to suggest possible determinants/impacts from Delphi than to suggest which determinants/impacts are more influential. The latter is supposed to be better answered by quantitative design.

4.3 Answering Question 1: Multinomial Logit

Discrete choice models (DCM) are regressions used to predict the probabilities of the different possible outcomes of a categorically distributed dependent variable (here the PCED), given a set of independent variables. 11 of the 21 shortlisted studies in Table 2-1 employed DCM. Multinomial logit (MNL), conditional logit (CL) and nested logit (NL) were introduced in Chapter 2. After data exploration and field interviews, I decided to adopt the basic MNL.

There are three reasons the advanced models are not practiced. Firstly, the summary statistics (Chapter 5) show that students and households have large variance in their views of alternative specific factors such as the direct cost and future reward of each PCED. Secondly, field interviews suggest that this variance is partially reasonable because, thanks to multiple government and social aids in the surveyed area, students pay quite differently even when they choose the same option.

Thirdly, the summary statistics also tell us that most students/households are unaware of some of the alternative specific factors, such as the policy incentives for VHS. Such findings all point out that there is no real factor that can only vary by educational decision, and therefore models with special treatment for alternative-specific variables (e.g. CL and NL) are unnecessary in the case of this research.

It can be predicted that there will only be a small number of students choosing dropout as expected their PCED (those expected to drop out may already have left school and thus not answering the questionnaire), leading to an imbalanced nested structure that is weak in supporting any statistical inference. NL is thus also unnecessary.

The MNL specifies that:

$$P_{ij} = \frac{\exp(x_i' \beta_j)}{\sum_{l=1}^m \exp(x_i' \beta_l)}, \quad j = 1, \dots, m$$

That is, the probability that the outcome for individual i is alternative j depends on factors x_i . m equals 5 as we have 4 alternatives plus the situation of undecided. Based on local context, I made a little adjustment regarding the variables that will be used in the estimation of MNL. They can be divided into nine groups (1) gender, age and ethnicity, (2) parental background, (3) number of siblings and birth order, (4) peer, teacher, and school factors, (5) household economic status and credit constraints, (6) subjective factors, (7) health, (8) monetary costs and rewards, and (9) academic performance and other variables. Section 4.7 will explain how these variables are defined.

Both relative-risk ratios (RRR) and marginal effects (ME) are calculated, but only RRR will be reported. The RRR of choosing alternative j rather than alternative 1 is given by

$$\frac{\Pr(y_i = j)}{\Pr(y_i = 1)} = \exp(x_i' \beta_j)$$

in which e^{β_j} gives the proportionate change in the relative risk of choosing alternative j rather than alternative 1 when x_{ir} changes by one unit.

The ME can be shown to be

$$\frac{\partial p_{ij}}{\partial x_i} = p_{ij} (\beta_i - \bar{\beta}_i)$$

where $\bar{\beta}_i = \sum_l p_{il} \beta_l$ is a probability weighted average of the β_l .

In this study, the major independent variables will be the potential determinants from Delphi plus other suggested variables from the literature (a union of Table 2-2 and the first two columns of Table 4-1). My dependent variable has a value of 1 to 4 indicating students in the four decisions, and 5 in the case of “undecided”. AHS is chosen as the baseline group for two reasons. Firstly, there is a satisfactory sample size for students choosing AHS (see Chapter 6). Secondly, from a policy perspective we would like to know more about how students decide between AHS and other options. The MNL output, in this study the RRR, will indicate how more or less likely the students are to end up with Dropout, Work, VHS or Undecided (compared with the AHS choice) as the values of potential determinants change, and whether these differences are statistically significant.

MNL relies on the independence of the irrelevant alternatives (IIA) assumption that the relative probability of choosing between two alternatives is unaffected by the presence of additional alternatives. When using categorical variable, IIA tests are forbidden by Stata⁶³, and therefore two measures are adopted to test the IIA assumption. The first is to change all variables into dummies and run the MNL plus IIA test. The other is to use multinomial probit for the main specification, and then compare its output with that of the MNL. If there is no big difference, we can expect that MNL is acceptable. It is worth mentioning that, due to the heavy computational burden when combined with multiple imputation, multinomial probit is not chosen as the main model.

I then test the robustness of MNL by applying it to different samples and specifications, and examine how the regression results vary by gender, wealth and academic performance. Given the large variable list, I also visually compare the standardized coefficient and corresponding z scores in scatter graphs, which provide broader pictures of how different factors affect PCED.

⁶³ More exactly, Stata does not do IIA test on factor variables, which refer to extensions of existing variables. In the case of categorical variable, the extension is adding “i.” in front of the variable name to turn them into dummy variables. Stata directly treats categorical variables as factor variables, so this kind of extension will return an error. The solution is to create dummy variables and run regressions on those dummy variables before the IIA test.

This research will not present other practices for regression with many predictor variables, like recursive model and step-up regression. The full-model MNL is not only for comparing the potential PCED determinants, but also for preparing the impact evaluation through showing if subjective factors remain influential when their possible determinants are in the same equation. If the subjective factors remain influential, then there is room left for socio-emotional supports to directly alter these factors. In the future, nevertheless, it is advisable to practice other regression forms to thoroughly examine specific PCED determinants.

Finally, it is worth mentioning that, by applying MNL, this study does not treat PCED with an “order”. It is true that the length of schooling increases from dropout to AHS, but it would be arbitrary to claim that more education must be better for all students, especially when it comes to the comparison between VHS and AHS tracks. The research design has also considered the reality that not all students know their PCED, and placed an option of “undecided” on the student questionnaire. It is hard to assign an order for “undecided”. It is admitted, however, that continuing education is a “positive” decision when compared to dropout, work, or undecided.

4.4 Answering Question 2: Propensity Score Matching

Propensity Score Matching (PSM) matches units that have the same or similar propensities of treatment participation (D_i) (Rosenbaum & Rubin, 1983). By doing this, researchers can largely control for selection bias without facing the limitation of matching on many observed variables. Suppose the conditional independence assumption holds, then:

$$p(X_i) = E[D_i | X_i] = p[D_i = 1 | X_i]$$

The application of PSM runs as follows: firstly, run a logit or probit regression using a dummy variable for participation, (1= participation, 0 = otherwise) as dependent variable and potential participation determinants as independent variables. We can include all independent variables for

the first research question for the selection of these determinants, or to be more straightforward the characters of the Lighthouse program participants known from Delphi (3rd column of Table 4-1), or to be more conservative, a combination of both with those possible program outcomes excluded. This study will use Delphi and the conservative specification, and will match only within schools with Lighthouse inventions. The measurements of the 14 characters are discussed in the last row of Table 4-2. Some subjective factors will not be used for score calculation because some are also suggested as outcomes. More detailed discussion is available in Chapter 7. I then substitute the value of each variable for each student to the obtained equation. The result is a figure measuring the individual's propensity for participation, namely the propensity score. After explorative analyses, outcomes worthy of further investigation will be identified, and more targeting variable lists for score calculation can be generated— based on the Monte-Carlo simulations, variables that are unrelated to the exposure but related to the outcome should always be included. The inclusion of these variables will increase the precision of the estimated exposure effect without increasing bias. In contrast, including variables that are related to the exposure but not the outcome at all will decrease the precision of the estimated exposure effect without decreasing bias (Brookhart et al., 2006). Accordingly, it is advisable to practice an adjusted specification based on variables that are closely related to outcome yet not fully unrelated to Lighthouse participation.

To decide whether the obtained propensity score can be used, the premise is that at each value the distribution of observed covariates are the same in the treated and control groups. In other words, the specification for score calculation should allow us to find treated and control individuals with similar covariates, or “balance”. In practice, there are different tests for the balancing property (Lee, 2013). This study uses the “pscore” command in Stata, which divides treated and control individuals of the same average propensity scores into blocks for balance tests. If a covariate is not balanced for many blocks, it is suggested that the estimation be modified by adding interaction terms and/or higher-order terms of that covariate (Dehejia and Wahba, 2002); and if balance is bad

on just a few covariates that are believed to be important for the prediction, it is acceptable to keep them (Stuart, 2010).

Another important requirement for PSM application is common support; there should be sufficient overlap of propensity scores between treated and untreated. Given the decent sample size and the fact that non-Lighthouse students largely outnumber Lighthouse students, common support is not going to be a problem for this study.

Table 4-2 Instruments Related to Lighthouse Intervention

Instruments	Core Measurement/ Comments	Connected Questions (See appendix)
Potential Impact	Judgment of a list of statements: Categorized from totally disagree to strongly agree	e1~62
Participation	Time of participation: number Participation to the 2012 summer camp: Dummy	g5, g6, g9
Volunteer Team ^a	Two groups of questions: 1st, the volunteer's background information and training participation; 2nd, the volunteer's perception on team operation (from totally disagree to strongly agree for 11 statements). Mean value would be taken for each team.	Volunteer Team questionnaire
Determinants of Participation ^b (see Column 3 of Table 3)	Academic performance: performance ranking and last semester's exam score Attitude towards housework/farm work: Categorized from totally disagree to strongly agree Availability of other activities, e.g. visiting cities: Categorized on household's agreement on different summer activities_ from totally disagree to strongly agree Distance to the school: commute time between school and home Housework/farm work burden: Time spent per day Number of friends /relatives with Lighthouse experience: Categorized_ best friends' choice Parents' attitude on Lighthouse: Categorized from totally agree to strongly disagree Previous Lighthouse experience_ Times of participation Size of surrounding migrant network: Categorized on popularity of migrant teenagers and job recruitment with the community_ from very popular to not sure Subjective factors (Ambition, Attitude towards study, Curiosity Extraversion, Need of Affiliation): Categorized from totally	b8, b11, b12, b15, e1~62, g2a~f, g5, g6, j3a~d

	disagree to strongly agree on relevant statements. These will not be used for score prediction because they can also be the treatment outcome.	
--	--	--

a. For pre-2012 volunteers, only background information is available.

There are various ways to use this score, and this study will practice Nearest Neighborhood (NN) matching, Kernel matching, and Radius matching. For NN matching, a student in the control group is matched to a treated student based on the closest propensity score. More specifically, here I apply the single NN with replacement, in which a control case can be matched to multiple treated cases as long as it has the nearest propensity score. Single-with replacement matching yields less bias, but higher variance. NN could be very sensitive to imputations (discussed in section 4.6), especially when there is a relatively large control group. It is therefore predictable that NN results could be relatively unstable, making it a way to screen the outcome variables. If we find a large and statistically significant treatment effect for an outcome in different imputations, we may further investigate that outcome using Kernel and Radius matching.

Kernel Matching uses the weighted averages of all students in the control group to estimate counterfactual outcomes (Heckman, Ichimura & Todd, 1998). The weight is calculated by the propensity score distance between a treatment case and all control cases. I will use a narrow bandwidth of 0.03 for Epanechnikov Kernel matching. Smaller bandwidth gives smaller bias but larger variance, and vice versa. Finally, radius matching allows a tolerance level in the maximum propensity score distance, the caliper, and matches all the individuals in the control group within that caliper (Cochran & Rubin, 1973). In this study I use a caliper of 0.08. Since in this study the control group is supposed to be much larger than the treatment group, radius matching with the smaller caliper should be more trustworthy when the three types of matching yield different results.

This study also makes a small adjustment in D_i to measure both the short- and mid-term Lighthouse impacts. I run two waves of PSM. In the first wave the treatment group only includes student who were involved in the past summer, while in the second wave the treatment group covers students who participated any Lighthouse camp(s) before the survey.

There are two challenges to my PSM application. The first challenge involves the calculation of the propensity score. Some socio-emotional variables that were suggested as treatment determinants (last row of Table 4-2) are also the output in my evaluation. This will not be a problem if the data is collected both before and after the program. In that case, I can use the pre-intervention variables for score calculation, and the post-intervention variables for impact identification, however as will be discussed in the next section, a large part of my sample is post-intervention. This issue is largely resolved by adopting the conservative means of propensity score calculation that includes all available variables except the subjective factors. Pre-treatment subjective factors will be largely proxied by such a long list of variables. I thus practice both conservative variable list and the Delphi-suggested list for propensity prediction. As mentioned before, a best specification should include variables that are not unrelated to treatment status and related treatment outcome. So, once the NN matching helps decide which outcome(s) should be further investigated, adjusted specification(s) could be derived for propensity prediction.

The second challenge comes from the fact that this PSM will be implemented with multiple imputations (see Section 4.6). There is not yet a real consensus on PSM after multiple imputation (Hill, 2004; Hayes & Groner, 2008), but of all the recommended ways it is advisable to make full use of the multiple dataset generated by multiple imputation, with different matching methods practiced (Stuart, 2010). In addition to the traditional way of putting results in tables, I also try simpler visualization. After different types of PSM on both treatment groups for each imputed dataset, the results will be pooled together in a scatter graph, where the y axis gives the average effects of treatment on the treated, or ATT, of an outcome, and the x axis refers to the corresponding t scores.

The investigation will not end with confirmation and measurement of Lighthouse impact; it will also discuss why those effects exist. Reminded by the theory of voluntary failure, I disseminated volunteer questionnaires (see Appendix B) to learn about the characteristics and operation of each Lighthouse team, and I also assigned a research assistant to observe negative events during the

Lighthouse program. Ultimately, I will discuss how untestable elements throughout the PSM implementation may affect the research quality.

Some might question the potential of other methods for causal identification, especially the options of difference-in-differences (DID) and instrumental variable (IV). Indeed, as will be introduced in the following sections, I do have a two-school sub-sample that could be used for a simple two-period DID, however those two schools are the shrinking Lighthouse sites with only 34 surveyed students enrolled in their latest summer programs⁶⁴. These two schools are also close in proximity to each other but far from all other Lighthouse sites, and therefore DID can guarantee neither statistical power nor the representativeness of findings from this sample. For IV, unfortunately there is no available theory on what factors are (1) related to the treatment status and (2) not related to the subjective outcomes that will be measured. In comparison, PSM remains a more reasonable method for the structure of my sample and the large number of available covariates.

4.5 Survey Design and Data Collection

The data collection was conducted at eight middle schools, six in Huaiji (怀集) County of Zhaoqing (肇庆) City, and two in two small towns of Qingyuan (清远) City. Both cities are located in the mountainous northwest Guangdong, and they are the major areas with Lighthouse interventions. Guangdong Province has a serious economic imbalance. Assuming a 1 to 6.3 exchange rate, in 2011 the GDP per capita in the two richest Cantonese cities, Shenzhen and Guangzhou, was 14968 and 13882 USD, while for the two cities I collected my data it was only 4442 and 4680 USD.⁶⁵ Northwest Guangdong not only shares with other coastal rural areas the lower migration opportunity cost/better access to manufacturing, clearer perception of the rural–urban disparity, and more accurate

⁶⁴ These two schools have primary school participants that were not included in the survey.

⁶⁵ Data source: China Statistical Yearbook for Regional Economy 2011, as for the data in the next two paragraphs.

information on urban opportunities, but also has the Cantonese features of gender discrimination and mercantilism.

Huaiji County was the major location of data collection. It is about 3.6 thousand square kilometers (21 times the size of Washington DC) with a population of 1.05 million. The 2010 per capita income for its rural population was only 6135 RMB, or 975 USD. I will mainly focus on this county when discussing the sampling strategy. Huaiji consists of 19 towns. Most towns have only one lower secondary school, except for the socioeconomic hub of Huaicheng. Most schools are named for the town in which they are located.

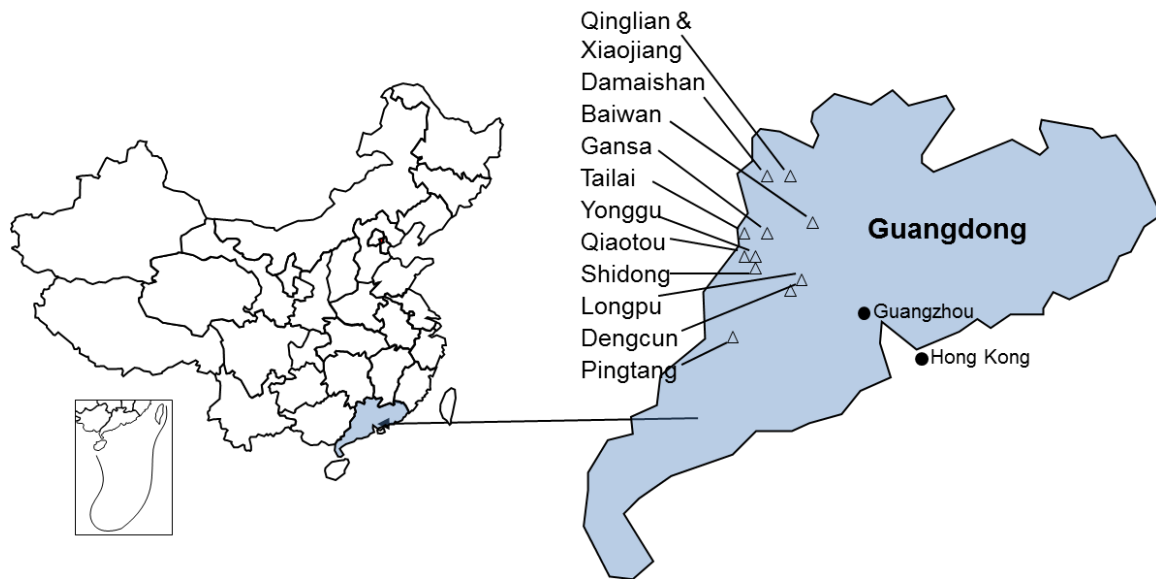
Of the two Qingyuan schools, one is located in Liannan Yao Chinese (瑶族) Autonomous District, and the other is located in nearby Qingxin County. In 2010, the per capita incomes for their rural populations were respectively 4295 and 6642 in RMB, or 682 and 1054 in USD.

Starting from the sampling section, pseudo names are used to further discuss the eight surveyed schools.

4.5.1 Sampling Strategy

Figure 4-5 shows the middle schools with Lighthouse interventions by 2012. Six of them will be surveyed as a result of the availability of a Lighthouse program in summer 2012. Of these, HQ, HS, HT and HY are all located in Huaiji. QD and QB are located in Qingyuan. According to the recommendations of local residents, I included two more Huaiji schools, HA and HL, to the survey, which have a socioeconomic environment similar to the towns with Lighthouse interventions. More specifically, I asked local residents to recommend towns where they perceived people had a similar income and culture to those of the Lighthouse towns. Including HA and HL helps expand the sample size for determinant analysis.

Figure 4-5 Schools with Lighthouse Interventions in Guangdong



These six Huaiji schools are sufficiently diverse regarding student enrollment and Lighthouse engagement. HQ had over 3000 students and eleven years of Lighthouse intervention before the survey; HS has about 4000 students and four years of Lighthouse intervention; HT has about 800 students and is a new Lighthouse site; HY about 1500 students and seven years of Lighthouse intervention; and both HA and HL have over 1500 students but no Lighthouse intervention. The Huaiji survey was performed with all lower secondary students (Grades 7-9) and their households, head teachers, and principals.

The two Qingyuan schools are relatively small, with a total enrollment of less than 1500. The QD middle school is dominated by Yao Chinese students, a minority group, while the QB middle school is dominated by Han Chinese students. Both the schools have been engaged with Lighthouse since 2004.

One concern to be instantly raised is sampling bias. In order to answer Research Question 2, six out of the eight surveyed schools are Lighthouse schools. The school characteristics leading to their engagement with Lighthouse could also affect PCED, therefore causing bias for results of PCED determinants. This study does not intend to offer one-size-fits-all findings, but it does try to offer accurate insight on the situation of northwest Guangdong. To maximize the value of this sample,

comprehensive questionnaires were developed to gather as many information as possible, as introduced in the following section.

4.5.2 Questionnaire Design

This research produces separate questionnaires for students, teachers, principals, and student households (presumably parents or guardians). There were also volunteer questionnaires for the Lighthouse volunteers when they were approaching the end of the 2012 summer program. These five questionnaires are presented in Appendix B.

The major data collected were PCED determinants suggested by literature and the Delphi results. Gansu Survey of Children and Families (GSCF) and Zhang's dissertation on the determinants of NCEE performance in China (Zhang, 2011) were my major references for questionnaire design. GSCF is the most frequently cited project in rural PCED studies (e.g. Park & Hannum, 2002; Hannum & Adams, 2007; Hannum et al., 2009, etc.).⁶⁶ Zhang's study also has a data collection process similar to that of this study (introduced below). Since the questionnaires from these two sources do not touch the topic of schooling tracks, I also refer to track-related questionnaires used in recent Chinese studies, including Zhu (2006), Fang (2007), and Zhang (2009).

The most challenging issue involved the subjective factors, especially those related to personality, or non-cognitive skills. Literature has recommended the Big Five Personality traits and Duckworth's Grit Scale for measurement (Muller, 2015), but with the tension between accuracy and answering time, I adopted the group of questions from GSCF (e1~e60 in the student questionnaire). They measure the student's mental health such as confidence, courage and gregariousness. The similar questionnaire has proven reliability and validity after tests on over 20000 Chinese middle school students (Wang et al., 1997). It is neither too long nor too short, and much more localized and specific than other available tests. In the GSCF questionnaire, the student makes a choice from four options: "totally disagree", "disagree", "agree", and "fully agree". In my version, I expand the number

⁶⁶ For details, please refer to <http://china.pop.upenn.edu/>

of options to 6, adding “agree a little” and “basically agree” to the middle. The reason for this adjustment is to create greater variation in answers to better capture the impact of personality-related factors on PCED, as well as the Lighthouse impact on these factors. In GSCF, most students were in elementary school when answering this group of questions for the first time, but in my sample the students were in lower secondary school. They are theoretically more cognitively ready to answer 6-option questions.

As suggested by the Delphi result (Figure 4-3), the Lighthouse impacts that are consistently considered important and well-realized are mostly socio-emotional, and therefore the change in some subjective factors could be attributed to Lighthouse participation. This study is not going to cover all 25 suggested impacts as some are for the long term, and some are difficult to measure. More importantly, it is necessary to limit the time required to answer, to ensure answer quality. If it takes too much time to finish a questionnaire, the students could lose patience and their responses become cursory.

The student, household, teacher and principal questionnaires are keys to answering the research questions, so in May 2012 a group of 20 students (and their families) and one retired principal were invited to answer the drafts to see if the number and content of questions are reasonable.

Finally, I also gathered information about the Lighthouse operation. In schools with Lighthouse interventions, the questionnaires will incorporate questions about engagement with, and perceptions of, the program.

4.5.3 Data Collection

Survey Team

I have seven research assistants (RA) working on this dissertation research. They are all college students recruited from Guangzhou, the capital city of Guangdong. Five are former Lighthouse volunteers, and the other two have volunteer experience in the survey area. I conducted resume screening and interviews to ensure that they were capable of survey implementation. All had also

completed the human research curriculum provided by the Collaborative Institutional Training Initiative (CITI), which teaches about how to engage human subjects without violating their rights. Their lodging and meals in the survey sites were paid, and each received a stipend of 1500 RMB (238 USD).⁶⁷

The RAs were given two assignments. They disseminated and collected the questionnaires, and they worked on the data entry. They worked together in a classroom for an entire day of pilot data entry, so we could discuss confusing answers. Each RA was then provided with a proportion of the answered questionnaires for data entry in MS Excel. Finally their files were merged and imported into Stata by myself.

At the same time as data entry was ongoing, my RAs had been involved with other qualitative surveys of students and their families at different stages of the summer camp. One worked on the Rural China Education Foundation (RCEF) project for service education, others worked as Lighthouse monitoring and evaluation volunteers at the sites. As the completed Delphi survey included scholars, volunteers, and educators, it was advisable to include students and households as they are also important stakeholders of PCED/Lighthouse interventions.⁶⁸ Assuming that the Delphi is well-implemented, there should not be new findings about students and their households.

Data Collection in the Qingyuan Schools

I conducted two waves of surveys in the Qingyuan schools. The baseline survey was undertaken in June 2012. An early version of the student, household, homeroom teacher, and principal questionnaires in Appendix B was used in the survey.

To some extent, this baseline survey served as a large-scale “pilot study”. It helped the refinement of questionnaire design. For example, in one question (d10 of the student questionnaire) I asked the students to write down the subject taught by their favorite teacher, and it turned out that some students thought I was asking for the name of the teacher. As a result, I had to again ask the

⁶⁷ Sponsored by the Weatherhead Ph.D. Summer Training Grant.

⁶⁸ Some might suggest governors as a group of stakeholders. They were included as educators. In the surveyed towns, principals and some fulltime teachers were natural candidates for positions in the County Education Bureau.

school the subjects taught by the indicated teachers. That question was refined to prevent the same misunderstandings from happening again when the survey was conducted for Huaiji students. The Qingyuan survey also helped me refine the survey procedure. Because some students were boarding, we had to take a weekend for the completion of household questionnaires. My implementation allowed students to finish the questionnaire in the classroom, and then bring the household version home. It turned out that this arrangement increased the administrative burden for both us and the schools, without an obvious improvement in survey quality. In addition, some boarding students just forgot to bring the household questionnaires to the schools. I obtained 1010 observations for students, but only 734 observations for households. Following this experience, I decided to let the students take home both student and household questionnaires for the survey in Huaiji. My team stayed for the extra days after the weekend to retrieve the questionnaires.

The post-intervention survey was conducted in late September. Students who were in Grade 7 or Grade 8 in 2011-12 school year were to be asked again about the personality-related questions and PCED, and whether they participated in the Lighthouse program in summer 2012. The actual PCED and HSEE scores of Grade 9 students (who were no longer in local schools) were collected from homeroom teachers and parents. As suggested by the literature, actual PCED could be different from expected PCED (e.g. Song et al., 2011). An analysis in Chapter 5 is devoted to examining how different they could be.

Data Collection in the Huaiji Schools

The Huaiji survey was scheduled for September 21st to 26th of 2012. This is the most appropriate period in the year. It is right after the Chinese Teacher's Days. During that time, there is less administrative burden for lower secondary schools. It is also right before the 7-day National Day Vacation, so my RAs had sufficient time for engagement. I actually received an official survey approval for a pre-summer baseline survey, however it was cancelled immediately before my team was ready to visit. For details, please refer to the survey log in Table 4-3.

Regarding the implementation of data collection, the student, household, homeroom teacher, and principal questionnaires were given out on September 21st, a Friday, while the rest of the days are for questionnaire collection. The local printing price was about 20 times that at urban universities, so my team printed everything in Guangzhou and took it to Huaiji. We used two cars to carry the staff and material.

Table 4-3 Survey Log

Date	Content	Progress	Note
12/26 th -30 th of 2011	Visited 7 Principals, 1 in Yunfu, 2 in Qingyuan, and 4 in Huaiji County of Zhaoqing. Also visited the new director of Huaiji Education Bureau.	Oral approval of survey from Huaiji	
March/April of 2012	1. Excluded Yunfu schools because Lighthouse is not going to have activities there. Targeted 10 Huaiji schools and 2 Qingyuan schools, which have different levels of Lighthouse intervention. 2. Design of Questionnaires. Mainly revised from the questionnaires used by the Gansu Team, Yu Zhang, and three Chinese study on rural educational track	Found two relative new Lighthouse schools so I can better measure the short-term impacts 1 st draft of questionnaires	Before that, one Lighthouse staff visited schools and officials twice to ensure the smooth implement.
May of 2012	Research Assistant Recruitment (05/06) Revision of questionnaires One day round trip between Huaiji and Shenzhen for survey negotiation. Pilot studies from students, teachers, and one principal	Seven RAs recruited in late May after resume screening and interview 2 nd draft of questionnaires Paper approval of survey from Huaiji (05/15) Allowed to re-apply for a survey in late-September The questionnaires used for the June survey in Qingyuan	Five RAs with Lighthouse experience. Started work assignment right after recruitment, e.g. questionnaire printing, car renting But then received a rejection on 05/29 Informed of the reason of rejection. A report from other organization exposing the “bad” local education ^a , which jeopardized the political life of the bureau’s leadership
June of 2012	06/07-06/08: surveys in two Qingyuan schools with 1 Lighthouse staff and 3 RAs 06/09-06/10: 3 RAs practiced data input 06/11-06/13: Getting back the household surveys. All RA practiced data input. Finding possible problems. Work	Student, teachers, principal questionnaire attained Generate/revise Stata and Excel file for input Expect the baseline dataset finished on 07/12. Building a doc.	1. Data orally provided by the Principals were more accurate than those written down in documents. 2. Having students answer the questions in class did not provide ideal quality.

	division. Right after the Qingyuan survey, I submitted the new application for the Huaiji survey	about input instruction and a doc. on interesting answers.	1. Unable to receive the results quickly because the Bureau was busy in High School Entrance Exam. 2. Included Sun Yat-sen University for survey organization to lower local government's worry about international background
July of 2012	Revised the questionnaire again based on the baseline answering quality.	data merge, further edit the questionnaires (07/17) Start a negotiation with the Guangzhou Youth Cultural Palace, try to acquire a survey permission through the party league system	For the 2 Qingyuan schools, received 1010 observations for students and 734 observations for households.
August of 2012	Volunteer questionnaires finished. Conducted by Lighthouse staff 2 RAs to the Lighthouse schools for qualitative studies, also for surveys of Lighthouse volunteers.	Volunteer information collected Extra qualitative information on student and household collected as observation reports	Data entry completed Surveys by RCEF and Lighthouse, but data accessible to self
September of 2012	2 RAs worked on follow-up survey for Qingyuan schools 5 RAs worked on survey in Huaiji schools	The information needed for all of the major analyses were obtained	A large expansion of expected sample size to over 7000. In the two largest school of HQ and HS, we randomly selected 7 classes for each grade.
October of 2012	Data Entry Disseminate the questionnaire to one more Huaiji school, HL	Entry of Qingyuan Data done Information from one more non-Lighthouse school.	The survey was finished in early October, but we cannot retrieve them until the winter revisit. The principal of HL is the former principal at HT school. He hoped Lighthouse could expand to his current school.

- a. Link to the report that caused a temporary rejection of the survey in May 2012:
<http://gcontent.oeeee.com/4/26/426c953178f1ab16/Blog/bfd/c4ed38.html>

4.6 Missing data

It is not surprising to find missing data because the student/parent/teacher/principals may lose patience when answering the questionnaire, may be reluctant to answer some of the questions, or may find it difficult to answer some of the questions, especially those related to the monetary costs and rewards of different PCEDs. This study employed multiple imputation (MI) by chained equations

to deal with missing data. More specifically, the missing PCED⁶⁹ was imputed by values attained from multinomial logit of PCED on all independent variables, and each independent variable was imputed by values attained from either the logit or order logit of that variable on PCED and other independent variables. The number of imputations to add is five, a classic number that can guarantee the efficiency of estimates (Rubin, 1987)⁷⁰. It is also worth mentioning that five imputations generate the proper amount of PSM results, neither too many nor too few.

Given the length of the student questionnaire, it is quite likely that some students lost their patience and provided random answers, generating systematic missing data that cannot be solved statistically. My solution to this kind of missing data is to insert a question asking how much they lost their patience in about 4/5 of the student questionnaire. If that question was left blank, the student is assumed to be totally impatient, and the whole observation will be removed from my analysis before the MI. This operation actually removes a large sample of 1693 students (860 boys, 833 girls). By checking the answers given by this group, it confirms that they did not fill the questionnaires seriously, with some even skipping basic information like gender and class. We cannot trust their given answers since we do not know whether they really paid attention to them. It is also interesting to see that among those responding to the question about patience, as many as 76.2% said they did not lose patience, so it seems the “distribution” of patience was polarized. Intuitively, impatient students may be less likely to continue their schooling, and, according to Delphi results, patience is neither a determinant nor an impact of, Lighthouse programs. Therefore, removing impatient students may result in selection bias for Research Question 1 about PCED determinants, but it should not affect the answers to Question 2 about Lighthouse impact. These assumptions are supported by cross-tabulation between the answering status of patience question and other variables on the raw dataset. The tabulation showed that students who skipped the patience question were more likely to choose dropout, work, or undecided, and that the two groups had almost identical treatment rate.

⁶⁹ I also tried the analysis without PCED imputed. It does not provide a particularly different result for both multinomial logit and propensity score matching.

⁷⁰ I also tried larger number of imputations, and little difference was found in the results. An important reason to keep the number small is to maintain conciseness when reporting PSM results.

Of course, caution is needed for interpretation, as the answers provided by impatient students might be less reliable.

4.7 Variable Construction

This section gives a master table on variable construction. It divides all variables adopted by this study into thirteen groups, including one group for PCED and treatment variables, eleven groups for potential PCED determinants, and one group for additional variables about treatment's outcomes and determinants. For each item, variable description and key questionnaire items (see Appendix B) are provided. Variables for volunteer teams are based on a very different sample and are not involved in the major model of MNL or PSM. They will be separately introduced in Chapter 7.

The grouping of potential PCED determinants matches almost 100% those suggested by the literature, except that now alternative-specific variables are set as and proxied by case-specific variables due to the fact that there are no pure alternative specific factors in this research. Community factors were also not specified as a group, but they are included in peer and school factors⁷¹, as are some localized variables suggested by Delphi (e.g. local entertainment industries, outreach of factory). The eleven groups of PCED determinants are (1) Gender, Age and Ethnicity, (2) Parental Background, (3) Number of Siblings and Birth Order, (4) Peer Factors, (5) Teacher Factors, (6) School Factors, (7) Household Economic Status and Credit Constraints, (8) Subjective Factors, (9) Health Factors, (10) Monetary Cost and Rewards, and (11) Academic Performance and Other Variables (from Delphi). Groups (4) to (6) will be combined in the interpretation of regression findings.

⁷¹ Note that each town has only one middle school, and students living too far away tend to be boarding or lease a room near the school.

Table 4-4 Variable Construction

Category	Variable	Description	Key items used
PCED and Treatment	pced	1 to 5 for Dropout/Work/VHS/AHS/Undecided	a7
	treated	Participated in either the latest or earlier Lighthouse program(s); 1/0=Yes/No	g5 g6 g9
	participation	Participated in the latest Lighthouse; 1/0=Yes/No	g9
Gender, Age and Ethnicity	female	Female student; 1/0=Yes/No	b2
	f_income	Female from a relatively high income household (log of income belongs to upper half); 1/0=Yes/No	b2 h8 h18 i2
	f_performance	Female with relatively high performance (test score/ranking belong to upper half in school); 1/0=Yes/No	b2 b11 g8
	f_cost	Female from a household that perceives relatively high cost of further education; 1 to 6 from low to high	b2 j5a~j5d
	age	Older than the mode of age within the grade; 1/0=Yes/No	b1
	minority	Minority; 1/0=Yes/No	b3
Parental Background	single_p	With single parent; 1/0=Yes/No	c2
	migrant_p	With migrant parent; 1/0=Yes/No	c2 h2 h12
	no_p	Both parents dead or at home for less than 1 month in the past year; 1/0=Yes/No	c2 h7 h17
	medu	Mother's education level; 1 to 6 for no schooling to some upper secondary education or above	h1
	fedu	Father's education level; 1 to 6 for no schooling to some upper secondary education or above	h11
	peasant	Parents being peasant; 1/0=Yes/No	h2 h12
	politicalc	Political capital; 1 to 3 for either parent is other/Communist League member/Communist Party member	h3 h13
	parent_leader	Father or mother are cadres; 1/0=Yes/No	h2 h12
	parentbadhealth	Father or mother's health does not allow for normal life or work; 1/0=Yes/No	h9 h19
Number of Siblings and Birth Order	sibship	Number of siblings (including the student); 1 to 6 in which 6 means 6 or more siblings	c3~c6
	witheldersister	Has an elder sister; 1/0=Yes/No	c4
	eldercohort	Being the older siblings; 1/0=Yes/No	c3~c6

Peer	mignetwork	Perceive prevailing trend of going out as young migrant worker; 1/0=Yes/No	g1d g2d
	peerpedu	Average parental education level in class; 1 to 3 for primary unfinished/primary/lower secondary unfinished	h1 h11
Teacher	tch_origin	Homeroom teacher's origin; 1 to 4 for local town/other town in county/other place in province/other province	k7
	tch_edu	Homeroom teacher's level of education; 1/0 for college/non-college	k5
	tch_admin	Homeroom teacher holds other administrative position in the school; 1/0=Yes/No	k12
	tch_exp	Homeroom teacher's experience as fulltime teacher; 1 to 4 for 2 years or less/3 or 4 years/5~10 years/over 10 years	k8
	tch_mthgain	Homeroom teacher's monthly income; divided into 6 quantiles	k13 k14 k15
	tch_paydelayed	Homeroom teacher experienced pay delayed in the past 6 month; 1/0=Yes/No	k16
	subtch_origin	Key subject (Chinese/math/English) teacher origin; take means and divide into 4 quantiles	16a 17a 18a
	subtch_edu	Key subject (Chinese/math/English) teacher level of education; take means and divide into 4 quantiles	16b 17b 18b
	subtch_exp	Sum of key subject teacher's experience as fulltime teacher; take means and divide into 4 quantiles	16c 17c 18c
School	classsize	Classsize; divided into 4 quantiles	k1d
	distance	Traveling time to school; divided into 6 quantiles	b8
	survival	School has relatively high retention rate (>66%)	n15 n17 oral-information
	school1	HL School; 1/0=Yes/No	a3
	school2	QB School; 1/0=Yes/No	
	school3	QD School; 1/0=Yes/No	
	school4	HQ School; 1/0=Yes/No	
	school5	HS School; 1/0=Yes/No	
	school6	HT School; 1/0=Yes/No	
	school7	HY School; 1/0=Yes/No	
	school8	HA School; 1/0=Yes/No	

Household Economic Status and Credit Constraints	wealth	Wealth status; 1 to 4 based on the availability of cement house, computer/internet/car, and motor cycle	i9k i9v i9w i9x i9y i10
	housesize	Household size; divided into 4 quantiles	i1
	income	Log of household income; divided into 6 quantiles	h8 h18 i2
	credit_financiali	Log of available credit from bank or credit cooperative; divided into 6 quantiles	i4
	credit_relative	Log of available credit from relative; divided into 6 quantiles	i5
Subjective Factors	stu_eduaspiration	Expected highest level of education, 1 to 5 for lower secondary/vocational high/academic high/college/graduate school	a11
	expect_norm	Expect agriculture or manufacturing as future career; 1/0=Yes/No	a12
	expect_advanced	Expect science, technology, or government as future career; 1/0=Yes/No	a12
	percep_schquality	Perception of school quality; take mean of the ratings to related items and divide into 6 quantiles	d1d d1e d1f d1l d1j d1m
	percep_schaffiliation	Emotional attachment to school; take mean of the ratings to related items and divide into 6 quantiles	d1a,b,c,o,p,q,r,s,t,u
	percep_schvalue	Perceived value of schooling; take mean of the ratings to related items and divide into 4 quantiles	d1g d1v
	percep_scheffort	Willingness to study; take mean of the ratings to related items and divide into 4 quantiles	d1h d1n
	confidence	Level of confidence; take mean of the ratings to related items and divide into 6 quantiles	e4 e8 e12 e14 e26 e44
	courage	Level of courage; take mean of the ratings to related items and divide into 6 quantiles	e5 e8 e25 e26 e29
	curiosity	Level of curiosity; take mean of the ratings to related items and divide into 6 quantiles	e24 e62
	ambition	Level of ambition; take mean of the ratings to related items and divide into 6 quantiles	e7 e11 e41
	familyonstudy	Level the family cares about their study and PCED, perceived by the student; take mean of the ratings to related items and divide into 6 quantiles (end up only category 1 to 5 available)	f5a f5b
	familyonemo	Level the family cares about their emotional status and respects their opinion, perceived by the student; take mean of the ratings to related items and divide into 6 quantiles	f5c f5d f5e
	tchr_contvsstop	Homeroom teacher's preference of continuing education over stopping education; take ratio of the ratings and divide into 4 quantiles	l1a~l1g
	tchr_genvsvoc	Homeroom teacher's preference for academic high school over vocational high school; take ratio of the ratings and divide into 4 quantiles	l1d~l1g

Health	sick	Suffers disease(s); 1/0=Yes/No	b9
	sick_class	Suffers health issues that directly affect study, namely feeling hungry/dizzy during class and having eyesight problem; 1/0=Yes/No	b10 d7 d8
Perceived Cost/ Reward of the PCED	cost_vocvsjunior	Cost of VHS relative to cost for middle school, perceived by the household; take ratio of the amounts and divide into 6 quantiles	j5a j5c
	cost_genvsvoc	Cost of AHS relative to cost for VHS, perceived by the household; take ratio of the amounts and divide into 6 quantiles	j5b j5c
	cost_colvsgen	Cost of college relative to cost for AHS, perceived by the household; take ratio of the amounts and divide into 6 quantiles	j5b j5d
	earn_workvsdrop	Expected relative earnings in 35 if work-after-graduation instead of dropout, perceived by both the household and the student; take ratio of the amounts and divide into 6 quantiles	f1a~f1e j4a~j4e
	earn_vocvswork	Expected relative earnings in 35 if continue to VHS instead of work, perceived by both the household and the student; take ratio of the amounts and divide into 6 quantiles	f1c~f1e f1g j4c~j4e j4g
	earn_genvsvoc	Expected relative earnings in 35 if continue to AHS instead of VHS, perceived by both the household and the student; take ratio of the amounts and divide into 6 quantiles	f1f f1g j4f j4g
	earn_colvsgen	Expected relative earnings in 35 if continue to college instead of AHS, perceived by both the household and the student; take ratio of the amounts and divide into 6 quantiles	f1f f1h j4f j4h
Academic Performance and Possible PCED Determinants	knowvoc	Student and their family's knowledge of vocational education policies; 1 to 4 for No to Very Much	f2 j6
	performance	Academic performance; take mean of both ranking and score and then divide into 4 quantiles within school	b11 g8
	business	Has family business to inherit; 1/0=Yes/No	h2 h12
	interpersonal	Situation of interpersonal relationships in school; take mean of the ratings to related items and divide into 6 quantiles	e17,19,20,28,35,36,43, 49,50,51,58
	urbanlife	Used to stay in nearby cities for over 1 month; 1/0=Yes/No	b16
	outreach_voc	Perceived frequent outreach from vocational schools; 1/0=Yes/No	g1f g2f
	outreach_fac	Perceived frequent outreach from factories; 1/0=Yes/No	g1c g2c

local_negative	Holds very negative view of local development; 1/0=Yes/No	f3 j7
local_entertain	Perceived prevalence of entertainment industries (KTV, gambling or illegal lottery, internet bar) in the neighborhood; 1/0=Yes/No	g1a g1b g1e g2a g2b g2e
gambling	Has been involved with gambling or illegal lottery; 1/0=Yes/No	d4
schatmos	School has relatively good study atmosphere (level of violence, cheating, class discipline); 1/0=Yes(> mean value)/No	d9a-d9f
chore	Time spent on housechore; divided into 4 quantiles	b12
love	Was or is in love with someone; 1/0=Yes/No. Considering the sensitivity of this topic for teenagers, this question was asked with 6 options from strongly disagree to strongly agree, so student can answer “basically agree” if they feel shy about confirming the relationship	e63
grade_7	Study in Grade one of the middle school; 1/0=Yes/No	a4
grade_8	Study in Grade two of the middle school; 1/0=Yes/No	
grade_9	Study in Grade three (last grade) of the middle school; 1/0=Yes/No	

Additional Variables for Treatment Outcomes or Determinants	extraversion	Level of extraversion; take mean of the ratings to related items and divide into 6 quantiles	e17 e19 e25 e28 e29 e43 e50 e55
	affiliationneed	Level of need of affiliation; take mean of the ratings to related items and divide into 6 quantiles	e31 e33 e35
	atti_chore_farm	Attitude towards housechore/farm works; 1 to 6 for hate to love	e61
	other_act	Level of other activities (housechore/farm works/city visit or job), according to the household; take mean of the ratings to related items and divide into 6 quantiles	j3b j3c
	peertreated	Popularity of Lighthouse participation among classmates (Lighthouse participants as % to the class); divided into 4 quantiles	g5 g6 g9
	attoncamp	How supportive the household is of participating in summer camp or how much they respect the student’s own preference; take mean of the ratings and divide into 6 quantiles	j3a j3d

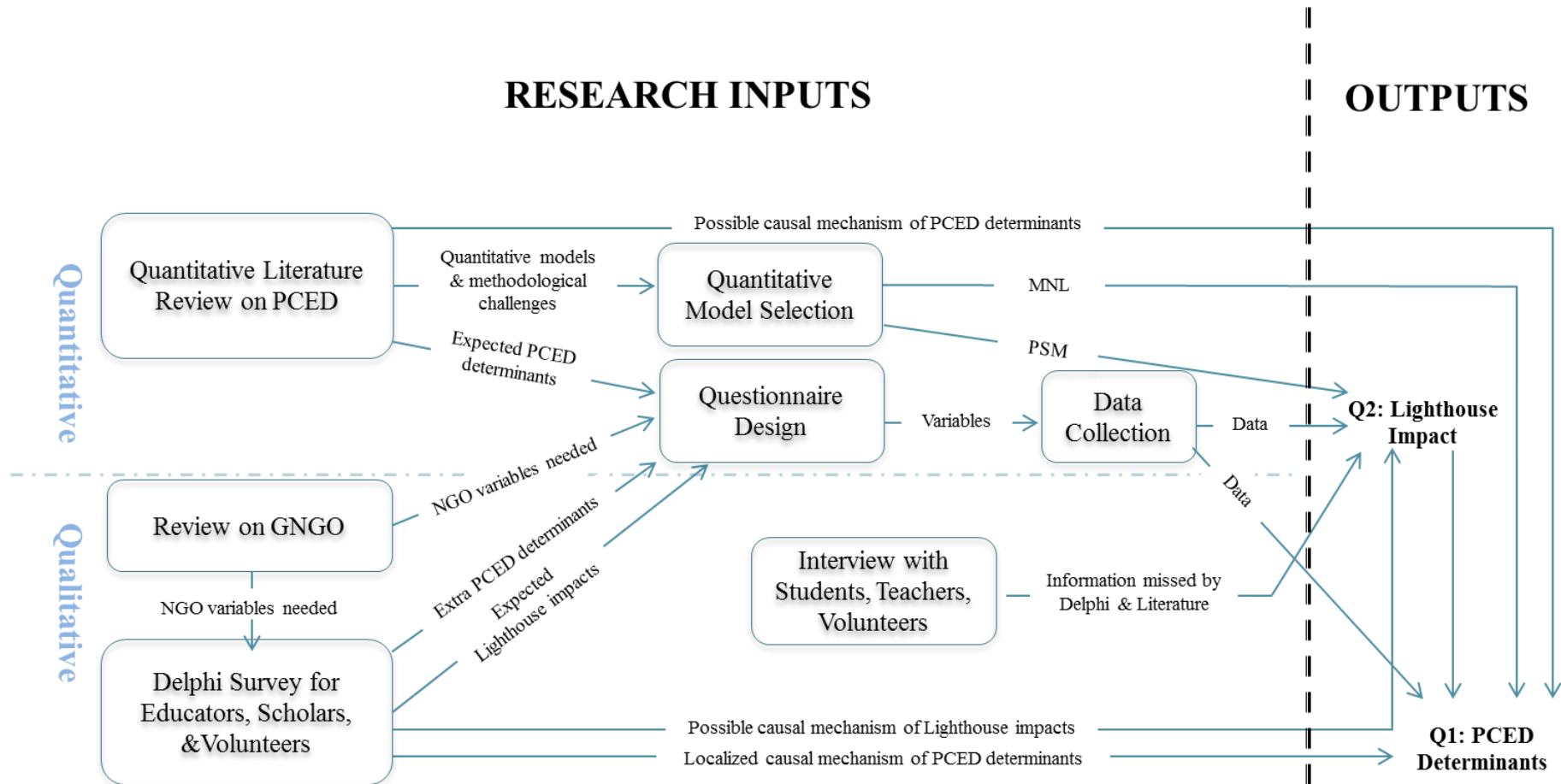
4.8 Synthesis of Research Components

As a summary, Figure 4-6 illustrates the logical connections between the research components, as well as how they ultimately contribute to answering the two research questions.

The review of PCED presents available quantitative methods and methodological challenges, while the review of GNGO uncovers the need of impact evaluation. From the knowledge gaps that both reviews suggest, we were able to select appropriate quantitative designs for this research. The literature reviews also lists potential PCED determinants and NGO factors for questionnaire design, however they offer little information specific to either Southern China or Lighthouse intervention, and therefore I conducted the Delphi survey to collect extra localized PCED determinants and Lighthouse-relevant information for questionnaire design.

The PCED-related data will be used for the implementation of MNL, which helps identify the PCED determinants. The Lighthouse data, together with PCED-related data, will be used for the implementation of PSM, which helps identify the direct Lighthouse impacts. As Delphi does not include students and households, I have acquired additional qualitative information for these two groups to identify whether any missing information exists. In terms of the causal interpretation of quantitative results, they were mostly prepared by Delphi. The assumption to be tested is whether Lighthouse can affect PCED through changing socio-emotional factors that are also PCED determinants.

Figure 4-6: Connections of Research Steps



Chapter 5 Descriptive Statistics

This chapter presents non-imputed descriptive statistics, starting from the expected and actual PCED, and then the independent variables of different classifications highlighting comparisons between full and treated samples, plus one section on additional variables for treatment outcomes or determinants. The full valid sample size is 6298 students from eight surveyed schools, among which the treated sample size is 678 for Lighthouse students of the six Lighthouse schools. Among these 678 students, 211 attended the most recent Lighthouse program (before data collection) in summer 2012.

5.1 Expected PCED and Actual PCED

The descriptive analyses on dependent variable illustrate how heterogeneous (to basic characteristics and grades) and changeable the expected PCED is. In addition, although expected PCED cannot fully predict actual PCED, the two-school subsample show that students expecting to continue schooling do tend to have further education (VHS or AHS) as actual PCED.

Table 5-1 provides distributions of expected PCED for the whole sample, for the subsamples by gender, wealth, and test performance, and for the sample that had participated in Lighthouse program(s). Given that students who wanted to drop out might be already out of school and therefore absent for the survey, it is understandable that less than 2% selected dropout. For the rest of options, over one third of students chose VHS, and a quarter had not made a decision (chose “Undecided”). Girls were more inclined to VHS, while boys were more likely to choose work or AHS. It is also notable that girls apparently outnumber boys, reflecting the fact that boys are more likely to stay with their migrant parents in cities. Tabulations by wealth and test performance were no surprise, as students with higher SES or test performance prefer to continue their schooling (VHS or AHS) rather than dropout or work. These students are also less likely to have undecided PCED. Finally,

PCED distribution for the treated sample is close to those of higher SES or test performance, except for a dropout tendency similar to the whole sample.

Table 5-1 Sample Distribution by Expected PCED and Student Background

	Whole	Gender		Wealth		Test Performance		Treated
	Sample	Female	Male	Richer	Poorer	Higher	Lower	Sample
Dropout	1. 67	1. 59	1. 78	0. 85	2. 17	0. 92	2. 45	2. 09
Work	16. 58	15. 42	18. 42	14. 16	18. 07	10. 66	20. 82	11. 69
VHS	36. 88	39. 87	32. 14	40. 63	34. 57	40. 71	34. 8	40. 31
AHS	20. 36	18. 17	23. 82	22. 8	18. 85	28. 62	16. 7	24. 61
Undecided	24. 51	24. 95	23. 82	21. 55	26. 34	19. 08	25. 22	21. 29
# of obs	5222	3203	2019	1991	3231	1960	1796	573

Note: Wealth and performance are both categorical variables with four values. Here values 1 and 2 are considered as Poorer/Lower, and values 3 and 4 Richer/Higher.

While tabulations by background characteristic can give us a big picture of the PCED distribution, a tabulation by grade helps further enrich that picture in a more dynamic way. Table 5-2 shows the PCED numbers and percentages by grade for the full and the treated samples. Since there is a decline of sample size by grade that may result from dropout, transfer, early VHS enrollment, or simply the demographic change, caution is needed when interpreting the figures. It appears that PCED distributions for treated samples tend to show a sharper and positive change from Grade 7 to Grade 9. For example, for both samples 25.1% of Grade 7 students chose undecided, and in Grade 9 they were still as high as 21% for the whole sample, but only 17.8% for the treated sample. Of course, without controlling for covariates, we cannot claim this gap is attributable to Lighthouse program.

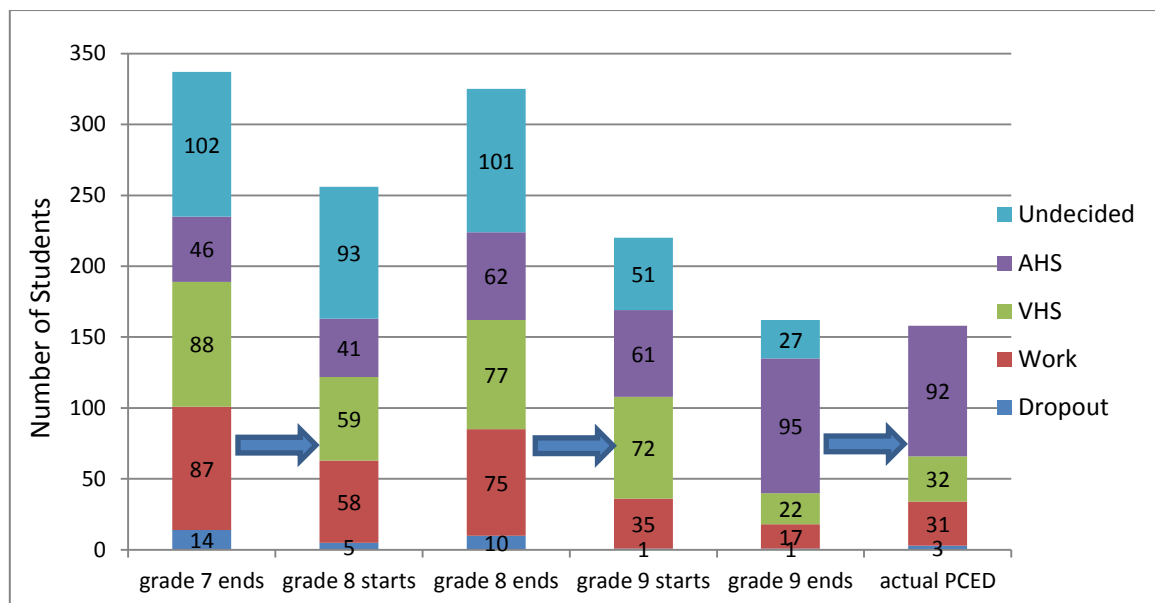
Table 5-2 Expected PCED by Grade: Whole Sample vs. Treated Sample

#	Whole Sample			Treated Sample		
	Grade 7	Grade 8	Grade 9	Grade 7	Grade 8	Grade 9
dropout	47	26	14	7	4	1
work	377	303	186	25	27	15
VHS	724	650	552	73	77	81
AHS	345	297	421	29	34	78
undecided	500	468	312	45	39	38

%	Grade 7	Grade 8	Grade 9	Grade 7	Grade 8	Grade 9
dropout	2.4	1.5	0.9	3.9	2.2	0.5
work	18.9	17.4	12.5	14.0	14.9	7.0
VHS	36.3	37.3	37.2	40.8	42.5	38.0
AHS	17.3	17.0	28.4	16.2	18.8	36.6
undecided	25.1	26.8	21.0	25.1	21.6	17.8

People may question the fact that tabulations by grade are not really dynamic since they are looking at different students in different grades. People may also question the value of using expected PCED as the dependent variable. These two worries could be partially resolved by looking at the panel sample of the two Qingyuan schools. Data was collected twice, in June and September, for the same group of students, so in Figure 5-1 below, the Grade 7 ends/Grade 8 starts are for the same student group, so are the Grade 8 ends/Grade 9 starts and Grade 9 ends/actual PCED. Overall, the PCED distribution did not change much after one summer, and it is quite evident that there was attrition due to dropout, transfer, or early VHS enrollment. For graduating students, they mostly move to neighboring cities for AHS or VHS, and to the Pearl Delta area for migrant jobs. As requested by schools, this paper would not discuss greater details about their graduating students.

Figure 5-1 PCED from Grade-7 to Post-Graduation (Qingyuan Panel Sample)⁷²



⁷² The 3 dropouts in "actual PCED" refer to the dropouts happened during the month after the first-round of survey but before the end of semester.

The simple tabulation conceals how changeable the PCED can be. Table 5-3 shows the detailed change of expected PCED. Overall, 45% of students still in middle school changed their minds after a summer, and there is no clear route for their change from one PCED to the other. The change rates for traceable students who had already left school (Table 5-4) are also high, although less statistically convincing due to the small sample size. Consequently, it is safe to say that PCED is quite changeable, or alterable, for the two schools with follow-up surveys. This means intervention on PCED determinants might work in changing expected PCED, which is good, but it also means that expected PCED might not be easily transferred to real PCED, which questions the value of this study since, due to data availability, the dependent variable has to be expected PCED.

Table 5-3 Changeable Expected PCED (Qingyuan Panel Sample)

		June 2012					
		Dropout	Work	VHS	AHS	Undecided	Total
September 2012	Dropout	2	2	0	1	0	5
	Work	3	48	6	5	14	76
	VHS	1	14	62	19	23	119
	AHS	0	7	26	48	13	94
	Undecided	5	24	19	10	74	132
Total #		11	95	113	83	124	426
# change minds		9	47	51	35	50	192
% change minds		82%	49%	45%	42%	40%	45%

Table 5-4 Change from Expected to Actual PCED (Qingyuan Panel Sample)

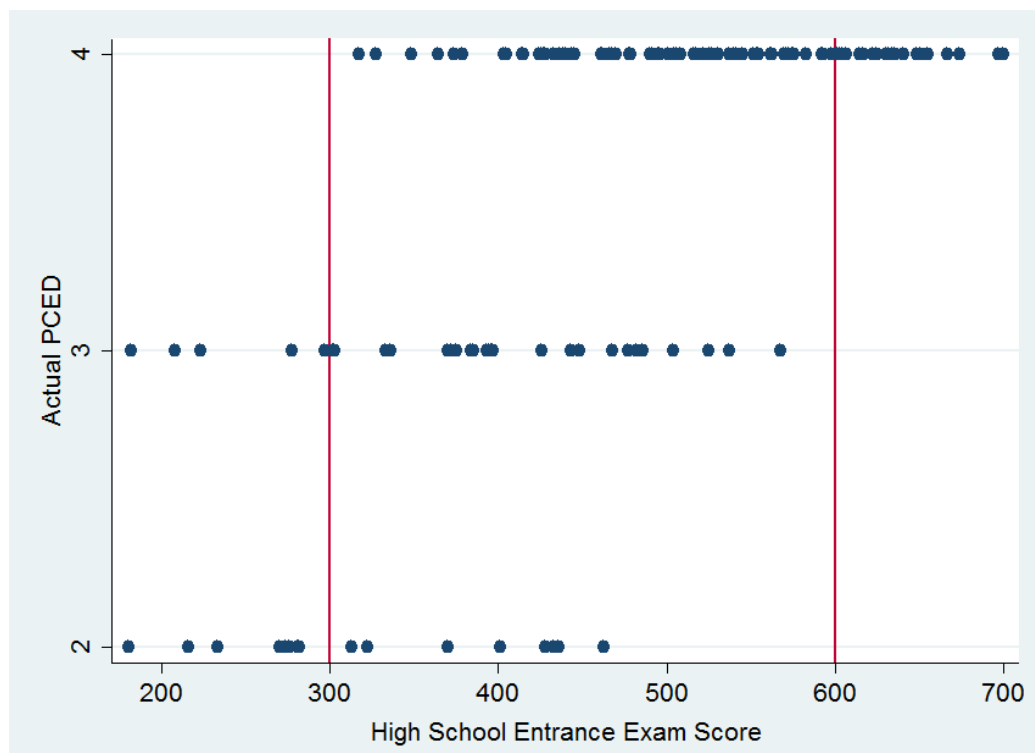
		Expected PCED in June 2012					
		Dropout	Work	VHS	AHS	Undecided	Total
Actual PCED in September 2012	Dropout	3	10	0	4	11	28
	Work	0	8	4	7	8	27
	VHS	3	7	11	8	18	47
	AHS	0	4	8	74	4	90
Total		6	29	23	93	41	192
# change (undecided excluded)		3	21	12	19	—	—
% change (undecided excluded)		50%	72%	52%	20%	—	—

Note: Larger proportion chose AHS because these are the students most likely to persist to the end of middle school.

Nevertheless, if we look closer at Table 5-4, the cross-tabulations actually justify the regressions of expected PCED. Those expecting work or being undecided were more likely to finally drop out or work than those expecting VHS or AHS, while those expecting VHS or AHS tended to stay within the pool of “continuing schooling”. Only 20% of those expecting AHS failed in their anticipation. These jointly imply that although expected PCED may not precisely predict actual PCED, it does predict whether the actual PCED will be positive, i.e. continuing schooling.

Finally, the availability of HSEE scores for the two Qingyuan schools offers a chance to examine the correlation between actual PCED and test results. As shown by Figure 5-2, although it is true that students with higher test scores are more likely to choose AHS, there is no real HSEE cutoff. Students with different PCED overlap between score 300 and score 600. This also reconfirms the argument in Chapter 1 that PCED is mostly driven by factors of demand rather than the supply of schooling opportunities.

Figure 5-2 High School Entrance Exam Score vs. Actual PCED (Qingyuan Panel Sample)



Note: 2=Work (after graduation); 3=VHS; 4=AHS. 140 observations are available for this graph. No dropout data is available since dropout student would not take the exam.

5.2 Independent Variables and Treatment-Related Variables

According to the literature, Delphi results and the reality of data availability, the candidates for PCED determinants were divided into nine groups. The rest of this section will provide non-imputed summary statistics by group for the whole and treated samples. Two-sample t tests were conducted for each variable to see if the treated sample differed from the whole sample at 5% level. Because the whole sample included two schools without Lighthouse intervention, finding a statistically significant difference may just reflect the difference between those two schools and the six Lighthouse schools. Notes will be given when this is the case. A summary table for the six-school sample is provided in Appendix D.

It might be difficult to memorize such a large number of variables, so for each group of variables their descriptions from Table 4-4 are listed again under the statistics.

5.2.1 Gender, Age and Ethnicity

Descriptive statistics for basic student information (Table 5-5) produced the expected results, so are the differences between Lighthouse students and the overall population. There are more girls than boys (6:4) because girls are more likely to be left behind when their parents are migrant workers in the city, and there are even more girls with Lighthouse experience, probably because they have less chance to visit cities in summer. Older students have more housework burdens and working opportunities, so they are less likely to take part in Lighthouse programs. Minorities, mostly Yao Chinese, are concentrated in one school which has continuous Lighthouse interventions, and there are also two non-minority schools with no Lighthouse involvement, which is why the minority rate is much higher for the treated sample, 14% vs. 6%.

For the three “interaction” terms, it turns out that girls with higher academic performance or whose family perceives a higher cost of further education are more likely to be engaged with Lighthouse. Family income, however, does not vary by participation. Strictly speaking, these three

variables are not real interactions. Due to missing data, I took the average of the imputed income and performance, divided them into two groups, and then multiplied them with female dummy. This operation aims to reduce the possible bias of imputed figures. For cost, I took the average of all imputations for all relative cost variables. This creates enough variation to generate a 6-quantile variable to be timed by the female dummy.

Table 5-5 Summary Statistics_ Gender, Age and Ethnicity

	Whole Sample			Treated			Stat. Dif. ?	Min	Max
	Obs	Mean	Std. Dev.	Obs	Mean	Std. Dev.			
female	6298	0. 61	0. 49	678	0. 66	0. 47	Y	0	1
f_income	6298	0. 42	0. 49	678	0. 45	0. 50	N	0	1
f_performance	6298	0. 35	0. 48	678	0. 41	0. 49	Y	0	1
f_cost	6298	2. 07	2. 04	678	2. 42	2. 17	Y	0	6
age	6298	0. 33	0. 47	678	0. 29	0. 45	Y	0	1
minority	6298	0. 06	0. 24	678	0. 14	0. 35	Y	0	1
female	Female student; 1/0=Yes/No								
f_income	Female from a relatively high income household (log of income belongs to upper half); 1/0=Yes/No								
f_performance	Female with relatively high performance (test score/ranking belong to upper half in school); 1/0=Yes/No								
f_cost	Female from a household that perceives relatively high cost of further education; 1 to 6 from low to high								
age	Older than the mode of age within the grade; 1/0=Yes/No								
minority	Minority; 1/0=Yes/No								

5.2.2 Parental Background

Summary statistics for parental background reveal the dilemma faced by many rural households in China today. 7% of students come from a single-parent family, and according to interviews in the field migrant work has become a major reason for separation; more than half the students had at least one migrant parent, and over 20% of the students lived in a household where both parents were dead or had been at home for less than one month in the past year. On the other hand, over 30% of students households merely live on farming. Migrant work brings more income and vision, but separates family members; being a peasant keeps the family intact, but limits future potential under the trend of urbanization.

For other parental background variables, fathers are on average one level higher than mothers in terms of education, reflecting the gender gap in education for their generation. 3% of students have parent(s) who are government officers, and 4% have parent(s) whose health does not allow for normal life or work. Parents who are Communist League or Party members are more likely to have their children participating Lighthouse program.

Table 5-6 Summary Statistics_ Parental Background

	Whole Sample			Treated			Stat. Dif. ?	Min	Max
	Obs	Mean	Std. Dev.	Obs	Mean	Std. Dev.			
single_p	5131	0.07	0.26	589	0.07	0.25	N	0	1
migrant_p	6090	0.54	0.50	656	0.57	0.50	N	0	1
no_p	6081	0.24	0.42	655	0.22	0.41	N	0	1
medu	5158	2.54	1.26	528	2.43	1.23	N	1	6
fedu	4879	3.80	1.37	490	3.71	1.39	N	1	6
peasant	5474	0.34	0.47	551	0.31	0.46	N	0	1
politicalc	5864	1.21	0.55	637	1.26	0.61	Y	1	3
parent_leader	5474	0.03	0.17	551	0.04	0.20	N	0	1
parentbadhealth	4087	0.04	0.20	433	0.04	0.20	N	0	1
single_p	With single parent; 1/0=Yes/No								
migrant_p	With migrant parent; 1/0=Yes/No								
no_p	Both of parents dead or at home for less than 1 month in the past year; 1/0=Yes/No								
medu	Mother's education level; 1 to 6 for no schooling to some upper secondary education or above								
fedu	Father's education level; 1 to 6 for no schooling to some upper secondary education or above								
peasant	Parents being peasants; 1/0=Yes/No								
politicalc	Political capital; 1 to 3 for either parent is other/communist league member/communist party member								
parent_leader	Father or mother being cadres; 1/0=Yes/No								
parentbadhealth	Father's or mother's health does not allow for normal life or work; 1/0=Yes/No								

5.2.3 Number of Siblings and Birth Order

Living in a province far from Beijing, the towns included in this study are somewhat “immune” to the One-Child policy. On average, every couple has three or more children. In the sample, 60% of students have an elder sister, who according to literature may sacrifice their schooling opportunity when necessary, and around 30% are older siblings. The numbers of siblings are statistically different

between the full sample and the treated sample, which is because the two non-lighthouse schools happen to have lower sibship sizes, 3.05 and 2.61.

Table 5-7 Summary Statistics_ Siblings and Birth Order

	Whole Sample			Treated			Stat. Dif. ?	Min	Max
	Obs	Mean	Std. Dev.	Obs	Mean	Std. Dev.			
sibship	6298	3.12	1.57	678	3.27	1.61	Y	1	6
witheldersister	6298	0.60	0.49	678	0.60	0.49	N	0	1
eldercohort	6298	0.30	0.46	678	0.32	0.47	N	0	1
sibship	Number of siblings (including the student); 1 to 6 in which 6 means 6 or more siblings								
witheldersister	Has an elder sister; 1/0=Yes/No								
eldercohort	Being the older siblings; 1/0=Yes/No								

5.2.4 Peer, Teacher, and School Factors

32% of students in the full sample perceived a prevailing trend of going out as young migrant workers, and this figure is much higher for Lighthouse students. The differences are statistically significant even when excluding non-Lighthouse schools. For around two thirds of students, the average parental education level in class is “primary completed”, or peerpedu=2. Due to better educational development in the two non-Lighthouse schools, the mean peerpedu is higher for the full sample.

Table 5-8 Summary Statistics_ Peer

	Whole Sample			Treated			Stat. Dif. ?	Min	Max
	Obs	Mean	Std. Dev.	Obs	Mean	Std. Dev.			
mignetwork	6298	0.32	0.47	678	0.40	0.49	Y	0	1
peerpedu	6298	2.23	0.56	678	2.02	0.49	Y	1	3
mignetwork	Perceive prevailing trend of going out as young migrant worker; 1/0=Yes/No								
peerpedu	Average parental education level in class; 1 to 3 for primary unfinished/primary/lower secondary unfinished								

With regard to teacher characteristics, most homeroom teachers come from local or other towns of the same county, and half have a college degree. About 6% of teachers also have administrative roles in the school, a sign of power, and around one third experienced delay in payment, a disincentive for their devotion. Teacher experience and monthly gain vary. Other teacher variables are all in quantile. Again the mean differences between the full sample and the treated sample are mainly caused by the differences between the two non-Lighthouse schools and the six Lighthouse schools.

Table 5-9 Summary Statistics_ Teacher

	Whole Sample			Treated			Stat. Dif. ?	Min	Max
	Obs	Mean	Std. Dev.	Obs	Mean	Std. Dev.			
tch_origin	6298	1.88	1.07	678	1.88	1.09	N	1	4
tch_edu	6298	0.52	0.50	678	0.49	0.50	N	0	1
tch_admin	6298	0.06	0.25	678	0.06	0.24	N	0	1
tch_exp	6298	2.40	1.12	678	2.40	1.14	N	1	4
tch_mthgain	6298	3.63	1.72	678	3.44	1.81	Y	1	6
tch_paydelayed	6298	0.37	0.48	678	0.29	0.46	Y	0	1
subtch_origin	6298	2.70	1.14	678	2.91	1.17	Y	1	4
subtch_edu	6298	2.54	1.19	678	2.49	1.20	N	1	4
subtch_exp	6298	2.57	1.04	678	2.50	1.04	N	1	4
tch_origin	Homeroom teacher's origin; 1 to 4 for local town/other town in county/other place in province/other province								
tch_edu	Homeroom teacher's level of education; 1/0 for college/non-college								
tch_admin	Homeroom teacher holds other administrative position in the school; 1/0=Yes/No								
tch_exp	Homeroom teacher's experience as fulltime teacher; 1 to 4 for 2 years or less/3 or 4 years/5~10 years/over 10 years								
tch_mthgain	Homeroom teacher's monthly income; divided into 6 quantiles								
tch_paydelayed	Homeroom teacher experienced pay delayed in the past 6 month; 1/0=Yes/No								
subtch_origin	Key subject (Chinese/math/English) teacher origin; take means and divide into 4 quantiles								
subtch_edu	Key subject (Chinese/math/English) teacher level of education; take means and divide into 4 quantiles								
subtch_exp	Sum of key subject teacher experience as fulltime teacher; take means and divide into 4 quantiles								

Variables for school characteristics are mostly for controlling purpose, except for schooling distance which was reported at individual level and then divided into six quantiles. The mean distance for the treated sample is far smaller than that of the whole sample (2.44 vs. 3.05), and there is no difference between the non-Lighthouse-school sample and Lighthouse-school sample. This

echoes the Delphi conclusion that schooling distance is influential in the possibility of Lighthouse participation.

Table 5-10 Summary Statistics_ School

	Whole Sample			Treated			Stat. Dif. ?	Min	Max
	Obs	Mean	Std. Dev.	Obs	Mean	Std. Dev.			
classsize	6298	2.34	1.06	678	2.22	0.97	Y	1	4
distance	5972	3.05	1.73	656	2.44	1.56	Y	1	6
survival	6298	0.48	0.50	678	0.47	0.50	N	0	1
school1	6298	0.14	0.35	678	N/A	N/A	N/A	0	1
school2	6298	0.07	0.26	678	0.14	0.35	Y	0	1
school3	6298	0.06	0.23	678	0.14	0.34	Y	0	1
school4	6298	0.12	0.32	678	0.13	0.34	N	0	1
school5	6298	0.13	0.33	678	0.12	0.33	N	0	1
school6	6298	0.08	0.27	678	0.14	0.35	Y	0	1
school7	6298	0.25	0.44	678	0.33	0.47	Y	0	1
school8	6298	0.15	0.36	678	N/A	N/A	N/A	0	1
classsize	Classsize; divided into 4 quantiles								
distance	Traveling time to school; divided into 6 quantiles								
survival	School has relatively high retention rate (>66%)								
school1	HL School; 1/0=Yes/No								
school2	QB School; 1/0=Yes/No								
school3	QD School; 1/0=Yes/No								
school4	HQ School; 1/0=Yes/No								
school5	HS School; 1/0=Yes/No								
school6	HT School; 1/0=Yes/No								
school7	HY School; 1/0=Yes/No								
school8	HA School; 1/0=Yes/No								

5.2.5 Household Economic Status and Credit Constraints

The category of household economic status and credit constraints contains not only wealth, income, credits, but also the number of household members (housesize), as this determines the average resources each member can receive. Although this category is supposed to be important for PCED, its complexity results in a large amount of missing data. The data could also be seriously distorted, as economic status and credit constraints are far less measurable and traceable in rural

area of China. The summaries are presented in Table 5-11. In the section for robustness, I have regression excluding high-missing-data variables of income and credit.

Table 5-11 Summary Statistics_ Household Economic Status and Credit Constraints

	Whole Sample			Treated			Stat. Dif. ?	Min	Max
	Obs	Mean	Std. Dev.	Obs	Mean	Std. Dev.			
wealth	6298	2.13	0.94	678	2.06	1.00	N	1	4
housesize	5449	2.18	1.12	549	2.36	1.16	Y	1	4
income	4230	3.44	1.68	452	3.50	1.64	N	1	6
credit_financiali	3163	3.21	1.68	356	3.33	1.72	N	1	6
credit_relative	3624	3.20	1.65	395	3.40	1.66	Y	1	6
wealth	Wealth status; 1 to 4 based on the availability of cement house, computer/internet/car, and motor cycle								
housesize	Household size; divided into 4 quantiles								
income	Log of household income; divided into 6 quantiles								
credit_financiali	Log of available credit from bank or credit cooperative; divided into 6 quantiles								
credit_relative	Log of available credit from relative; divided into 6 quantiles								

5.2.6 Subjective Factors

In this study, subjective factors include a student's personality, career expectations, perceptions of school life, perceptions of their family's attitude to their study and emotions, as well as teacher PCED preferences. All variables are presented in quantiles of the raw value, except for the career expectations. Over one third of the students hope for a career in the field of science, technology, or government, which are considered advanced options in China, but close to one quarter of students were satisfied with agriculture or manufacturing, as were most of their parents. In the treated sample and either the full sample or the Lighthouse-school sample, there are statistically significant differences when it comes to educational aspiration, affiliation to school, and curiosity. From summary statistics, one cannot tell whether these are the determinants or results of Lighthouse participation. This will be further explored when presenting the propensity score matching results.

Table 5-12 Summary Statistics_ Subjective Factors

	Whole Sample			Treated			Stat. Dif. ?	Min	Max
	Obs	Mean	Std. Dev.	Obs	Mean	Std. Dev.			
stu_eduaspiration	5009	3.27	1.33	565	3.41	1.27	Y	1	5
expect_norm	4624	0.23	0.42	543	0.24	0.43	N	0	1
expect_advanced	4624	0.37	0.48	543	0.38	0.49	N	0	1
percep_schquality	6194	3.38	1.65	666	3.33	1.63	N	1	6
percep_schaffiliation	6210	3.45	1.70	668	3.73	1.72	Y	1	6
percep_schvalue	6180	2.38	1.16	664	2.45	1.16	N	1	4
percep_scheffort	6172	2.18	1.00	665	2.21	0.97	N	1	4
confidence	6271	3.33	1.68	676	3.45	1.75	N	1	6
courage	6268	3.30	1.74	676	3.32	1.74	N	1	6
curiosity	6273	3.02	1.74	678	3.17	1.80	Y	1	6
ambition	6258	3.13	1.71	675	3.13	1.71	N	1	6
familyonstudy	6008	2.97	1.48	664	2.91	1.52	N	1	5
familyonemo	6010	3.31	1.72	664	3.20	1.75	N	1	6
tchr_contvsstop	6138	2.60	1.07	637	2.79	1.07	Y	1	4
tchr_genvsvoc	6298	1.99	1.29	678	1.97	1.22	N	1	4
stu_eduaspiration	Expected highest level of education, 1 to 5 for lower secondary/vocational high/academic high/college/graduate school								
expect_norm	Expect agriculture or manufacturing as future career; 1/0=Yes/No								
expect_advanced	Expect science, technology, or government as future career; 1/0=Yes/No								
percep_schquality	Perception of school quality; take mean of the ratings to related items and divide into 6 quantiles								
percep_schaffiliation	Emotional attachment to school; take mean of the ratings to related items and divide into 6 quantiles								
percep_schvalue	Perceived value of schooling; take mean of the ratings to related items and divide into 4 quantiles								
percep_scheffort	Willingness to study; take mean of the ratings to related items and divide into 4 quantiles								
confidence	Level of confidence; take mean of the ratings to related items and divide into 6 quantiles								
courage	Level of courage; take mean of the ratings to related items and divide into 6 quantiles								
curiosity	Level of curiosity; take mean of the ratings to related items and divide into 6 quantiles								
ambition	Level of ambition; take mean of the ratings to related items and divide into 6 quantiles								
familyonstudy	Level the family cares about their study and PCED, perceived by the student; take mean of the ratings to related items and divide into 6 quantiles (end up only category 1 to 5 available)								
familyonemo	Level the family cares about their emotional status and respects their opinion, perceived by the student; take mean of the ratings to related items and divide into 6 quantiles								
tchr_contvsstop	Homeroom teacher's preference for continuing education over stopping education; take ratio of the ratings and divide into 4 quantiles								
tchr_genvsvoc	Homeroom teacher's preference for academic high school over vocational high school; take ratio of the ratings and divide into 4 quantiles								

5.2.7 Health

38% of students in the sample suffered from one or more common health problems, such as anemia and hepatitis, and 48% had absenteeism due to health problems or experiencing symptoms that directly affected study, such as feeling hungry/dizzy in class or having eyesight problems. QD school has very high rate of Lighthouse students (25.3%), students reporting sickness (68.9%), and students with sickness related to class attendance (56.4%), increasing the mean values for the treated sample.

Table 5-13 Summary Statistics_ Health

	Whole Sample			Treated			Stat. Dif. ?	Min	Max
	Obs	Mean	Std. Dev.	Obs	Mean	Std. Dev.			
sick	5516	0.38	0.49	602	0.44	0.50	Y	0	1
sick_class	6210	0.48	0.50	672	0.54	0.50	Y	0	1
sick	Suffers disease(s); 1/0=Yes/No								
sick_class	Suffers health issues that directly affect study, namely feeling hungry/dizzy during class and having eyesight problem; 1/0=Yes/No								

5.2.8 Monetary Costs and Rewards

For each PCED, the ratios of household estimates for different PCED costs, as well as the ratios of student estimates for earnings at 35 years old, were transformed into quantiles to construct the variables for monetary costs/rewards. The purpose of this group of variables is to test how PCED varies depending on the expectations of relative cost/reward among different PCEDs. As with the variables for economic status and credit constraints, missing data could be an issue for the accuracy of regression results.

Table 5-14 Summary Statistics_ Monetary Costs and Rewards

	Whole Sample			Treated			Stat. Dif. ?	Min	Max
	Obs	Mean	Std. Dev.	Obs	Mean	Std. Dev.			
cost_vocvsjunior	3217	3.42	1.68	365	3.60	1.74	N	1	6

cost_genvsvoc	3202	3.24	1.78	364	3.20	1.79	N	1	6
cost_colvsgen	3171	3.51	1.71	361	3.66	1.74	N	1	6
earn_workvsdrop	4189	3.49	1.69	519	3.33	1.74	Y	1	6
earn_vocvswork	4137	3.51	1.69	518	3.42	1.73	N	1	6
earn_genvsvoc	4136	3.33	1.64	517	3.38	1.64	N	1	6
earn_colvsgen	4123	3.43	1.68	518	3.35	1.67	N	1	6
cost_vocvsjunior	Cost of VHS relative to cost of middle school, perceived by the household; take ratio of the amounts and divide into 6 quantiles								
cost_genvsvoc	Cost of AHS relative to cost of VHS, perceived by the household; take ratio of the amounts and divide into 6 quantiles								
cost_colvsgen	Cost of college relative to cost of AHS, perceived by the household; take ratio of the amounts and divide into 6 quantiles								
earn_workvsdrop	Expected relative earning in 35 if work-after-graduation instead of dropout, perceived by both the household and the student; take ratio of the amounts and divide into 6 quantiles								
earn_vocvswork	Expected relative earnings at 35 if continue to VHS instead of work, perceived by both the household and the student; take ratio of the amounts and divide into 6 quantiles								
earn_genvsvoc	Expected relative earnings at 35 if continue to AHS instead of VHS, perceived by both the household and the student; take ratio of the amounts and divide into 6 quantiles								
earn_colvsgen	Expected relative earnings at 35 if continue to college instead of AHS, perceived by both the household and the student; take ratio of the amounts and divide into 6 quantiles								

5.2.9 Academic Performance and Other Variables

The last group of MNL variables does not belong to one single classification, but are suggested in the Delphi survey as potential PCED determinants for the surveyed area. Academic performance is the most familiar, and in the descriptive statistics for expected and actual PCED we already knew that it does not completely decide a student's fate since the HSEE score cutoff is becoming vague for the current generation. However, performance is still supposed to be one of the strongest "traditional" PCED determinants. Other variables in this group offer information hard to find in literature. For example, we now know that 10% of students are young lovers, 8% of students have been involved with gambling, and about one third of the survey students used to stay in cities for over one month.

Among the variables with different mean values between whole and treated samples, it is interesting to see that Lighthouse students are quite different from their classmates in the same school, as they or their families had better knowledge of VHS policies, higher academic performance, more family business, and richer urban experience.

Table 5-15 Summary Statistics_ Academic Performance and Other Variables

	Whole Sample			Treated			Stat. Dif. ?	Min	Max
	Obs	Mean	Std. Dev.	Obs	Mean	Std. Dev.			
knowvoc	5650	1.64	0.66	630	1.73	0.68	Y	1	4
performance	4358	2.53	1.12	532	2.72	1.12	Y	1	4
business	5474	0.05	0.23	551	0.08	0.27	Y	0	1
interpersonal	6295	3.52	1.69	678	3.49	1.70	N	1	6
urbanlife	5538	0.32	0.47	602	0.38	0.48	Y	0	1
outreach_voc	5830	0.14	0.34	658	0.14	0.35	N	0	1
outreach_fac	5853	0.12	0.32	660	0.13	0.34	N	0	1
local_negative	5814	0.07	0.26	649	0.09	0.29	N	0	1
local_entertain	5915	0.07	0.26	662	0.08	0.27	N	0	1
gambling	6071	0.08	0.27	658	0.09	0.29	N	0	1
schatmos	6298	0.40	0.49	678	0.53	0.50	Y	0	1
chore	5419	2.23	1.31	616	2.18	1.30	N	1	4
love	6228	0.10	0.30	666	0.14	0.34	Y	0	1
grade_7	6298	0.39	0.49	678	0.34	0.48	Y	0	1
grade_8	6298	0.33	0.47	678	0.31	0.46	N	0	1
grade_9	6298	0.27	0.45	678	0.35	0.48	Y	0	1
knowvoc	Students and their family's knowledge on vocational education policies; 1 to 4 for No to Very Much								
performance	Academic performance; take mean of both ranking and score and then divide into 4 quantiles within school								
business	Has family business to inherit; 1/0=Yes/No								
interpersonal	Situation of interpersonal relationships in school; take mean of the ratings to related items and divide into 6 quantiles								
urbanlife	Used to stay in nearby cities for over 1 month; 1/0=Yes/No								
outreach_voc	Perceived frequent outreaches from vocational schools; 1/0=Yes/No								
outreach_fac	Perceived frequent outreaches from factories; 1/0=Yes/No								
local_negative	Holds very negative views of local development; 1/0=Yes/No								
local_entertain	Perceived prevalence of entertainment industries (KTV, gambling or illegal lottery, internet bar) in the neighborhood; 1/0=Yes/No								
gambling	Has been involved with gambling or illegal lottery; 1/0=Yes/No								
schatmos	School has relatively good study atmosphere (level of violence, cheating, class discipline); 1/0=Yes(> mean value)/No								
chore	Time spent on household chores; divided into 4 quantiles								
love	Was or is in love with someone; 1/0=Yes/No. Considering the sensitivity of this topic for teenagers, this question was asked with 6 options from strongly disagree to strongly agree, so student can answer "basically agree" if they feel shy about confirming the relationship								
grade_7	Study in Grade One of the middle school; 1/0=Yes/No								
grade_8	Study in Grade Two of the middle school; 1/0=Yes/No								
grade_9	Study in Grade Three (last grade) of the middle school; 1/0=Yes/No								

5.2.10 Additional Variables for Treatment Outcomes or Determinants

A final list of variable consists of six variables that will only be used for propensity score matching, all of which are in quantile form. Household attitudes to summer camp appear to be a factor of interest. The mean is 3.13 for the treated sample, 2.93 for the whole sample, and actually even smaller for the 6-Lighthouse-school sample, 2.83. It is safe to say that household attitude matters for Lighthouse participation.

Table 5-16 Summary Statistics_ Additional Variables Related to Treatment

	Whole Sample			Treated			Stat. Dif. ?	Min	Max
	Obs	Mean	Std. Dev.	Obs	Mean	Std. Dev.			
extraversion	6294	3.38	1.69	678	3.37	1.72	N	1	6
affiliationneed	6230	2.98	1.53	673	3.04	1.57	N	1	6
atti_chore_farm	6225	3.64	1.29	669	3.60	1.30	N	1	6
other_act	5173	3.08	1.57	520	3.20	1.61	N	1	6
peertreated	4462	3.08	0.83	678	3.45	0.70	Y	1	4
attoncamp	5321	2.93	1.68	525	3.13	1.75	Y	1	6
extraversion	Level of extraversion; take mean of the ratings to related items and divide into 6 quantiles								
affiliationneed	Level of need for affiliation; take mean of the ratings to related items and divide into 6 quantiles								
atti_chore_farm	Attitude towards housechore/farm works; 1 to 6 for hate to love								
other_act	Level of other activities (household chores/farm work/city visits or job), according to the household; take mean of the ratings to related items and divide into 6 quantiles								
peertreated	Popularity of Lighthouse participation among classmates (Lighthouse participants as % to the class); divided into 4 quantiles								
attoncamp	How supportive the household is of participating in summer camp or how much they respect the student's own preference; take mean of the ratings and divide into 6 quantiles								

Note: For the variable “peertreated”, the reported “whole sample” figure is for 6 Lighthouse schools only

Chapter 6 Empirical Results for PCED Determinants

This chapter evaluates potential PCED determinants based on the multiple-imputed MNL model adopting all independent variables. As explained in the research design chapter, other forms of regression results (e.g. recursive, step-up) will not be presented because the full-model presentation serves well for the transition to the impact evaluation in Chapter 7. For succinctness, only Relative Risk Ratios (RRR) and asterisks for p-values are presented. One asterisk is given to estimates that are statistically significant at the 10% level, so we may know what variables could have a chance to be significant at 5% when we alter the sample or specification (for robustness), or when we apply the model to a subgroup (for heterogeneity), however the interpretation here will focus on those really having p values smaller than 0.05. Detailed MNL outputs can be found in Appendix E. Following the presentation of main-model results, the chapter also tests robustness by offering results from other samples and specifications, and heterogeneity tests focusing on how the PCED determinants vary across gender, wealth, and academic performance. To draw a big picture by comparing the PCED determinants, scatter graphs are used to visualize the standardized coefficients and absolute z scores of all variables. The chapter ends with a summary of findings, highlighting the differences with, and new contributions to, the literature.

Before unfolding the analyses, there are four issues to note. Firstly, the MNL in this study satisfies the IIA assumption. I converted all independent variables to dummies for the seemingly unrelated estimation (SUE)-based Hausman test. The p value obtained is close to 1, which means one cannot reject the equality of the common coefficients across PCED. I also applied the same list of variables to multinomial probit (MNP), which is free of IIA assumption. Although MNL and MNP results are not comparable, they do show the similar relative size of coefficients and z scores. MNP results are omitted.

The second clarification is related to the number of independent variables. For the full sample, there are 84 regressors for 6298 cases, which is not overwhelming but still an amount big enough to

cause worry about multicollinearity. Fortunately, these 84 variables have weak correlation with each other; for most of the pairs the absolute correlations barely pass 0.1, let alone the weak-correlation cutoff of 0.3. Specified collinearity test provided mixed results. It appears that school and grade dummies can create high collinearity, but they are necessary for controlling purposes. Once the school/grade dummies are taken out, the mean variance inflation factors (VIF) of 1.68 and no-intercept condition index of 6.5 are far from the red lines of 10 and 30. Since I will not discard school and grade dummies⁷³, the safest response to multicollinearity is to see if effect sizes or significant levels change drastically when applying different samples/specifications. This will be dealt with in Section 6.2. A related note to this is that the full sample/full specification model is also that with the lowest Akaike information criterion (AIC) and Bayesian information criterion (BIC), meaning it carries the most appropriate variable combination for PCED prediction.

The third note is about missing data, for which the study applies five imputations as suggested by Rubin (1987). Because statistical packages do not allow for many additional tests following MI MNL, all the above tests except the collinearity tests are conducted imputation by imputation. The results are consistent across the five imputed samples. Although no imputation is perfect, applying the same model to samples with less missing data can help identify whether there is a large bias in estimates. This is included in the discussion of robustness in Section 6.2.

The final note to make is on the role of Lighthouse treatment. The treatment dummy is not included in the full-specification MNL for PCED determinants. It is assumed that socio-emotional support affects PCED through mediators that are already included in the model. Lighthouse itself does not mention education decisions as something it aims to change. Nevertheless, including a treatment variable to observe its statistical significance can help uncover whether Lighthouse impacts are fully captured by other variables, or if there are determinants of Lighthouse participation that happen to be PCED determinants that are overlooked. This chapter includes treatment variables only for one robustness-check model (column (2) in Table 6-10 and 6-11), but the next chapter will

⁷³ In practice, school5, school8, schatmos and grade_3 are automatically omitted by stata due to collinearity.

have more discussion about what happens if treatment variables are included in the PCED regressions.

6.1 Determinants of PCED

In this section, imputed MNL results are reported as RRR according to the classifications of determinants presented in Chapter 5⁷⁴. From Table 6-1 to Table 6-9, the columns are for the three non-baseline (non-AHS) PCEDs plus undecided, and the rows are for independent variables. RRR is obtained by exponentiating the MNL coefficients to describe how the relative odds between one outcome and the base outcome will change given one unit of change in an independent variable. This is mathematically easy to understand. For example, holding all other factors constant, if the probability of choosing VHS instead of AHS rises from 40% to 80% due to an increase of 1 unit in a variable, then the RRR for that variable is $80\%/40\%=2$. When $RRR=1$, it means no relative change at all, although the two options can change together in the same manner.

Results in this section are all obtained from the fully imputed sample of 6298 students. Within each imputation, MNL gives a McFadden's pseudo R-squared around 0.18, indicating a satisfactory goodness of fit, as exceeding 0.2 means extremely good fit (Domencich & McFadden, 1975). Nevertheless, the focus here is not perfect prediction, but to identify real relationships between PCED and its potential determinants, which are given by p values.

6.1.1 Gender, Age and Ethnicity

Gender impact does not follow suggestions in the literature for the surveyed towns. It turns out that the PCED of girls are not more elastic to income, performance, or expected PCED cost than those of boys. Rather, the old theory that girls are more likely to go with "disadvantageous" options are proven to be true. This is in line with Guangdong's image as a province of gender discrimination

⁷⁴ Marginal effects can also be reported, but they would not serve well the purpose of this study because students choosing all other PCEDs will be pooled together for comparison.

against girls. Being relatively old is also influential, by relatively increasing the possibility of choosing work or undecided, although the magnitudes are not impressive. Ethnicity does not play any role in PCED. This is probably due to the domination of minority students in just one school, which makes it hard to tell if any difference is a result of ethnicity or just a school fixed effect.

Table 6-1 Relative Risk Ratios_ Gender, Age and Ethnicity

	Dropout	Work	VHS	Undecided
female	3.03**	1.93**	1.85**	2.12***
f_income	0.9	1.05	1.08	1.08
f_performance	0.94	1.08	1.21	1.06
f_cost	0.94	0.93	0.95	0.91*
age	1.4	1.32**	1.07	1.24**
minority	0.25	1.02	0.53	1.52

Note: Option AHS is the base outcome. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Please refer to Table 4-4 for variable description.

6.1.2 Parental Background

Surprisingly, parental background is no longer a powerful PCED determinant when the regression includes a comprehensive list of other factors. The sole clear trend to be found is that students of an incomplete family (single_p, migrant_p, no_p) are more likely to think of their PCED seriously, with the RRR for undecided all around 0.7. A natural explanation for this is that the children in these incomplete families tend to be more independent, and at their adolescent age know that they are going to take more responsibility for the family. Such findings are indeed important. The impact can actually be the opposite because these students do not receive as much advice from parents as their peers, but such assumptions are now rejected. Of other parental factors, education, health, and identity of the parents do not play strong roles in PCED. This is another interesting finding as they all are convenient variables in many studies.

Table 6-2 Relative Risk Ratios_ Parental Background

	Dropout	Work	VHS	Undecided
single_p	0.39*	0.78	0.73*	0.66**
migrant_p	0.9	0.97	1.03	0.71***
no_p	1.13	1.04	0.88	0.65***
medu	0.9	0.93	1.01	0.93

fedu	1.06	0.91*	1.01	0.98
peasant	0.72	0.86	0.93	0.92
politicalc	1.38	0.99	1.06	0.93
parent_leader	1.62	0.93	0.74	1.08
parentbadhealth	3.19	1.13	1.17	0.89

Note: Option AHS is the base outcome. * p<0.1, ** p<0.05, *** p<0.01. Please refer to Table 4-4 for variable description.

6.1.3 Number of Siblings and Birth Order

Number of siblings, but not birth order, plays a role in determining PCED. Larger numbers of siblings increase the relative odds of work and VHS, both of which are faster ways of entering the labor market than AHS. The RRR is however just slightly over 1, meaning a small effect size. Having an older sister(s) may increase the odds of AHS, and being relatively old among the siblings may lower the odd, both of these match the theory, yet are statistically insignificant.

Table 6-3 Relative Risk Ratios_ Siblings and Birth Order

	Dropout	Work	VHS	Undecided
sibship	1.2	1.16***	1.09**	1.07
witheldersister	0.82	0.78*	0.97	0.96
eldercohort	0.86	1	1.1	1.22*

Note: Option AHS is the base outcome. * p<0.1, ** p<0.05, *** p<0.01. Please refer to Table 4-4 for variable description.

6.1.4 Peer, Teacher and School Factors

Peer, teacher and school factors are found to be influential on PCED. For peer effects, a larger migrant network is correlated to greater AHS odds, implying that a large migrant network may remind students of the benefit of vocational skills, rather than encourage more teenagers to become low-skilled migrant workers, however the RRR is statistically insignificant. The other peer-effect variable, mean parental education level in class, gives significant yet counter-intuitive results. If a student comes from a class with more educated parents, they have higher relative odds of choosing

work or being undecided against AHS. Since a class of more educated parents could mean better access to different information, the association with undecided is understandable. It is more of a mystery to see the effect on work, which will be further discussed in the sections on robustness and heterogeneity.

The two related influential factors in teacher characteristics are a homeroom teacher's education and experience. If the teacher has a college degree, the student's relative odds of work or VHS are higher; and if the teacher has more years of experience, the relative odds of AHS are higher against all other options. It is true that a teacher's experience and education can have an impact in either direction, but also true that schools may assign teachers based on their own rules, such as assigning more experienced teacher to classes with higher AHS hopes. There should be reservations about which direction the causality dominates. Other teacher characteristics such as origin, administrative role, income and payment delay do not matter much for student PCED, and, as expected, subject teachers matter less than homeroom teachers. After all, homeroom teachers are not only academically but also emotionally responsible for students.

The last group in this category is school characteristics. Class size and schooling distance are not significantly related to PCED. Based on the literature, these two factors might be more influential in primary school children than in lower secondary school students in this sample. Students from schools of higher survival rates have a much lower risk of choosing VHS or undecided relative to AHS. This is understandable as the main incentive for staying in a school is the opportunity of getting into AHS. A low survival rate could be due to dropout, transfer, or early VHS enrollment. Finally, the range of RRR plus the number of asterisks illustrate how different the schools are in this sample. It also confirmed that there are remain unobserved school/town-level determinants, even though the regression has already controlled for so many variables.

Table 6-4 Relative Risk Ratios_ Peer, Teacher and School Factors

	Dropout	Work	VHS	Undecided
mignetwork	0. 92	0. 86	0. 95	0. 83*
peerpedu	1. 91*	1. 53***	1. 22*	1. 51***

tch_origin	1.11	0.88*	1	1
tch_edu	1.13	1.42**	1.32**	1.15
tch_admin	1	0.95	0.97	1.31
tch_exp	0.71*	0.85**	0.87***	0.89**
tch_mthgain	1.01	1.05	1.06*	1.07*
tch_paydelayed	0.71	1.1	1.02	1.15
subtch_origin	0.92	1.08	1.02	1.14**
subtch_edu	0.98	0.93	0.95	1.01
subtch_exp	1.12	0.94	1.03	1.04
classsize	1.05	1.07	1.01	0.95
distance	1.2*	1.03	1.02	0.99
survival	0.25	0.59	0.42***	0.37***
school1	0.41	0.57*	0.4***	0.4***
school2	0.47	0.22***	0.23***	0.56*
school3	1.41	0.99	0.57	0.2**
school4	0.39	0.76	0.57**	0.64
school5	—	—	—	—
school6	1.32	1.13	1.04	1.77**
school7	5.5*	1.08	1.67**	2.07***
school8	—	—	—	—

Note: Option AHS is the base outcome. * p<0.1, ** p<0.05, *** p<0.01. Please refer to Table 4-4 for variable description.

6.1.5 Household Economic Status and Credit Constraints

In the category of household economic status and credit constraints, the most popular variables of wealth and income matter the most. In rural areas, being rich and having a higher income are correlated, but that correlation does not need to be strong, as households largely inherit wealth from the previous generation. What is true is that both richness and high income promote the relative odds of AHS. Household size is not influential, nor are the credit constraints, although that could be due to high missing data and the household's inaccurate estimates.

Table 6-5 Relative Risk Ratios_ Household Economic Status and Credit Constraints

	Dropout	Work	VHS	Undecided
wealth	0.62***	0.83***	0.96	0.85***
housesize	0.95	1.01	0.94	1.02
income	0.89	0.88*	0.89***	0.88**
credit_financiali	1.05	1.07	1.03	1.08
credit_relative	1.07	0.97	0.96	0.97

Note: Option AHS is the base outcome. * p<0.1, ** p<0.05, *** p<0.01. Please refer to Table 4-4 for variable description.

6.1.6 Subjective Factors

Most subjective factors are significantly correlated with PCED. A student's educational aspiration is strongly linked to the preference of AHS - in current China, AHS remains the main gate toward college and graduate education. It is worth noting that this correlation stays strong even though performance and family background are thoroughly controlled. This reveals that PCED should not be considered merely a "pure rational" process counting ability, affordability and returns. Career expectation also predicts PCED in a predictable way. If a student is expecting a normal low-skilled career, they will choose work or undecided, and vice versa for those thinking of an advanced career in science, technology or government.

Student perceptions towards schooling form another subgroup of subjective factors. Except the perceived quality of current school, all perceptions matter for PCED. Affiliation to school leads to lower relative odds for options that will take the students out of school, namely dropout, work, and undecided. The perceived value of schooling is related to higher relative odds of VHS, still an option of continuing schooling. Willingness to study is related lower in the relative odds of work and undecided, which is self-explanatory.

In terms of personality, confidence, courage, curiosity, and ambition all have statistically significant connections with PCED, *ceteris paribus*. Confidence, courage and ambition are correlated with each other, but they do have differences. Simply speaking, confidence is to trust that oneself can do something right, courage is to be brave enough to start and persist in that thing, and ambition is to have something better in mind for the future. According to the MNL results, RRR for courage and ambition actually point in different directions. Students with higher level of courage have lower odds of dropout, VHS and undecided, while interestingly students with higher ambition have higher odds of dropout, work, and VHS. A possible explanation for the ambition-PCED relationship is that disadvantaged students have more space for improvement, however if this is true, the impact should

be captured by variables related to SES. This will be further discussed in the section on robustness and heterogeneity. For the other two personality variables, confidence is linked to higher relative odds of VHS, and curiosity is linked to lower relative odds of VHS/undecided, both with small magnitudes.

The last subgroup of subjective factors involves household and teacher attitudes. The more a family cares about a student's study and PCED, the lower the relative odds of work or undecided, however PCED is not affected by how a family care about the student's emotional status or respect their opinion. With regard to homeroom teacher PCED preference, it appears that the more a teacher prefers AHS against VHS, the higher relative odds of AHS, however a teacher's preference for continuing schooling against stopping education does not change the odds of any option. In other words, teacher preference has an impact on student when it comes to schooling track.

Table 6-6 Relative Risk Ratios_ Subjective Factors

	Dropout	Work	VHS	Undecided
stu_eduaspiration	0.46***	0.39***	0.75***	0.66***
expect_norm	1.72*	1.51***	0.99	1.3**
expect_advanced	0.74	0.62***	1.02	0.77*
percep_schquality	0.98	1.05	1.04	1.05
percep_schaffiliation	0.79**	0.88***	0.96	0.91***
percep_schvalue	0.78	1.01	1.11**	0.96
percep_scheffort	0.84	0.86*	0.92	0.88**
Confidence	1.15	1.01	1.08**	1.05
Courage	0.81***	0.95	0.93***	0.91***
Curiosity	0.87	0.96	0.94**	0.92***
Ambition	1.18**	1.1**	1.07**	1.01
Familyonstudy	0.83	0.89**	0.98	0.9***
Familyonemo	1.09	0.96	0.99	1.01
tchr_contvsstop	0.95	0.9	1.02	1.03
tchr_genvsvoc	0.82*	0.85***	0.86***	0.83***

Note: Option AHS is the base outcome. * p<0.1, ** p<0.05, *** p<0.01. Please refer to Table 4-4 for variable description.

6.1.7 Health

Health may affect academic performance and make a student more or less likely to pursue additional schooling, however since academic performance is already included in the regression, the results for health, especially health issues related to class attendance/performance, will inform other information. Suffering disease appears to lower the relative odds of work. A possible explanation for this is that a sick student knows about their incapacity for low-skill labor work, so they are inclined to continue with more schooling.

Table 6-7 Relative Risk Ratios_ Health

	Dropout	Work	VHS	Undecided
sick	0.56	0.71***	0.96	0.87
sick_class	1.19	1.15	1.02	1.04

Note: Option AHS is the base outcome. * p<0.1, ** p<0.05, *** p<0.01. Please refer to Table 4-4 for variable description.

6.1.8 Monetary Costs and Rewards

The regression results for monetary costs and rewards suggest that PCED is more sensitive to the relative return than the relative cost of different options. If the household perceives higher AHS cost than VHS cost, their children have lower relative odds of choosing VHS. This is quite strange. It cannot be explained by common arguments such as “cost is a proxy of quality” because that effect should be captured by relative earning expectation. Indeed, both the relative earning expectations of “AHS vs. VHS” and “College vs. AHS” are strongly and positively correlated to the relative odds of AHS. There are two other possible reasons for the counter-intuitive cost effect. One is the nearly 50% missing data for that variable (cost_genvsvoc). Too many imputations will simply turn an insignificant coefficient into one that is significant. The other possible reason is that the construction of cost variables only reflects household opinions, while earning variables are the mean of the household and student opinions. In other words, these cost and earning variables are not totally comparable. When designing the questionnaire, my rationale was that students should be given a talk on the

expected rewards, as they can learn about these from the teachers as well as by observing adults with different education backgrounds. Finally, it is interesting to see that the relative earnings of work against dropout increases the undecided odd, although at small magnitudes. Overall, caution is needed in interpretation as this group of variables relies on a large number of imputations.

Table 6-8 Relative Risk Ratios_ Monetary Costs and Rewards

	Dropout	Work	VHS	Undecided
cost_vocvsjunior	1	1.03	1	1.04
cost_genvsvoc	0.92	0.87*	0.86***	0.95
cost_colvsgen	0.95	0.9	0.96	0.95
earn_workvsdrop	1.11	1.05	1.05	1.1**
earn_vocvswork	0.84	0.99	0.96	0.91*
earn_genvsvoc	0.65***	0.82***	0.76***	0.79***
earn_colvsgen	0.67***	0.84***	0.87***	0.85***

Note: Option AHS is the base outcome. * p<0.1, ** p<0.05, *** p<0.01. Please refer to Table 4-4 for variable description.

6.1.9 Academic Performance and Other Variables

Some other candidates of PCED determinants show clear influence, as expected. The relative odds of work, VHS, and undecided are much lower for students with better test scores. Knowledge of vocational education also shows the expected association with the relative odds of VHS with a RRR of 1.28, and being in love with someone is associated with higher odds of dropout, work, and undecided. It should be noted that some causal inferences could be two-way. For example, students and households might choose VHS because they know more about it, or because they have already chosen VHS they have done more research on VHS policies. Finally the grade dummies show the apparent attrition of students as they climb the grade, and that Grade 7 and Grade 8 students have much more diversity of PCED compared to the base group of Grade 9 students. Of course, grade dummies also help capture the rest of the unobserved grade-level factors.

Some variables yield results neither easily predicted nor counter-intuitive. Urban life experience lowers the relative odds of work or undecided. It seems urban experience helps students to realize the importance of skills for a decent city life, so they have a clear preference for continuing schooling.

The prevalence of local entertainment industries and the time spent on household chores are two variables without clear theory guidance. The regression results show that the former raises the relative odds of VHS, while the latter is associated to higher relative odds of work.

There are also variables showing no statistical association to PCED. These are the availability of family business, interpersonal relations in school, outreach of vocational schools/factories, prospect of local development, and involvement with gambling.

Table 6-9 Relative Risk Ratios_ Academic Performance and Other Variables

	Dropout	Work	VHS	Undecided
knowvoc	1.04	1.18	1.28***	0.9
performance	0.73	0.68***	0.84***	0.71***
business	0.38	0.52*	0.93	0.72
interpersonal	1.01	0.94*	1.05*	1.02
urbanlife	0.73	0.73**	0.9	0.77**
outreach_voc	0.73	0.99	0.96	0.91
outreach_fac	0.89	1.35	1.18	1.3
local_negative	0.66	1.47*	1.34	1.06
local_entertain	1.37	1.04	1.44**	1.09
gambling	1.34	0.91	1.05	1.13
chore	1.15	1.16***	1.04	1.01
love	3.59***	1.71***	1.18	1.56**
grade_7	3.11***	1.85***	1.41**	1.73***
grade_8	1.8	1.68***	1.65***	2.1***
grade_9	—	—	—	—

Note: Option AHS is the base outcome. * p<0.1, ** p<0.05, *** p<0.01. Please refer to Table 4-4 for variable description.

6.2 Robustness

The complexity of variable constructions, the concern about multicollinearity, and the missing data issue all remind us of the importance of examining how PCED determinants behave with different specifications and samples. Since one of the major purposes of applying a comprehensive variable list is to be free from problems caused by incomplete controls, it is also advisable to explore how different the results could be between the full specification and the specification that includes variables that are conventionally adopted in previous literature, such as gender and parental

education. This section compares the imputed MN outputs for five samples/specifications. Because of the large number of results, the RRR for the four non-based outcomes are separated into two tables. For each outcome, Column 1 is for the original result, full sample and full specification. Column 2 is for the full sample but only conventional variables of basic characteristics, parental education, wealth, performance, and school/grade dummies. A Lighthouse treatment dummy is also included to lower the impact of uncontrolled factors, but not reported in the table. Column 3 is for the full specification but excludes the sample for QD, which has a tradition of early VHS enrollment. Column 4 is for the full specification but also excludes the QD sample as well as students who said they completely lost their patience during survey (answered “6” for Item e64). Column 5 is for the same sample as Column 4, but excluding variables related to money or cost/reward, which includes a large proportion of missing data. School and grade dummies serve as fixed effects, which this section will not discuss in detail regarding their corresponding estimates.

Table 6-10 presents the RRR for the outcomes of dropout and work. Since those who want to drop out might be out of school and absent for the questionnaire, “dropout” is very small group in the sample with very few statistically significant estimates. Four differences can be found among different samples and specifications, however. The gender effect is consistently strong in all models except that with only conventional variables. This is alarming. Recent literature has tended to suggest that gender is less of a determinant of attendance, but perhaps that is just due to over-simple specification? At least for the sample in this study, it turns out that we can make a false adjustment if we only run regression on those easy variables. Schooling distance becomes statistically significant at the 5% level in smaller sample with less imputation (Column 4 and 5). Theoretically, schooling distance should be negatively correlated with school attendance. The main model does confirm this, but is only significant at the 10% level. Contrary to distance, ambition tends to be less significant in other models. Ambition’s positive correlation with dropout is one of the counter-intuitive findings of the main model, now it seems this may just reflect the problem of missing data and variable construction. Lastly, when applying the conventional-variables, MNL, performance and the dummy

for Grade 8 become statistically significant at the 1% level, while in all other models their effects are considered random. This is not surprising however, as those two variables are supposed to absorb the effect of many other dropout determinants.

There are also four findings worth mentioning for the outcome of work. Father's education becomes statistically significant in models with fewer control variables: Column (2) and (5). This echoes the belief that a father's education is a strong predictor of schooling decisions, although its impact is imposed through mediators such as income and family care for schooling. RRR for homeroom teacher origin, outreach of factories, and the size of migrant network tends to be more significant in other models. It is easy to see why more factory outreach will increase the possibility of choosing work, but it is harder to predict that homeroom teachers from further away discourage the work option. Given that teacher taste is already captured by variables of relative preference, the plausible explanation for this negative association could be that non-local teachers tend to be assigned to classes who are less in favor of the work option. The RRR of 0.79 at the 5% significance level for migrant networks in Specification (5) suggests that a larger migrant network may actually strengthen a student's preference for AHS over work, as students living in this kind of community are more aware that further education is a better way to reach urban life than being a migrant worker. As for dropout, the estimates for ambition are no longer significant. The last finding from the model comparison is that some estimates change between statistical significance and insignificance under different samples/specifications. These are gender, age, mean parental education level in class, and homeroom teacher education. For gender, the RRR also changes a great deal across models. Accordingly, we should not be too certain when making claims related to these variables.

Table 6-11 presents the RRR for the outcome of VHS and undecided. Five key variables do not give consistent results across different models, although the differences are of statistical significance only. Number of siblings, perceptions of the value of schooling, and ambition (again) turn from significant to insignificant in some of the models, implying that the impact of these factors should be interpreted with caution. Wealth is significant only when traditional variables are included. This is

Table 6-10 Relative Risk Ratios of “Dropout” and “Work”_ Various Samples and Specifications

Dropout	(1)	(2)	(3)	(4)	(5)		Work	(1)	(2)	(3)	(4)	(5)
female	3.03**	1.42	3.38**	3.78**	2.74***		female	1.93**	1.22*	1.76*	1.8*	1.6***
f_income	0.9		0.89	0.93			f_income	1.05		1.08	1.07	
f_performance	0.94		0.96	0.93	0.9		f_performance	1.08		1.02	1	0.99
f_cost	0.94		0.92	0.92			f_cost	0.93		0.95	0.95	
age	1.4	1.63	1.42	1.34	1.36		age	1.32**	1.39***	1.34**	1.31*	1.31**
minority	0.25	0.2	0	0	0		minority	1.02	1.35	0.68	0.68	0.75
single_p	0.39*		0.41*	0.43*	0.52		single_p	0.78		0.78	0.81	0.91
migrant_p	0.9		0.82	0.84	0.77		migrant_p	0.97		0.89	0.88	0.86
no_p	1.13		0.93	1.01	0.92		no_p	1.04		0.99	1.07	1.07
medu	0.9	0.96	0.92	0.9	0.91		medu	0.93	0.95	0.91*	0.9*	0.9*
fedu	1.06	0.99	1.04	1.03	0.99		fedu	0.91*	0.83***	0.91*	0.91*	0.88**
peasant	0.72		0.8	0.82	0.83		peasant	0.86		0.83	0.82	0.85
politicalc	1.38		1.38	1.34	1.28		politicalc	0.99		0.99	0.96	0.95
parent_leader	1.62		1.72	1.97	1.96		parent_leader	0.93		0.89	0.94	0.98
parentbadhealth	3.19		2.45	2.14	2.34		parentbadhealth	1.13		1.01	0.98	1.04
sibship	1.2		1.18	1.18	1.15		sibship	1.16***		1.16***	1.14**	1.13***
witheldersister	0.82		0.87	0.85	0.8		witheldersister	0.78*		0.8	0.81	0.81
eldercohort	0.86		0.87	0.83	0.81		eldercohort	1		0.98	0.94	0.94
mignetwork	0.92		0.92	0.91	0.79		mignetwork	0.86		0.85	0.85	0.79**
peerpedu	1.91*		1.61	1.88	2.05*		peerpedu	1.53***		1.47*	1.5**	1.58**
tch_origin	1.11		1.06	1.07	1.1		tch_origin	0.88*		0.84**	0.83**	0.84**
tch_edu	1.13		1.27	1.31	1.33		tch_edu	1.42**		1.44*	1.45*	1.46**
tch_admin	1		1.01	1.04	0.9		tch_admin	0.95		0.95	0.93	0.9

tch_exp	0.71*		0.71*	0.7**	0.71*	tch_exp	0.85**		0.88*	0.88*	0.88*
tch_mthgain	1.01		1.01	1	1.01	tch_mthgain	1.05		1.05	1.04	1.04
tch_paydelayed	0.71		0.77	0.81	0.79	tch_paydelayed	1.1		1.11	1.15	1.21
subtch_origin	0.92		0.94	0.96	0.95	subtch_origin	1.08		1.11	1.1	1.09
subtch_edu	0.98		0.98	0.94	0.91	subtch_edu	0.93		0.95	0.95	0.93
subtch_exp	1.12		1.1	1.12	1.12	subtch_exp	0.94		0.91	0.9	0.92
classsize	1.05		1.08	1.07	1.06	classsize	1.07		1.07	1.06	1.05
distance	1.2*		1.19*	1.22**	1.23**	distance	1.03		1.03	1.05	1.06
survival	0.25		0.31	0.26	0.21	survival	0.59		0.65	0.63	0.51*
school1	0.41	0.94	0.45	0.43	0.31*	school1	0.57*	0.79	0.61	0.58	0.49**
school2	0.47	0.77	0.45	0.35	0.37	school2	0.22***	0.27***	0.23***	0.23***	0.22***
school3	1.41	5.26				school3	0.99	1.06			
school4	0.39	0.8	0.39	0.38	0.36	school4	0.76	1.11	0.77	0.71	0.69
school5		2.15*				school5		1.59**			
school6	1.32	1.15	1.31	1.38	1.59	school6	1.13	1.13	1.2	1.34	1.49
school7	5.5*	1.36	4.29	5.43	5.99*	school7	1.08	0.75*	0.92	0.94	1.08
school8						school8					
wealth	0.62***	0.58***	0.61***	0.6***		wealth	0.83***	0.78***	0.82***	0.81***	
housesize	0.95		0.92	0.93		housesize	1.01		0.99	1	
income	0.89		0.89	0.89		income	0.88*		0.89*	0.89**	
credit_financiali	1.05		1.04	1.06		credit_financiali	1.07		1.07	1.08*	
credit_relative	1.07		1.06	1.04		credit_relative	0.97		0.97	0.96	
stu_eduaspiration	0.46***		0.48***	0.46***	0.46***	stu_eduaspiration	0.39***		0.39***	0.39***	0.38***
expect_norm	1.72*		1.77*	1.79*	1.93*	expect_norm	1.51***		1.42***	1.43***	1.49***
expect_advanced	0.74		0.71	0.67	0.67	expect_advanced	0.62***		0.61***	0.6***	0.6***
percep_schquality	0.98		0.98	1	1.01	percep_schquality	1.05		1.05	1.06	1.06

percep_schaffiliation	0.79**		0.8**	0.8*	0.8*		percep_schaffiliation	0.88***		0.89**	0.89**	0.88***
percep_schvalue	0.78		0.78	0.77	0.77		percep_schvalue	1.01		0.99	0.97	0.97
percep_scheffort	0.84		0.85	0.83	0.81		percep_scheffort	0.86*		0.87	0.87	0.86*
confidence	1.15		1.16	1.18*	1.18*		confidence	1.01		1.01	1.02	1.02
courage	0.81***		0.82***	0.82**	0.81**		courage	0.95		0.95	0.95	0.95
curiosity	0.87		0.87	0.85	0.84*		curiosity	0.96		0.96	0.95	0.95
ambition	1.18**		1.16*	1.14*	1.12		ambition	1.1**		1.1*	1.08	1.06
familyonstudy	0.83		0.83*	0.81*	0.81*		familyonstudy	0.89**		0.88***	0.87**	0.87**
familyonemo	1.09		1.1	1.1	1.11		familyonemo	0.96		0.97	0.96	0.97
tchr_contvsstop	0.95		0.93	0.93	0.95		tchr_contvsstop	0.9		0.88*	0.88*	0.9
tchr_genvsvoc	0.82*		0.85	0.84	0.84		tchr_genvsvoc	0.85***		0.85**	0.83**	0.82***
sick	0.56		0.6	0.59	0.62		sick	0.71***		0.7***	0.71***	0.74**
sick_class	1.19		1.2	1.24	1.17		sick_class	1.15		1.18	1.23*	1.18
cost_vocvsjunior	1		1.02	1.02			cost_vocvsjunior	1.03		1.04	1.04	
cost_genvsvoc	0.92		0.92	0.93			cost_genvsvoc	0.87*		0.88*	0.88	
cost_colvsngen	0.95		0.95	0.96			cost_colvsngen	0.9		0.89	0.89	
earn_workvsdrop	1.11		1.11	1.13			earn_workvsdrop	1.05		1.06	1.07	
earn_vocvswork	0.84		0.87	0.88			earn_vocvswork	0.99		0.99	0.98	
earn_genvsvoc	0.65***		0.66***	0.66***			earn_genvsvoc	0.82***		0.81***	0.8***	
earn_colvsngen	0.67***		0.67***	0.67***			earn_colvsngen	0.84***		0.84***	0.84***	
knowvoc	1.04		1.06	1.08	1.04		knowvoc	1.18		1.18	1.19	1.16
performance	0.73	0.57***	0.73	0.75	0.76		performance	0.68***	0.56***	0.68***	0.67***	0.68***
business	0.38		0.43	0.42	0.38		business	0.52*		0.52*	0.54	0.48*
interpersonal	1.01		0.99	1	0.98		interpersonal	0.94*		0.93*	0.95	0.95
urbanlife	0.73		0.73	0.69	0.69		urbanlife	0.73**		0.73**	0.73**	0.69***
outreach_voc	0.73		0.59	0.54	0.6		outreach_voc	0.99		0.96	0.98	1.04

outreach_fac	0.89		1.04	1.13	1.07		outreach_fac	1.35		1.49*	1.56**	1.58**
local_negative	0.66		0.64	0.66	0.67		local_negative	1.47*		1.41*	1.43*	1.47*
local_entertain	1.37		1.51	1.75	1.9		local_entertain	1.04		1.11	1.14	1.17
gambling	1.34		1.45	1.63	1.55		gambling	0.91		0.91	0.81	0.77
chore	1.15		1.18	1.17	1.17		chore	1.16***		1.17***	1.16***	1.15***
love	3.59***		3.63***	3.78***	4.19***		love	1.71***		1.84***	1.83***	1.86***
grade_7	3.11***	2.54***	2.93***	3.43***	3.96***		grade_7	1.85***	1.48***	1.86***	1.82***	2.08***
grade_8	1.8	2.45***	1.68	1.85	2.01		grade_8	1.68***	1.9***	1.79***	1.79***	2***
grade_9							grade_9					
Dropout	(1)	(2)	(3)	(4)	(5)		Work	(1)	(2)	(3)	(4)	(5)

Note:

Option AHS is the base outcome. * p<0.1, ** p<0.05, *** p<0.01.

Model (1) Full sample full specification, N=6298. (2) Full sample but conventional variables. Lighthouse participation (1=yes) included but not reported, the RRR is 1.09 for Dropout and 0.56*** for Work. There is no big difference in results if Lighthouse participation is excluded. (3) Full specification but excludes the sample for QD, which has a tradition of early VHS admission, N=5931. (4) Full specification but excludes QD and students who said they totally lost their patience when answering questions, N=5713. (5) Sample (4) without variables related to money or cost/reward.

actually quite easy to understand. Income is not included as a conventional variable because it was hard to measure in previous literature. Once income is excluded, its effect is presumably captured by wealth, which reflects current income plus that previously inherited. The last variable with a changed significance level is the mean parental education level in class. The estimates are significant at the 10% level in the original model, but 5% in Columns (3) to (5), with an RRR larger than 1.3. This is no mystery since VHS is still about getting more schooling.

Finally, according to the main model, whether the students have thought about their PCED seriously, i.e. are not undecided, was proved to be sensitive to a number of PCED determinants. Results from other samples and specifications warn that we cannot be 100% confident of some of the effects, as they turn out to be statistically insignificant in some cases. Those variables are age, single parents, teacher experience, expectations of a normal career, and the feeling of affiliation to a school. On the other hand, migrant network turns out to be significant at the 1% level in Specification (5) with an RRR of 0.74, indicating that access to a larger migrant network actually makes students believe that getting a further education is a better track than being a migrant worker like the last generation. They could move to a city for AHS attendance, and then to a metropolitan area if they are able to enter higher education.

Overall, changing samples and/or specifications alters the statistical significance of certain variables, such as ambition, age, homeroom teacher origin and education, mean parental education in class (a proxy to peer effect) and perceptions of schooling, but it is good to see that there is no large change in RRR. Gender is the only variable with a sharp change in effect size— the gender effect declines every time with the conventional variable list. If we recall that recent literature tended to find a diminishing gender effect on education decisions, our robustness test suggests that this may be due to a simplification of covariates. Gender effect remains worrying when extensive variables are controlled.

Table 6-11 Relative Risk Ratios of “VHS” and “Undecided”_ Various Samples and Specifications

VHS	(1)	(2)	(3)	(4)	(5)	Undecided	(1)	(2)	(3)	(4)	(5)
female	1.85**	1.71***	1.83**	1.85**	1.66***	female	2.12***	1.51***	2.06***	2.06**	1.67***
f_income	1.08		1.11	1.11		f_income	1.08		1.1	1.08	
f_performance	1.21		1.14	1.16	1.17	f_performance	1.06		1.04	1.04	1.04
f_cost	0.95		0.95	0.95		f_cost	0.91*		0.92	0.92	
age	1.07	1.05	1.03	1.02	1.02	age	1.24**	1.22*	1.21*	1.2	1.22*
minority	0.53	0.6	0.37	0.37	0.38	minority	1.52	1.55	0.96	0.96	1.01
single_p	0.73*		0.72*	0.73	0.81	single_p	0.66**		0.68**	0.7*	0.76
migrant_p	1.03		1	1	0.99	migrant_p	0.71***		0.68***	0.69***	0.67***
no_p	0.88		0.84	0.87	0.88	no_p	0.65***		0.64***	0.64***	0.65***
medu	1.01	1.02	1	1	1	medu	0.93	0.94	0.93	0.93	0.92*
fedu	1.01	0.97	1.01	1.01	0.99	fedu	0.98	0.94*	0.98	0.98	0.96
peasant	0.93		0.93	0.92	0.95	peasant	0.92		0.91	0.91	0.96
politicalc	1.06		1.05	1.04	1.04	politicalc	0.93		0.95	0.94	0.94
parent_leader	0.74		0.72	0.77	0.81	parent_leader	1.08		1.03	1.07	1.13
parentbadhealth	1.17		1.09	1.09	1.13	parentbadhealth	0.89		0.83	0.81	0.84
sibship	1.09**		1.08**	1.08*	1.06*	sibship	1.07		1.07*	1.06	1.06
witheldersister	0.97		0.99	1	0.96	witheldersister	0.96		0.95	0.94	0.92
eldercohort	1.1		1.08	1.07	1.05	eldercohort	1.22*		1.18	1.16	1.15
mignetwork	0.95		0.98	0.96	0.89	mignetwork	0.83*		0.84	0.82*	0.74***
peerpedu	1.22*		1.3**	1.31**	1.45***	peerpedu	1.51***		1.58***	1.58***	1.67***
tch_origin	1		0.95	0.94	0.95	tch_origin	1		0.96	0.95	0.96
tch_edu	1.32**		1.43***	1.49***	1.49***	tch_edu	1.15		1.16	1.2	1.23
tch_admin	0.97		0.96	0.92	0.91	tch_admin	1.31		1.32	1.27	1.23

tch_exp	0.87***		0.87***	0.87***	0.87***	tch_exp	0.89**		0.91*	0.91	0.91
tch_mthgain	1.06*		1.05	1.05	1.06*	tch_mthgain	1.07*		1.06	1.05	1.05
tch_paydelayed	1.02		1.03	1.06	1.13	tch_paydelayed	1.15		1.16	1.19	1.25*
subtch_origin	1.02		1.11*	1.12*	1.11*	subtch_origin	1.14**		1.18***	1.2***	1.19***
subtch_edu	0.95		0.93	0.91	0.89**	subtch_edu	1.01		1.02	1.01	0.99
subtch_exp	1.03		0.97	0.96	0.98	subtch_exp	1.04		0.98	0.98	0.99
classsize	1.01		1.04	1.04	1.02	classsize	0.95		0.97	0.98	0.97
distance	1.02		1.02	1.03	1.03	distance	0.99		1	1.01	1.02
survival	0.42***		0.49***	0.48***	0.41***	survival	0.37***		0.41***	0.43***	0.35***
school1	0.4***	0.66***	0.44***	0.42***	0.38***	school1	0.4***	0.7**	0.41***	0.42***	0.36***
school2	0.23***	0.35***	0.29***	0.29***	0.24***	school2	0.56*	0.93	0.64	0.67	0.63
school3	0.57	0.85				school3	0.2**	0.49			
school4	0.57**	1.08	0.62**	0.61**	0.62**	school4	0.64	1.3	0.66	0.69	0.66
school5		1.81***				school5		2.08***			
school6	1.04	0.89	1.03	1.12	1.21	school6	1.77**	1.59**	1.87**	1.97**	2.17***
school7	1.67**	1.08	1.31	1.33	1.49*	school7	2.07***	1.29*	1.77**	1.7*	1.91**
school8						school8					
wealth	0.96	0.92**	0.95	0.95		wealth	0.85***	0.79***	0.84***	0.84***	
housesize	0.94		0.94	0.94		housesize	1.02		1.01	1.02	
income	0.89***		0.89***	0.89***		income	0.88**		0.88**	0.89**	
credit_financiali	1.03		1.03	1.04		credit_financiali	1.08		1.08	1.09	
credit_relative	0.96		0.96	0.95		credit_relative	0.97		0.97	0.97	
stu_eduaspiration	0.75***		0.75***	0.75***	0.74***	stu_eduaspiration	0.66***		0.66***	0.66***	0.65***
expect_norm	0.99		0.95	0.92	0.95	expect_norm	1.3**		1.26	1.23*	1.26*
expect_advanced	1.02		1.02	0.99	0.99	expect_advanced	0.77*		0.78	0.77	0.76*
percep_schquality	1.04		1.04	1.04	1.05	percep_schquality	1.05		1.04	1.04	1.05

percep_schaffiliation	0.96		0.98	0.98	0.96		percep_schaffiliation	0.91***		0.93**	0.93*	0.92**
percep_schvalue	1.11**		1.07	1.08	1.07*		percep_schvalue	0.96		0.94	0.94	0.94
percep_scheffort	0.92		0.94	0.94	0.94		percep_scheffort	0.88**		0.88**	0.89**	0.88**
confidence	1.08**		1.07**	1.07**	1.07*		confidence	1.05		1.04	1.04	1.04
courage	0.93***		0.92***	0.93***	0.93***		courage	0.91***		0.9***	0.9***	0.9***
curiosity	0.94**		0.94**	0.94**	0.95**		curiosity	0.92***		0.92***	0.92***	0.92***
ambition	1.07**		1.07**	1.06*	1.04		ambition	1.01		1	1	0.99
familyonstudy	0.98		0.97	0.96	0.95		familyonstudy	0.9***		0.89***	0.88***	0.88***
familyonemo	0.99		0.99	0.99	1		familyonemo	1.01		1.01	1	1.01
tchr_contvsstop	1.02		1	0.99	1.01		tchr_contvsstop	1.03		0.99	0.98	0.99
tchr_genvsvoc	0.86***		0.89**	0.89**	0.89***		tchr_genvsvoc	0.83***		0.84***	0.85***	0.84***
sick	0.96		0.96	0.95	0.98		sick	0.87		0.89	0.9	0.93
sick_class	1.02		1.03	1.07	1.03		sick_class	1.04		1.04	1.08	1.03
cost_vocvsjunior	1		1	1			cost_vocvsjunior	1.04		1.04	1.04	
cost_genvsvoc	0.86***		0.86***	0.86***			cost_genvsvoc	0.95		0.96	0.96	
cost_colvsngen	0.96		0.96	0.97			cost_colvsngen	0.95		0.95	0.95	
earn_workvsdrop	1.05		1.06	1.06			earn_workvsdrop	1.1**		1.11***	1.11***	
earn_vocvswork	0.96		0.96	0.96			earn_vocvswork	0.91*		0.91*	0.91*	
earn_genvsvoc	0.76***		0.75***	0.75***			earn_genvsvoc	0.79***		0.79***	0.78***	
earn_colvsngen	0.87***		0.86***	0.86***			earn_colvsngen	0.85***		0.84***	0.84***	
knowvoc	1.28***		1.29***	1.29***	1.25***		knowvoc	0.9		0.9	0.9	0.88
performance	0.84***	0.83***	0.83***	0.83***	0.83***		performance	0.71***	0.65***	0.71***	0.71***	0.72***
business	0.93		0.94	0.94	0.85		business	0.72		0.73	0.76	0.69*
interpersonal	1.05*		1.05*	1.05*	1.05*		interpersonal	1.02		1.01	1.01	1.02
urbanlife	0.9		0.89	0.89	0.85		urbanlife	0.77**		0.78**	0.78**	0.74***
outreach_voc	0.96		0.91	0.91	0.97		outreach_voc	0.91		0.88	0.86	0.9

outreach_fac	1.18		1.19	1.21	1.23		outreach_fac	1.3		1.36*	1.38*	1.39*
local_negative	1.34		1.32	1.35	1.35*		local_negative	1.06		1.04	1.06	1.08
local_entertain	1.44**		1.52**	1.54**	1.59**		local_entertain	1.09		1.15	1.12	1.19
gambling	1.05		1	1	0.97		gambling	1.13		1.11	1.08	1.04
chore	1.04		1.05	1.04	1.03		chore	1.01		1.02	1.01	1
love	1.18		1.21	1.17	1.19		love	1.56**		1.59**	1.5**	1.53**
grade_7	1.41**	1.53***	1.33**	1.36**	1.64***		grade_7	1.73***	1.43***	1.71***	1.71***	1.94***
grade_8	1.65***	1.67***	1.63***	1.69***	1.94***		grade_8	2.1***	1.96***	2.07***	2.05***	2.26***
grade_9							grade_9					
VHS	(1)	(2)	(3)	(4)	(5)		Undecided	(1)	(2)	(3)	(4)	(5)

Note:

Option AHS is the base outcome. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Model (1) Full sample full specification, N=6298. (2) Full sample but conventional variables. Lighthouse participation included but not reported, the RRR is 0.97 for VHS and 0.68*** for Undecided. No great difference in results if Lighthouse participation is excluded. (3) Full specification but excludes the sample for QD, which has a tradition of early VHS admission, N=5931. (4) Full specification but excludes QD and students who said they totally lost their patience when answering questions, N=5713. (5) Sample (4) with variables related to money or cost/reward.

6.3 Heterogeneity

For policy purposes, it is important to learn how the effects of determinants vary across different student groups, so there could be better targeting of knowledge and interventions for them. To achieve this, in this section the imputed MNL is conducted by gender (female vs. male), wealth (richer 50 percentile vs. poorer 50 percentile), and test performance (higher 50 percentile vs. lower 50 percentile). I chose by-background regression instead of using interaction terms to avoid expanding the matrix dimension, which is already big. The regression output of RRR and p-value asterisks are presented in Appendix E2. Here the findings are highlighted by the category of the independent variables.

For basic characteristics, the richer and high-performance groups are more sensitive overall. In the richer group, being female has an RRR for VHS and undecided close to 3, and being relatively old has an RRR of 1.54 for undecided. It is also notable that, in this group, being a girl with a higher estimated cost of further education can significantly lower the relative odds of VHS. In the high-performance group, girls have much greater odds of work, VHS, and undecided. The only significant finding for the disadvantage group is that, among lower-performance students, being relatively old leads to higher relative odds of work.

The effects of family completeness and mother's education vary regarding parental background variables. For lower-performance children with single parents, the relative odds for dropout are much lower ($RRR=0.16$), but this needs to be carefully interpreted as that may actually suggest that those without strong determination have already dropped out. Migrant parents and no-parent status are able to lower the odds of undecided for all groups, with a slightly greater effect (lower RRR) for the advantaged groups of male, richer, and higher-performance students. For higher levels of mother's education, it is able to lower the relative odds of work and undecided for the higher-performance group. Without these by-group regressions, the impact of mother's education will be otherwise ignored.

All variables for siblings, have associations with PCED that are heterogeneous to student background. Sibling size has increased odds for work among female, poorer, and lower-performance students, so are the odds for VHS among female and lower-performance students, and the odds for undecided among lower-performance children. Having an older sister largely lowers the odds for work among females and higher-performance students. Finally, being relatively old among siblings only affect students with lower test performance. It increases the relative odds of VHS and undecided for this group.

The large variable group of peer, teacher and school factors shows complicated relationships with PCED in the full sample regression, yet the by-group regressions reveal a clear rule for these relationships, which is that they are largely driven by the reactions of disadvantage groups. Generally speaking, female, poorer, or lower-performance students are very sensitive to mean parental education level in class, schooling distance, teacher characteristics, and school survival rate. More attention should be paid to the subtle peer effect. For richer students, the mean parental education has no impact at all on the relative odds of dropout or work, and if there is any, it would be negative as the RRR is lower than 1. For poorer students, however, the RRR is statistically significant and far greater than 1, which basically drives the results for the whole-sample regression. Such a finding suggests a possible explanation for why higher mean parental education in class may not nurture positive PCED— students with relatively disadvantaged backgrounds may find it easier to give up positive PCED after seeing the rest of the class have more hopes for it.

As shown in the full-sample results, the effect of household economic status and credit constraints are concentrated in wealth and income. Greater wealth lowers the relative odds of dropout for high-performance students; its negative association with the relative odds of work mainly applies to female or lower-performance students; and its negative association with the relative odds of undecided mainly applies to female or higher-performance students. For higher household income, it lowers the relative odds of work for girls, the relative odds of VHS for the poor, and the relative odds of undecided for girls and higher-performance students. It is interesting to see

that the six category income variable has an effect heterogeneous to gender, but the interaction between gender and income level, a dummy, does not reveal that heterogeneity. This is an example of how different forms of variable construction lead to various results. We should also bear in mind that income data has many imputations, which adds to the uncertainty of regression results.

Despite having a similar number of variables, the rules of heterogeneity are not as clear for subject factors as for peer, teacher and school factors. For simplification, the discussion here will follow the grouping instead of single variables. More details are presented in the appendix. For gender difference, ambition, curiosity, affiliation to school, and the level of family care for study and PCED, appears to mainly affect girls, while expectation of advanced career, willingness to study, courage, and confidence matter more for boys. When it comes to wealth difference, curiosity, ambition, expectation of advanced career, affiliation to school, willingness to study, perceived value of schooling, and teacher's relative preference for AHS are all more influential for poorer students, while level of confidence and family's care for study/PCED matter more for richer students. The effects of courage are a mixture. Higher levels of courage mainly lower poorer student's relative odds of dropout, and richer student's relative odds of VHS and undecided. For performance difference, a teacher's relative preference for AHS, expectation of advanced career, willingness to study, and level of family care for study/PCED matter more for lower-performance students, while expectations of normal career, perceived value of schooling, confidence, and courage play a stronger role for higher-performance students. There are also variables showing impacts on different PCEDs for different groups, such as the affiliation to school, ambition, and curiosity. Lastly, educational aspiration is a variable maintaining a strong and stable influence without regard for gender, wealth, and academic performance.

As shown in the main model results (Table 6-7), sickness lowers the relative odds of work, and that is the sole effect discovered for health factors. Regressions by background further reveal that such effects mainly work for female, richer, and higher-performance students, which matches common expectations.

The expected relative earning of AHS vs. VHS and college vs. AHS continue to have strong effects across different backgrounds in an expected direction, however heterogeneity does exist for other cost/reward variables. Perceiving a relatively higher cost of AHS lowers the relative odds of work for boys; perceiving a relatively higher cost of college lowers the relative odds of VHS for boys; and perceiving higher earnings from VHS vs. work (strangely) lowers the relative odds of VHS for girls. Poorer student's relative odds of being undecided turns out to be sensitive to all four relative-earning variables. Here we again see the counter-intuitive cost effect on VHS odds, which may result from too many imputations and the cost variable construction that merely reflects household opinion.

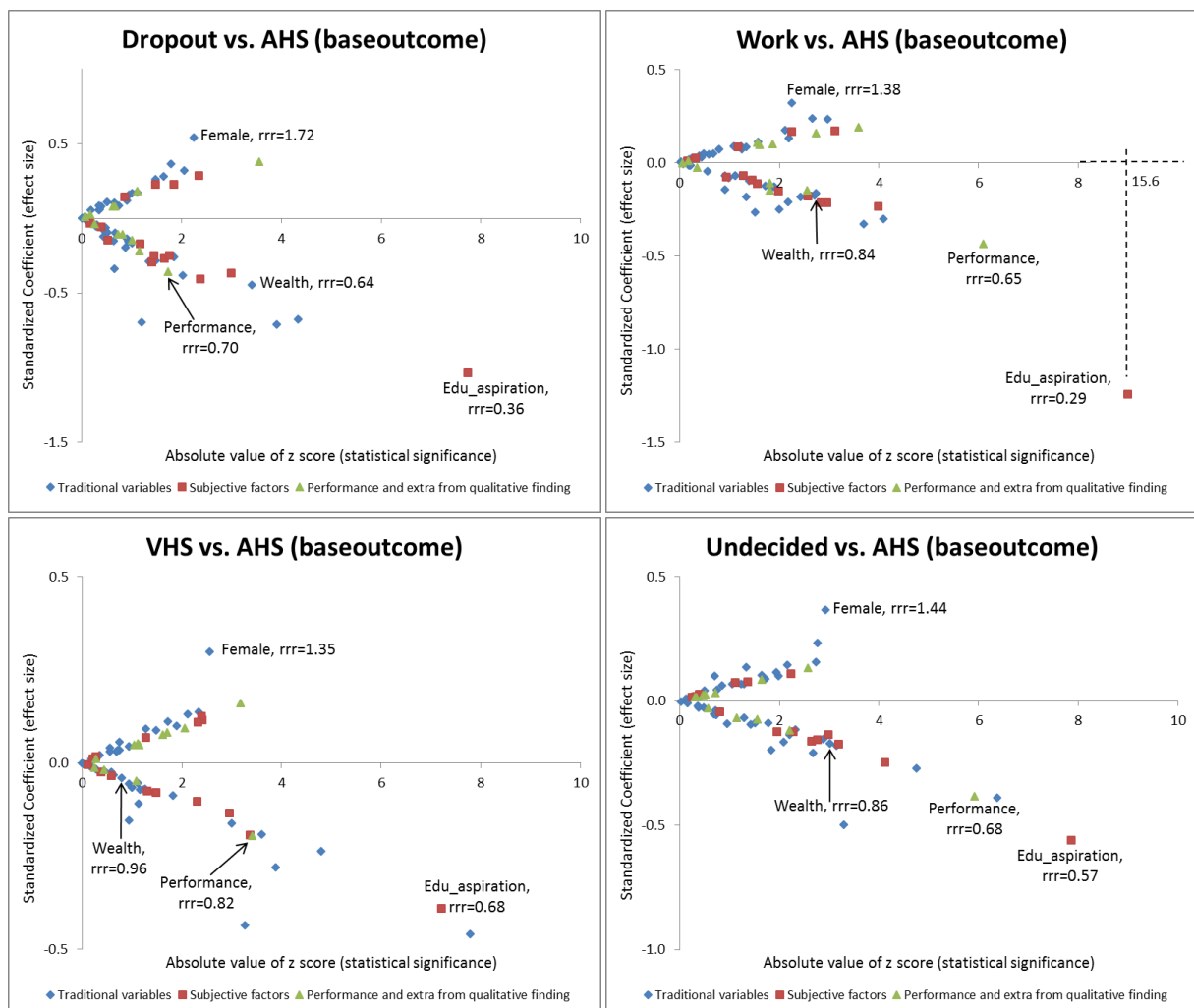
Finally, academic performance and other variables have PCED links that are heterogeneous to gender, wealth, or performance, but most are not surprising. Some eye-catching links are as follows. It is among the higher-performance students that more time spent on household chores and being in Grade 7 can be associated with higher relative odds of dropout and work. Urban experience discouragement of work option mainly applies to female, poorer, and higher-performance students. It is among the richer students that holding negative views of local development can largely increase the odds of work (RRR=2.18). Knowledge, performance, local entertainment industry, and being in Grade 7 all affect the odds of VHS disproportionately, but they are not as extreme as the outreach of factories, which has a statistically significant RRR of 1.66 for higher-performance group, but an insignificant RRR of 0.71 for lower-performance groups. Lastly, the opposite effects of factory outreach also apply to the odds of undecided. Its RRR is 1.94 for higher-performance students and 0.75 for lower-performance students, although the latter is again statistically insignificant.

6.4 Synthesis: Subjective vs. Traditional vs. Localized Determinants

Give the large number of potential PCED determinants, it is never easy to explain all regression results succinctly, but a visualization of the main-model results with more general grouping should

help in grasping the whole picture. In Figure 6-1, independent variable- standardized coefficients (y axis) and absolute values of z scores (x axis) are drawn as scatter graphs for each outcome, with the variables generally categorized as subjective factors, traditional variables (non-subjective variables mentioned in previous literature), and performance, plus extra Delphi-suggested variables that are mostly localized. Since the coefficients are standardized, we can compare the effect sizes of different variables. Dots falling on the upper or lower right-hand side will be for variables showing strong PCED connections, holding other variables constant⁷⁵.

Figure 6-1 Visualization of Standardized Effect Size and Statistical Significance



Note: School and grade dummy results excluded. The MI standard deviations (SD) for independent variables are calculated with Rubin's combination rules, listed in Appendix E3. The independent variable-standardized coefficients are calculated as coefficient * SD, and the corresponding RRR are calculated as $\exp(\text{coefficient} * \text{SD})$.

⁷⁵ Coefficients are not proportional to effect size, neither is the absolute z score to statistical significance, but larger coefficients and absolute z scores do mean better effect size and statistical significance.

In the big picture, PCED is something quite alterable. There are many dots squeezed near the origin, but there are also dots passing $|z|=2$ with decent dispersion, especially for “work” and “undecided”. Since different factors also affect each other, it is acceptable to have many dots behind the $|z|=2$ line. For example, the effect of class-related sickness will be absorbed by performance, so we will see no effect from class-related sickness. Those most critical determinants can remain having an absolute z score that is higher than 2. It is notable that educational aspiration stands out. For all outcomes against AHS, the dots for educational aspiration are always in the lower right, even though relevant variables like parental education and economic status are all controlled. Perceived relative earnings (AHS vs. VHS and College vs. AHS) also appear to be important, presenting as blue diamonds close to educational aspiration, but they are less trustworthy due to high rates of imputation.

The graphs also highlight three other popular variables, female, performance, and wealth, with RRR reported to displace how the related possibility of choosing an option over AHS changes given a one standard deviation move of the variable. Performance falls on the margin of being statistically significant for the decision to dropout, and wealth has an ignorable impact on the decision of schooling track. Only the gender effect appears to be as evident as the aspiration effect. Still, education aspiration seems to be more alterable. This finding is closely connected to the next chapter on Lighthouse impact.

6.5 Summary and Discussion of Findings Regarding PCED Determinants

6.5.1 Summary of Findings Regarding PCED Determinants

For PCED determinants, the main model presents the following major findings:

1. Being female or being older decreases the relative odds of AHS.

-
2. Students from an incomplete family (single parent, migrant parent or no parent) are more likely to think seriously about their PCED.
 3. Number of siblings is positively associated with the odds of work and VHS relative to AHS.
 4. Higher mean parental education level in class is actually correlated to lower relative odds of AHS. Later it is revealed that this negative association applies to disadvantage students, who may be discouraged from AHS after realizing the gap between themselves and their peers. A homeroom teacher's education is linked to lower AHS odds, while experience is linked to higher AHS odds, but these associations are probably related to the school's preference for teacher assignment. Finally, the school survival rate is clearly associated with higher AHS odds, as students continuing to the final grade are those who would like to take the high school entrance exam to enter AHS.
 5. As expected, wealth and income are associated with higher relative odds of AHS.
 6. In terms of subjective factors, educational aspiration, expectations of a normal career, perceptions towards schooling, courage, curiosity, family's care for study, and teacher's preference for AHS show the expected influence on PCED. Among them, educational aspiration clearly stands out as the strongest determinant. It is worth noting that, with so many other variables held constant, the relevance of subjective factors are much more evident.
 7. Sickness lowers the relative odds of work since sick students recognize their incapacity for low-skill labor work.
 8. Knowledge of relevant policies as well as homeroom teacher's track preference could affect the decision on VHS.
 9. PCED is more sensitive to the expected relative return than the relative cost of different options.
 10. Better academic performance clearly promotes the relative odds of AHS. Among the additional variables proposed by the Delphi survey, knowledge of vocational education policy,

urban experience, local entertainment industry, house chore, and teenager love all relate to PCED in a predictable direction. It is also worth mentioning that students with lower grades have more diverse PCEDs, while many of those promoted to the last grade are pursuing AHS.

There are also variables that are popular in the literature yet show very weak PCED connections in the main model, including parental education/identity and the school factors of class size and schooling distance. Their effects might be absorbed by other stronger determinants, or become more subtle, and perhaps heterogeneous to some student characteristics.

The main model passes the robustness check. It is true that p values fluctuate across different samplings and/or specifications, but these do not bring about large coefficient changes. Nevertheless, the unstable statistical significance does question the reliability of some variables (e.g. level of ambition), and remind us that some variables (e.g. size of migrant network) may actually be more important than the main model suggests if sampling, specification, or missing data is no longer an issue.

In addition to robustness, this chapter also explores heterogeneity. It is not surprising to see different variables disproportionally affect students of different gender, wealth, or academic performance. Overall, basic characteristics (gender, age and ethnicity) and parental background affect more children with advantaged backgrounds (male, richer, high-performance), while sibling and peer/teacher/school factors matter more for the disadvantaged group (female, poorer, low-performance). Other PCED determinants show mixed heterogeneous effects. These patterns are neither easily predictable nor counter-intuitive. The ultimate value of uncovering these heterogeneities is to help in targeting interventions for appropriate interventions. For example, we certainly want higher-performance students to continue their schooling after compulsory education, but low expectations of future careers and heavier household chore burdens both increase the relative odds of work for this group (and not for the lower-performance students). Accordingly, it is wise to pay attention to promoting career expectations and lowering household chore burdens.

Finally, putting standardized regression outputs in scatter graphs show that PCED does react to certain variables with diverse effect size and statistical significance. Among these variables, educational aspiration has been one of the most influential and alterable determinants that matters for all PCEDs. It connects the discussion of PCED determinants to the impact evaluation of the socio-emotional support provided by Lighthouse.

6.5.2 Comparison with the Literature

In comparison to existing literature, this study has brought new discoveries mainly related to gender, parental background, cost and reward, subjective factors, and local factors.

The literature suggests that gender effect has been declining and becomes more sophisticated, as being a girl is more income-, performance-, and cost-elastic than being a boy in PCED (e.g. Brown and Park, 2002; Sun, 2004; Song et al., 2006; Hannum and Adams, 2007; Li, 2009; Li and Cheng, 2009; Yi et al., 2011). This research, however, finds that the gender effect remains quite straightforward, with significant and high RRR for non-AHS options on the dummy variable of being female. Tests of heterogeneity show that such gap mainly exists in the richer and high-performance groups. During the robustness check, it is interesting to see that RRR on the gender dummy gets smaller when the regression only includes variables that are popular in the literature. This leads to the concern that the diminishing gender effect actually results from insufficient control in regressions.

Parental background is another field with findings that “counter” the literature (e.g. Brown, 2006; Zhu, 2006; Ding and Li, 2007; Fang, 2007; Liu, 2007; de Brauw and Giles, 2008; Lu, 2012). According to the main model, parents’ educations, positions, and political capitals no longer significantly affect PCED. This is to some extent a reflection of the completeness of my variable list. After all, parental background should affect PCED through mediators, such as more care on children’s study and less birth. Thanks to the recognition of “undecided” as an option to these young students, we are able to

uncover that students from an incomplete family are more progressive on thinking of their PCED, with a preference on AHS. This is a bonus finding that was not touched by previous literature.

In terms of the effect of monetary cost and reward, literature have a consensus that whether choosing a PCED, especially when it involves school track, is discouraged by the expectation of relative cost (e.g. Li and Cheng, 2009; Liu et al., 2009; Song et al., 2011) and encouraged by the expectation of relative reward (e.g. Sun and Du, 2004; Ding and Li, 2007; Chen, 2009). This study takes a further step to find that students probably react more to relative earning than to relative cost among different PCEDs, however I have less confidence in this finding due to the missing data in the reward and cost variables, and to the different means of construction for these two groups of variables⁷⁶. In fact, the higher expected relative cost of AHS against VHS is associated with lower relative odds of VHS, but we cannot say cost proxies quality since that should be captured by the relative-earning variables

With regard to subjective factors, while the literature agrees that personality, attitude, and perceptions of or between the PCED stakeholders (students, parents, and teachers) account for PCED (e.g. Jiang and Dai, 2005; Wang, 2005; Hannum and Adams, 2007, 2008; Lee and Park, 2010; Zhang, 2011), this study further confirms that their impacts are quite strong when compared to other variables. 12 out of the 15 subjective variables are significantly associated with the relative odds of one or several PCEDs in predictable directions. It is worth noting that subjective factors can all be treated as mediators. For example, a family's care for study can be a mediator of parental education, and factors like confidence, career expectation, and schooling aspiration can be mediators of numerous individual, household, and community factors. Some background factors like parental education, ethnicity, or chronic disease are hard or impossible to change, but subjective factors can still be altered by socio-emotional interventions.

Finally, thanks to the Delphi survey, this study also adopts variables that did not receive enough attention in the previous literature, and provides some fresh insights into the PCED discussion. Now

⁷⁶ Cost variables only reflect household opinions, while earnings variables are the mean of household and the student opinions.

we confirm that assumptions such as knowledge of VHS policies encourages its enrollment, sufficient urban experience makes the students more inclined to AHS, and teenager love increases the risk of discontinuing schooling. We also find subtle messages, such as that higher-performance children are more sensitive to the outreach of factories, and a thriving local entertainment industry encourages richer students to choose VHS instead of AHS.

Simply speaking, this thorough investigation of PCED determinants has resulted in findings that are different to those of the previous literature, that are a further extension of existing arguments, and that are totally new to the field. This study does not have the ambition to generalize its findings to the whole of rural China, as it only focuses on the rural part of a coastal province. In fact, these new findings may be new only because the study includes an area which has not received much attention from the previous quantitative research, but this is indeed another contribution of the study. With rapid urbanization, vast internet coverage, and the sprawling bullet train network, the PCED issues faced by today's rural students in coastal China may reach their peers in inner China tomorrow.

Chapter 7 Empirical Findings Regarding Lighthouse Impact

This chapter analyzes the PSM results for Lighthouse impact for the six Lighthouse schools. It starts with the determinants of Lighthouse participation for those participating in the latest program in summer 2012, and those who have participated in any Lighthouse program. In Section 7.2, with-replacement nearest neighborhood (NN) matching results are presented for all five imputations. Because the control group was a much larger sample than the treatment group, NN control cases could change easily across specifications and imputation. With-replacement NN results tend to have larger variance, and therefore NN is the most rigorous PSM method for screening outcomes that are really caused by the Lighthouse program. Educational aspiration turns out to be the only consistent outcome. Further analyses including adjusted propensity score estimates, other PSM methods, by-background analyses, and by-site analyses are conducted for educational aspiration. Following these analyses, there is an exploration of causal mechanism based on qualitative findings, which suggests the role-model effect could explain why the Lighthouse program mainly affects educational aspiration. The chapter ends with a summary of findings and a discussion of the untestable variables throughout the PSM process.

7.1 Determinants of Lighthouse Participation

There are two options to start with in searching for the determinants of Lighthouse participation. One is to run a regression of treatment status on the determinants suggested by the Delphi survey (plus school and grade dummies), the other, a conservative way, is to run a regression on the Delphi list and the PCED determinants together. Table 7-1 presents the probit marginal effect and p values for the most recent participation and any participation with these two variable lists. Subjective factors are taken out because they could also be treatment effects. It turns out that, for the purpose of propensity score calculation, the short Delphi list will be the quickest pick. It yields smaller AIC/BIC

than the conservative list, which means the equation gained from the Delphi list predicts treatment propensity with higher precision, and that the conservative variable list has an over-fitting problem.

If the purpose is to see what factors really matter for treatment status, it does no harm to look at the results of both specifications. For the full-list regression, the latest Lighthouse participation is positively associated with academic performance, popularity of Lighthouse among classmates (proxy to class effect), household attitude to summer camps, migrant network, being female, family size, availability of family business, availability of credits from relatives, and sickness, but negatively associated with schooling distance, age, and expected future earnings of AHS relative to VHS, both at the 5% level. Among these variables, it is hard to explain why sickness increases the possibility of Lighthouse participation. Perhaps, sick students have fewer chores or work burdens, and more leisure time for camps. It is even harder to explain why higher expected future AHS earnings lowers propensity of treatment, however if we look at the regression results for any-participation, the marginal effects for these two controversial values are almost zero with reversed signs, with p values higher than 0.9. The effects for any participation should have the same direction, so such a change in significant levels and directions simply implies that the results are unreliable. There are other variables with sizeable changes to significant level when the dependent variable is any participation, including gender, father's education, estimated relative AHS cost, and knowledge of vocational education policies. These all remind us of the problem of over-fitting.

If we compare the results for Delphi variables only, we see more stable marginal effects and p values. Overall, academic performance, schooling distance, household attitudes to summer camp, and migrant network are the four treatment determinants that can be claimed with confidence. Their effects remain strong and consistent across models and dependent variables. Performance is divided into four quantiles, distance and attitudes to camp into six quantiles, and migrant network a dummy variable, so, if we check the effect size, distance is certainly the most influential treatment determinant. A one unit increase in the distance variable lowers the propensity of the most recent participation by over 1%, and the propensity of any participation by nearly 3%. Actually, the

popularity of the Lighthouse program among classmates (peertreated) has the strongest marginal effects, but it is a mixture of peer effect and class fixed effect. We can conclude that Lighthouse reputation among peers is important, but we cannot confidently tell how important it is. Among other variables suggested by Delphi, attitudes to household chores and farm work, perceived value of schooling and the availability of other summer activities do not have significant impact; and time spent on household chore does not have consistent results. It is a disappointment to see that not all Delphi-suggested variables are influential, but nevertheless, the Delphi survey does help generate a more accurate treatment prediction using a much shorter variable list.

Table 7-1 Probit Outputs for the Determinants of Lighthouse Participation

	Most Recent Participation				Any Participation			
	Full List		Delphi List		Full List		Delphi List	
	dy/dx	P>z	dy/dx	P>z	dy/dx	P>z	dy/dx	P>z
Performance	0.010	0.005	0.012	0.000	0.021	0.001	0.018	0.000
atti_chore_farm	-0.001	0.707	-0.001	0.653	-0.001	0.897	-0.001	0.752
percep_schvalue	0.001	0.686	0.003	0.263	0.006	0.248	0.006	0.196
other_act	0.000	0.825	0.000	0.901	0.003	0.316	0.004	0.194
Distance	-0.011	0.000	-0.013	0.000	-0.025	0.000	-0.026	0.000
chore	0.003	0.269	0.005	0.018	-0.005	0.260	-0.003	0.422
peertreated	0.024	0.000	0.020	0.000	0.076	0.000	0.074	0.000
Attoncamp	0.009	0.000	0.009	0.000	0.011	0.001	0.010	0.001
Mignetwork	0.018	0.006	0.018	0.005	0.023	0.044	0.025	0.026
female	0.034	0.023			0.039	0.118		
f_income	-0.014	0.125			-0.016	0.342		
f_performance	-0.007	0.503			-0.013	0.423		
f_cost	0.002	0.495			0.005	0.342		
age	-0.015	0.026			-0.018	0.125		
minority	0.011	0.737			-0.003	0.964		
single_p	0.012	0.305			0.001	0.979		
migrant_p	0.000	0.989			0.019	0.127		
no_p	0.004	0.617			0.019	0.195		
medu	0.001	0.844			0.006	0.224		
fedu	-0.004	0.127			-0.009	0.030		
peasant	-0.003	0.652			0.005	0.672		
politicalc	0.009	0.075			0.018	0.052		
parent_leader	0.014	0.332			0.042	0.112		
parentbadhealth	-0.019	0.281			0.028	0.245		
sibship	-0.002	0.536			0.005	0.264		
witheldersister	-0.003	0.700			0.002	0.905		
eldercohort	-0.001	0.847			0.004	0.768		
peerpedu	-0.005	0.591			-0.002	0.884		
tch_origin	0.003	0.495			0.004	0.509		
tch_edu	0.002	0.799			0.002	0.903		

tch_admin	0.011	0.473			0.024	0.353		
tch_exp	0.003	0.518			0.007	0.329		
tch_mthgain	0.000	0.929			-0.007	0.065		
tch_paydelayed	0.015	0.068			-0.016	0.245		
subtch_origin	-0.007	0.070			-0.008	0.184		
subtch_edu	0.003	0.499			0.000	0.956		
subtch_exp	-0.002	0.528			0.002	0.713		
classsize	-0.004	0.444			0.009	0.384		
survival	-0.015	0.232			0.003	0.885		
school1	—	—	—	—	—	—	—	—
school2	-0.088	0.000	-0.057	0.000	-0.005	0.891	-0.019	0.304
school3	-0.023	0.523	0.017	0.099	0.060	0.371	0.049	0.009
school4	-0.029	0.042	-0.002	0.841	0.037	0.122	0.026	0.124
school5	—	—	0.018	0.059	—	—	0.001	0.971
school6	0.061	0.000	0.057	0.000	0.022	0.431	0.001	0.975
school7	—	—	—	—	—	—	—	—
school8	—	—	—	—	—	—	—	—
wealth	-0.004	0.283			0.003	0.618		
housesize	0.007	0.042			0.012	0.037		
income	0.000	0.982			0.002	0.662		
credit_financiali	-0.001	0.637			-0.004	0.316		
credit_relative	0.006	0.018			0.011	0.008		
sick	0.019	0.004			-0.001	0.943		
sick_class	-0.008	0.189			0.019	0.080		
cost_vocvsjunior	-0.002	0.377			-0.007	0.054		
cost_genvsvoc	0.001	0.684			-0.008	0.047		
cost_colvsgen	0.002	0.314			0.007	0.068		
earn_workvsdrop	-0.002	0.226			-0.002	0.555		
earn_vocvswork	-0.004	0.093			-0.003	0.428		
earn_genvsvoc	-0.005	0.032			0.000	0.932		
earn_colvsgen	-0.001	0.524			0.002	0.577		
knowvoc	0.004	0.361			0.021	0.007		
business	0.028	0.014			0.026	0.241		
interpersonal	0.003	0.188			-0.004	0.239		
urbanlife	-0.003	0.669			0.017	0.137		
outreach_voc	-0.005	0.615			-0.001	0.971		
outreach_fac	-0.014	0.220			0.003	0.882		
local_negative	0.009	0.379			0.006	0.736		
local_entertain	-0.003	0.799			-0.010	0.646		
gambling	0.008	0.484			0.000	0.996		
schatmos	—	—			—	—		
love	-0.008	0.447			0.031	0.062		
grade_7	0.007	0.453	0.004	0.663	0.016	0.368	0.025	0.095
grade_8	0.005	0.620	-0.005	0.522	0.006	0.727	0.003	0.816
grade_9	—	—	—	—	—	—	—	—
AIC	1483.644		1462.963		3540.515		3540.685	
BIC	1931.879		1571.82		3988.75		3649.542	

Note: N=4462. These are probit regression results from imputation_1 with average marginal effects and corresponding p values reported. Two non-Lighthouse schools were excluded from the sample. Similar results from other imputations. There are no different findings if using logit instead.

7.2 Effect of Lighthouse Participation

Based on the Delphi result (Figure 4-3) and the feasibility of variable construction, I tested Lighthouse's impacts on eight indexes for both the latest participants and the participants of any Lighthouse program. Since there are many more untreated students than treated students, any change in imputations or variables for propensity score prediction can change the untreated student with the nearest propensity score to a certain treated student, making NN matching results the most fluctuating ones. If the NN average treatment effects on the treated (ATT) for an outcome index stay statistically significant across models and imputations, we are confident that it is a treatment effect, and we should explore that index in-depth.

Common support and balance properties were both tested. Because the control sample largely outnumbers the treatment sample, there is a very good overlap of propensity scores between non-Lighthouse and Lighthouse students. However, the balancing property is not perfectly satisfied. For each imputation, there is an unbalanced grade dummy or school dummy in one of the score blocks, which is understandable, as Lighthouse engagement does vary across school and grade. There are also other unbalanced variables, but no more than four, in some imputations. Since the balance is bad for just a few covariates that are considered necessary treatment determinants, they should be kept (Stuart, 2010). Common support and balance property will be further discussed in Section 7.2.3.

7.2.1 Impact of the Most Recent Participation

The PSM results for the most recent Lighthouse participation are given in Table 7-2. For each of the five imputations and both full and Delphi specifications, the t scores for unmatched difference and NN ATT are listed for the eight outcome indexes of confidence, courage, curiosity, ambition, extraversion, need of affiliation (affiliationneed), educational aspiration (stu_eduaspiration), and whether a normal career in agriculture or manufacturing is expected (expect_norm). The table also gives on-support sample sizes for treated and untreated students under each imputation. Since subjective factors could also be the determinants of participation, they should be highly correlated

with the treatment status. It is therefore not surprising to see a large dip from unmatched to matched t scores. If the rigorous NN t scores remain high (close to or larger than 1.96) under most imputations, their corresponding index is more likely to be a treatment outcome.

Only education aspiration survives the t-score screening, with a mean matched t score of 1.62 under the conservative specification, and 2.09 under the Delphi specification. For all imputations and both specifications, educational aspiration has higher unmatched/matched t scores than other indexes. Overall, its t scores are higher under the Delphi specification, which is confirmed to be a better treatment prediction than the full specification by its lower AIC/BIC. The only scenario in which Lighthouse impact on educational aspiration turns to be totally ignorable is in imputation_2/full specification, in which the t scores drop from 4.81 unmatched to 0.85 matched, however the imputation_2/full specification seems to be unique as the t scores for other indexes even drop to around 0.

Other than educational aspiration, curiosity, extraversion and need for affiliation also produce decent t scores, but mostly when they are for the unmatched differences between treated and untreated students. As a matter of fact, these three personalities were all mentioned as both determinants (Table 4-1) and outcomes (Figure 4-3) of the Lighthouse program. They are now recognized as determinants rather than outcomes by comparing unmatched and matched results. Apparently, selection bias is a big issue when evaluating the socio-emotional support of voluntary participation. Without the matching analyses, people see many benefits that might just represent the pre-treatment difference.

For the other outcome indexes of confidence, courage, ambition and expectation of normal career, even the unmatched t scores are low in most imputations. It is a pity that confidence was unanimously considered by Delphi experts as the most important and best realized Lighthouse impact, lying as a small dot in upper right of Figure 4-3. There could be several explanations for such a discrepancy between the Delphi results and PSM results. To begin with, people may have been wishfully thinking that a good cause should generate good results. Secondly, some students with

Table 7-2 Nearest Neighborhood Matching Results (t Scores)_ Most Recent Participation as Treatment

Full Specification												
	Imputation_1		Imputation_2		Imputation_3		Imputation_4		Imputation_5		Mean	
	Unmatched	Matched	Unmatched	Matched	Unmatched	Matched	Unmatched	Matched	Unmatched	Matched	Unmatched	Matched
confidence	0.55	0.08	0.53	-0.19	0.54	1.11	0.56	0.51	0.55	1.46	0.55	0.59
courage	1.23	0.56	1.2	-0.11	1.2	0.88	1.22	-0.47	1.22	1.06	1.21	0.38
curiosity	2.2	0.38	2.23	0.05	2.22	2.37	2.2	1.51	2.18	1.08	2.21	1.08
ambition	-0.17	-0.67	-0.18	0.3	-0.15	1.11	-0.15	-0.35	-0.15	0.25	-0.16	0.13
extraversion	1.83	0.39	1.82	0.26	1.83	0.45	1.83	-0.14	1.83	1.1	1.83	0.41
affiliationneed	2	0.52	2.2	0.33	1.97	3.32	1.96	1.45	1.95	0.96	2.02	1.32
stu_eduaspiration	4.81	2.45	4.81	0.85	4.45	1.69	4.78	1.96	4.7	1.15	4.71	1.62
expect_norm	-2.21	-0.12	-1.4	-0.46	-1.3	1.18	-1.46	-0.35	-0.57	-0.34	-1.39	-0.02
Total on support	4179		3941		4249		4209		4322		----	
On support _Untreated #	3977		3733		4039		4003		4117		----	
On support _Treated #	202		208		210		206		205		----	
Delphi Specification												
	Imputation_1		Imputation_2		Imputation_3		Imputation_4		Imputation_5		Mean	
	Unmatched	Matched	Unmatched	Matched	Unmatched	Matched	Unmatched	Matched	Unmatched	Matched	Unmatched	Matched
confidence	0.55	0.03	0.53	0.14	0.54	0	0.56	-0.18	0.55	1.41	0.55	0.28
courage	1.23	0.27	1.2	0.76	1.2	-0.69	1.22	0.87	1.22	0.86	1.21	0.41
curiosity	2.2	1.62	2.23	0.68	2.22	1.27	2.2	1.75	2.18	0.62	2.21	1.19
ambition	-0.17	-1.45	-0.18	-0.97	-0.15	-0.24	-0.15	0.19	-0.15	0.72	-0.16	-0.35
extraversion	1.83	1.42	1.82	0.24	1.83	0.26	1.83	0.8	1.83	2.14	1.83	0.97
affiliationneed	2	0.89	2.2	0.75	1.97	1.17	1.96	1.4	1.95	1.76	2.02	1.19
stu_eduaspiration	4.81	2.21	4.81	2.08	4.45	1.55	4.78	2.72	4.7	1.91	4.71	2.09
expect_norm	-2.21	-0.72	-1.4	-0.7	-1.3	0.12	-1.46	-0.57	-0.57	-1.3	-1.39	-0.63
Total on support	4316		4388		4274		4361		4374		-----	
On support _Untreated #	4108		4185		4067		4157		4164		-----	
On support _Treated #	208		203		207		204		210		-----	

Note: t scores for the average treatment effect on the treated (ATT) reported.

more progressive personalities could easily stand out as examples of achievement, and then dominate our perception of the overall effect. Lastly, there are over 400 former Lighthouse students in the control group, who may also possess very high levels of confidence. The first two reasons somewhat involve the disadvantages of qualitative judgment, while the third reason is a technical issue that can be resolved in the following section.

7.2.2 Impact of Any Participation

When measuring the effect of the most recent participation, we actually made a comparison between the most recent participants and “non-participants + former participants”. It is possible that some Lighthouse impacts need time to manifest. It is also possible that the impact of the most recent participation will either diminish or grow over time. These questions could be partially answered by looking at the impact of any participation, or in other words, by making a comparison between “former + most recent participants” and non-participants.

The NN matching results are presented in Table 7-3 in exactly the same format as Table 7-2. The impact on education aspiration looks strong, but under both specifications it is at the 5% level for only two out of the five imputations. Still, its t scores for ATT are relatively large and stable, suggesting it is the very index worthy of further investigation. The mean matched t score is 1.86 under full specification, and 1.88 under Delphi specification.

With high unmatched and low matched t scores, curiosity is still a strong treatment determinant. Courage, ambition and normal career expectations are likely to be irrelevant, being neither determinants nor outcomes.

The most interesting findings lie in the level of confidence and need for affiliation. Having large unmatched t scores but small matched t scores, confidence is now confirmed to be a treatment determinant. The reason for the small unmatched t scores in the previous section (Table 7-2) is that those non-latest Lighthouse participants raise the mean level of confidence for the control group. If

we take the mean ATT scores for the five imputations, we can see that the significant level of boosting confidence is second to an increase in aspiration, and therefore it is now understandable there could be some outstanding cases making the Delphi experts believe in a Lighthouse impact on confidence. The need for affiliation goes in the opposite direction. When testing the impact of the most recent participation, its unmatched differences are statistically significant, but when testing the impact of any participation, its unmatched differences are basically random, with t scores lower than 1. The sole explanation for this is that former participants have equal or even lower affiliation needs than non-participants. Indeed, the non-imputed mean scores of need-of-affiliation are 2.98, 2.96, and 3.2 for non-participant, former participants and recent participants. On the other hand, due to a closer sample size, the difference between former participants and the recent participants is actually not significant at the 5% level. It is very likely that the change in the gap of sample sizes leads to the big change in unmatched t scores.

Table 7-3 Nearest Neighborhood Matching Results (t Scores)_ Any Participation as Treatment

Full Specification												
	Imputation_1		Imputation_2		Imputation_3		Imputation_4		Imputation_5		Mean	
	Unmatched	Matched	Unmatched	Matched	Unmatched	Matched	Unmatched	Matched	Unmatched	Matched	Unmatched	Matched
confidence	2.13	-0.77	2.09	0.38	2.1	0.87	2.2	1.95	2.14	2.65	2.13	1.02
courage	0.55	-1.14	0.55	0.25	0.57	0.44	0.6	1.47	0.57	0.84	0.57	0.37
curiosity	2.58	1.08	2.64	0.97	2.61	0.3	2.57	-0.15	2.54	1	2.59	0.64
ambition	0.31	-1.4	0.26	-1	0.33	-0.24	0.29	-0.68	0.32	0.1	0.30	-0.64
extraversion	-0.27	-0.42	-0.28	-0.14	-0.27	-0.11	-0.27	0.51	-0.27	0.8	-0.27	0.13
affiliationneed	0.82	0.11	0.88	0.7	0.78	-0.56	0.77	0.34	0.8	0.11	0.81	0.14
stu_eduaspiration	5.12	2.92	4.05	1.31	4.14	1.32	3.79	2.34	3.82	1.4	4.18	1.86
expect_norm	-0.43	0.3	-0.13	-1.8	0.22	0.23	0	-0.17	0.31	0.52	-0.01	-0.18
Total on support	4430		4454		4429		4408		4444		---	
On support _Untreated #	3754		3776		3753		3732		3766		---	
On support _Treated #	676		678		676		676		678		---	
Delphi Specification												
	Imputation_1		Imputation_2		Imputation_3		Imputation_4		Imputation_5		Mean	
	Unmatched	Matched	Unmatched	Matched	Unmatched	Matched	Unmatched	Matched	Unmatched	Matched	Unmatched	Matched
confidence	2.13	0.62	2.09	1.6	2.1	1.68	2.2	0.43	2.14	2.46	2.13	1.36
courage	0.55	0.41	0.55	0.44	0.57	1.28	0.6	-0.39	0.57	2.02	0.57	0.75
curiosity	2.58	-0.01	2.64	2.09	2.61	1.02	2.57	0.56	2.54	1.17	2.59	0.97
ambition	0.31	-0.19	0.26	1.37	0.33	0.06	0.29	-0.96	0.32	0.95	0.30	0.25
extraversion	-0.27	-0.04	-0.28	0.2	-0.27	0.78	-0.27	-1.31	-0.27	1.35	-0.27	0.20
affiliationneed	0.82	0.22	0.88	0.06	0.78	0.57	0.77	0.32	0.8	-0.5	0.81	0.13
stu_eduaspiration	5.12	3.04	4.05	2.15	4.14	0.99	3.79	1.54	3.82	1.66	4.18	1.88
expect_norm	-0.43	-0.75	-0.13	-0.06	0.22	-0.12	0	0.06	0.31	1.84	-0.01	0.19
Total on support	4432		4429		4432		4434		4424		---	
On support _Untreated #	3754		3751		3754		3756		3746		---	
On support _Treated #	678		678		678		678		678		---	

Note: t scores for the average treatment effect on the treated (ATT) reported.

7.2.3 Educational Aspiration as the Key Outcome

Education aspiration is confirmed by the preliminary PSM results as a key program outcome. An overhaul of propensity score calculation will be the first step for further investigation. When we are unsure which outcome matters, it is natural to try the full specification and the Delphi specification, but once we know what outcome to be further explored, there is a rule that one should include variables related to outcome rather than treatment in order to maintain both high precision and low bias (Brookhart et al., 2006). Accordingly, an adjusted specification is generated to include variables correlated to educational aspiration ($p < 0.05$) and not totally unrelated to participation ($p < 0.6$), plus school and grade dummies. This adjusted variable list is to some extent a compromise between the conservative full list and the simplified Delphi list. Corresponding regression and NN matching results are available in Appendix F. Table 7-4 uses AIC/BIC to compare the three specifications. Lower AIC/BIC means better prediction. When the dependent variable is participation, AIC suggest that the adjusted list is the worst for prediction, but BIC suggests the full list as the worst. When the dependent variable is educational aspiration, both AIC and BIC confirm the adjusted list to be the best combination for prediction. The following analyses will continue with the adjusted list. It is worth mentioning that this specification does make the aspiration effect more evident, but not erratically away from the effects of the full or Delphi specifications.

Table 7-4 Akaike/Bayesian Information Criteria_ Various Models and Specifications

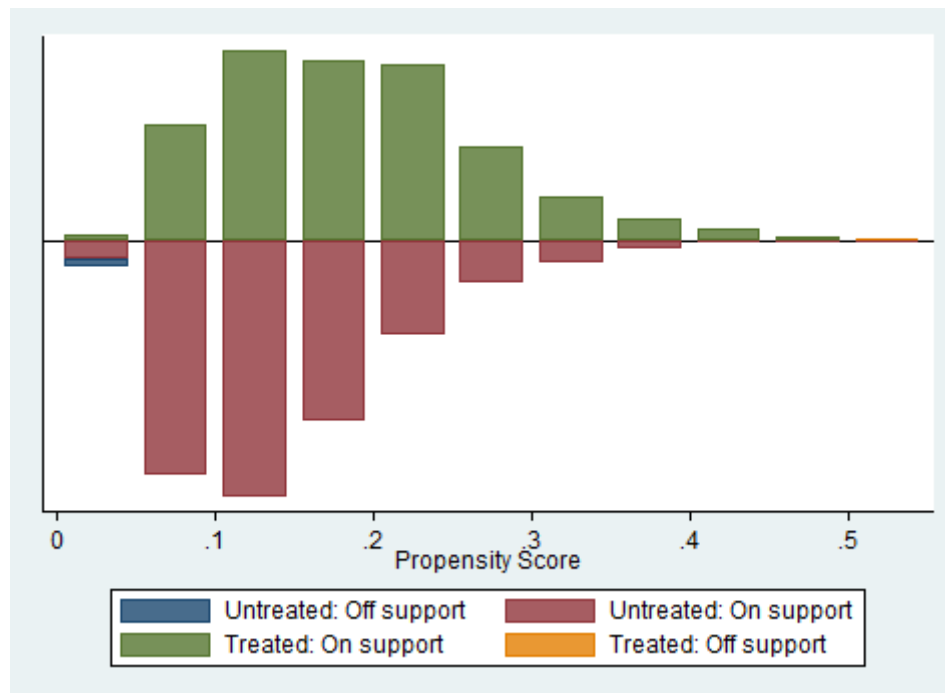
	Most Recent Participation			Any Participation			Educational Aspiration		
	Full	Delphi	Adjusted	Full	Delphi	Adjusted	Full	Delphi	Adjusted
AIC	1483.6	1463.0	1522.8	3540.5	3540.7	3673.8	12476.9	12598.1	12442.4
BIC	1931.9	1571.8	1714.9	3988.8	3649.5	3865.9	12944.3	12726.2	12653.7

Note: Two schools with no Lighthouse interventions are excluded from the sample. A probit model is run when the dependent variable is most recent participation or any participation. An ordered probit model is run when the dependent variable is a student's education aspiration.

As shown in Figure 7-1, the large untreated sample makes it easy to achieve satisfactory common support. Due to the long list of regressors, the propensity scores are mostly small for both the

treated and untreated groups. More treated students have higher propensity scores, but overall there is a very good overlap. This again justifies the use of PSM.

Figure 7-1 Distribution of Propensity Scores_ Adjusted Specification



Note: This is from imputation_3 with adjusted list of treatment determinants. Graphs made from all five imputations are almost identical. 'Treated group' refers to those participating in any of the Lighthouse programs.

Under the adjusted specification, the balancing property is not well kept if we check it by block where the mean propensity scores are no different between the control and treatment groups⁷⁷, but such imbalance is within an acceptable level. Imputations 1, 2 and 5 have one unbalanced school dummy, and Imputation 4 has an unbalanced grade dummy, but school and grade dummies should be included in the specification even if we know they may cause imbalance. For other variables, a subject teacher's origin is unbalanced for three imputations, teenage love and interpersonal relationships for two imputations, and performance, sibling number, and attitude to summer camps for one imputation. On average, for each imputation only 3 out of the 29 non-omitted variables (Appendix F1) were diagnosed as unbalanced, which is a small proportion. These variables are also

⁷⁷ The number of block ranges from 5 to 9 in the five imputations.

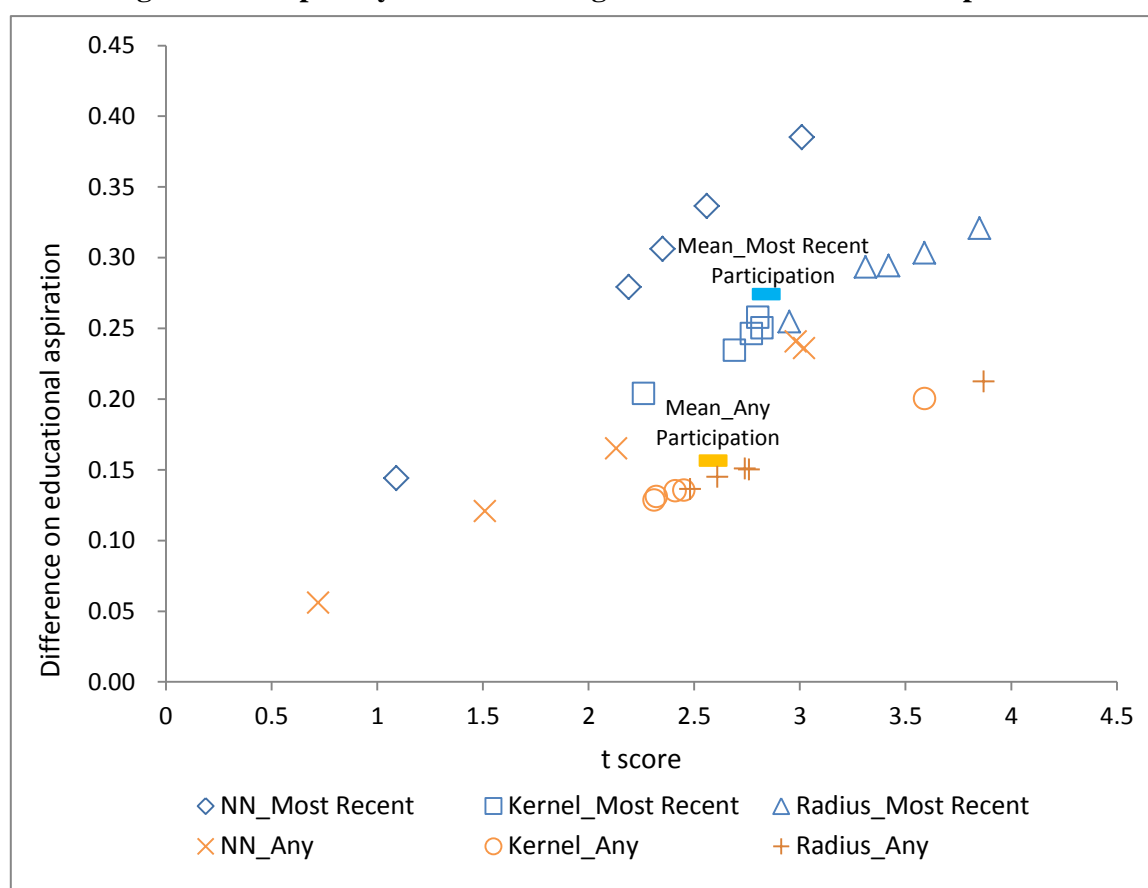
unbalanced in either the first or the last score block, where the treatment sample tends to be too small to secure statistical power. Particularly in the last block, the sample sizes range from 13 to 21 in the five imputations. Thus, despite an imperfect balance, it is acceptable to process the PSM without extra adjustment on specification (Stuart, 2010)⁷⁸.

As mentioned before, NN matching produces unstable results when the imputed control group is much larger than the treatment group. Other matching methods that utilized more control cases should generate more stable estimates. Figure 7-2 displays the results of three matching methods in one scatter graph, with the y axis for ATT and x axis for t scores. Epanechnikov Kernel matching, which makes use of all control cases, and radius matching, which utilizes control cases with close propensity scores, both produce much more stable estimates across imputations. It can be seen that the more control cases used (Kernel>Radius>NN), the more concentrated the symbols in the scatter graph.

The diminishing impact of Lighthouse is the most important discovery from pooling matching results. In Figure 7-2, the blue symbols on the most recent participation are generally closer to the upper right than the orange symbols for any participation. The mean of blue symbols shows an ATT almost double the mean of the orange symbols with a higher t score. In other words, Lighthouse's short-term impact on educational aspiration is stronger in both magnitude and statistical significance. As introduced in Chapter 3, Lighthouse has follow-up services such as short-term visits, student organization creation, and communication by letter. These seem to be insufficient for sustaining the impact, and it is possible that those follow-ups mainly benefit active students.

⁷⁸ Stuart (2010) also suggested Mahalanobis Matching under minor imbalance. I have practiced it. For all imputations, both ATTs and corresponding t scores appear to be much larger with Mahalanobis Matching. This study will proceed with the more stringent results of NN, Kernel and Radius. Detailed Mahalanobis results are available upon request.

Figure 7-2 Propensity Score Matching Results for Educational Aspiration



Note: Five data points for different groups because there are five imputations. Detailed data is in Appendix F4.

It is not rare to have a diminishing effect in program evaluations, so perhaps a more constructive angle from which to look at the impact is to see how it sustains or declines for certain groups. It has been a key assumption throughout this research that rural students need an “appropriate” schooling level more than a “higher” schooling level. This is also why I did not use an order model when examining PCED determinants. The Lighthouse leadership has been clear that Lighthouse volunteers should help students decide what they should do, not tell them what they should do. If, for example, there is a poor low-performance student who happens to be the oldest sibling at home, it is debatable whether they should pursue a college or graduate degree. Such concerns lead to the by-background PSM.

7.3 Heterogeneous Effect, School Engagement and Program Quality

This section furthers the investigation of Lighthouse impact on education aspiration by testing how that impact varies by student characteristics and school. It turns out that the aspiration increase mainly applies to those with higher-performance. School comparison has suggested the Lighthouse impact could be associated with school engagement and the characteristics of the Lighthouse team.

7.3.1 Impact by Student Characteristics

By-background PSM suggests that Lighthouse mainly increases educational aspiration for higher-performance students. In Table 7-5, NN matching t scores for both the most recent participation and any participation are presented by gender, wealth and academic performance for the five imputations. Except for Imputation_2/most recent participation, all t scores are higher than 1.96 for students with higher performance. Under NN matching with a large control group, these t scores are very compelling. In fact, even the Imputation_2/most recent participation score, 1.4, is actually the highest figure in its column. This is indeed an encouraging finding, as higher schooling level is surely “appropriate” for higher-performance students.

The aspiration increase may also be heterogeneous to gender. For male students, Imputations 1 and 2 generate high t scores for the impact of any participation, while Imputations 3 to 5 generate high t scores for the impact of the most recent participation. With these mixed results, it is still difficult to tell whether the impact on boys can be confirmed once we have a larger sample or less missing data.

Unlike by-gender matching, by-wealth matching gives a clearer message that the increase in educational aspiration does not vary by wealth. It is true that the t scores for poorer students are mostly higher than those for richer students, but both groups of t scores are small.

Table 7-5 Matching Results by Background Characteristics (t Scores)

	Imputation_1		Imputation_2		Imputation_3		Imputation_4		Imputation_5		Mean	
	Latest	Any	latest	Any	latest	Any	latest	Any	latest	Any	latest	Any
female	0.77	1.65	1.34	1.27	0.65	0.24	1.6	-0.73	1.27	0.89	1.13	0.66
male	1.58	2.77	0.41	2.12	1.93	1.41	1.94	0.41	2.29	0.72	1.63	1.49
richer	1.85	0.83	0.88	0.89	0.92	0.85	0.86	0.23	1.06	-0.42	1.11	0.48
poorer	1.38	1.76	0.69	1.95	2.57	1	1.3	1.7	-0.27	1.24	1.13	1.53
higher performance	2.11	2	1.4	3.11	2.83	2.1	1.92	3.18	2.94	3.52	2.24	2.78
lower performance	0.53	0.68	0.13	0	2.26	0.81	1.28	-0.23	-0.97	-1.31	0.65	-0.01

Note: Nearest neighborhood matching t scores for the average treatment effect on the treated (ATT) reported.

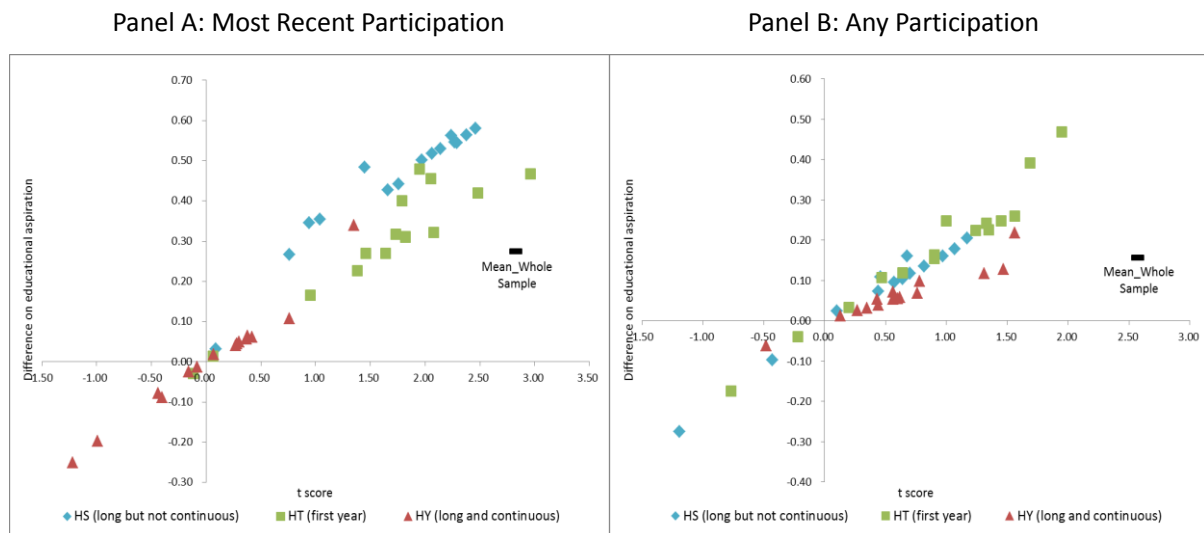
7.3.2 Impact by Lighthouse Site

In impact evaluation, it is a common practice to see how the outcome varies by the receiver's background, but it is a less common practice to look at how the outcome varies by the provider of interventions. When an intervention is purely material, such as providing a grant, the quality of treatment is supposed to be the same for all treated individuals, but when an intervention involves lots of human interaction, it is very likely that factors such as training (if they are not centralized and compulsory), site-specific interruptions, and the characteristics of service providers can all make a difference. In the case of Lighthouse, diverse groups of volunteers received different levels and contents of training, and each volunteer team has a different style and forms its own unique strategy. The grouping is never really random. It is therefore important to investigate how the differences in these volunteer groups lead to different program outcomes. Since Lighthouse volunteer groups are divided by school, the volunteer effect will be interwoven with school effects. This section discusses them together.

Three typical sites of different Lighthouse engagements are selected for comparison. HS school had paused their Lighthouse program and then restarted it in 2012 (31 most recent participation, 83 any participation out of 805 at randomly selected classes); HT school was a first-year Lighthouse school, although it also had some transferred former Lighthouse students (75 latest, 94 any out of 479); and HY school had been a long-time Lighthouse school (56 latest, 225 any out of 1600)⁷⁹. With the proper overlaps of propensity scores, these three schools are also more qualified than other Lighthouse schools for PSM. Figure 7-3 shows the results of three matching methods for the three schools. There are two immediate findings. The Lighthouse program does not have an impact on HY students, and the impact of any participation (Panel B) is rarely statistically significant, implying that the previous pooling result may underrate the seriousness of diminishing effect.

⁷⁹ Although HY's Lighthouse programs were sometimes conducted in primary schools, the participants were mainly from the middle school.

Figure 7-3 Three-School Comparison of the Increase in Educational Aspiration



Note: Nearest Neighborhood, Kernel and Radius PSM results are all presented for the five imputations, so there are 3*5=15 data points for each site. Detailed data is in Appendix F4.

The reason, this could show a diminishing marginal effect since the Lighthouse style is no longer new to local people. If looking at this phenomenon from a positive angle, one cannot rule out the possibility of the ripple effect – that Lighthouse students had gradually affected non-Lighthouse students, lowering the measurable difference. From the side of Lighthouse, the lack of impact could be related to the organization’s policy of sending the best volunteers to new sites. In comparison to HY, HS restarted after a break of several years, and HT was totally new. Lighthouse did admit that when assigning the volunteers for summer 2012, the best combinations were given to HS and HT. Sadly, it is difficult to distinguish between these factors, and the diminishing marginal impact and ripple effect would be particularly hard to measure. Thanks to the collection of volunteer information, however, it is possible to determine which factors affect program quality. Assuming the same program quality, we should find a higher impact on the HT sample in Panel A of Figure 7-3. The impact for other Lighthouse schools will be diluted by the larger group of former Lighthouse students in the control group, however the reality is, at least in the short term, that there was a higher effect size in HS (the blue symbol) with similar statistical significance. This indicates a difference between the HS team and the HT team, which could be measured by comparing the volunteer team

information collected two weeks after the programs started. Detailed findings on volunteer teams are available in Appendix G.

Nineteen volunteers in HS and seventeen volunteers in HT were able to stay from the beginning to the end of the summer 2012 program. The major differences in team characteristics between these two sites were grades in college and the levels of engagement in pre-program training. There are as many as seven freshmen in the HS team, while in HT there are only two. All HT volunteers finished the whole process of the first team building (they did not then know which team they would be allocated to), while five HS volunteers only joined some parts of it. Three HS volunteers undertook no training in teaching skills at all, while all HT volunteers undertook some or all of the training courses. Other than this, there was no big difference in the distribution of gender, subject major, origin, or volunteering experience.

Between HS and HT, there were three major differences regarding volunteer perceptions of team operation. First of all, HT volunteers perceived much greater support from local people, including households, teachers, school and local governors. From 1 to 6, their mean ratings for corresponding items were 5.2~5.7, while HS's are just 4.2~4.8. HS volunteers had much greater confidence in their performance. They had an average self-rating of 4.8 for the statement of "we are the best Lighthouse team this year", while HT's was just 4.1. At the time of survey the volunteers did not really know how programs proceeded in other sites, so the rating was a reflection of their belief rather than their real performance. Finally, HS volunteers appreciated the Lighthouse instructional framework more than HT volunteers, with a mean rating of 4.1 vs. 3.4. It is worth mentioning that all teams gave low ratings to the value of teaching training. Taking the mean of all ratings for all items, the two sites have very similar figures, as are the corresponding standard deviations. This means members of the two groups actually had similar levels of criticism, which makes their ratings comparable. It is possible that these simple mean calculations are biased, as members have different levels of team information. Accordingly, I also conducted the calculation assigning more weight to team leaders and

those in charge of a class or team function (Appendix G3). The weighted results suggest that HS also agreed more on the value of teambuilding (4.8 vs. 4.4), and those unweighted findings persisted.

Combining team characteristics and volunteer opinions, several arguments can be made for why HS had a better outcome than HT, at least in the short term. They may not tell the whole story, but they are what the data seems to tell us most clearly. Sometimes passion weighs more than maturity, as the HS team is quite young. Participation in training does not matter much, yet the acceptance of the content does matter. In other words, it is about quality, not quantity. The quality of teaching training is however questionable. Lighthouse training teams should receive more feedback on this session to improve the training quality. Although local support is important, a lack of local support is not serious. Socio-emotional support is after all about interactions between volunteers and students, not their families, teachers, principals or local officers. Last but not least, team spirit is crucial, as maintaining a belief of “we are the best” may be transferred to program outcome. The last two arguments together also suggest that investing time in the relationship between team members could be more rewarding than public relations with local stakeholders. Of course, the latter remains important for maintaining a long-term partnership with Lighthouse sites.

Finally, here are brief notes for the other three Lighthouse sites of HQ, QB and QD. HQ yields similar results as HY, while it also has similar size and level of Lighthouse engagements. Here I choose HY instead of HQ for elaboration because the latter only allowed me to collect data from one third of its students. QB results suggest aspiration boost, but the findings are less valuable due to the small number of Lighthouse students (only seven surveyed students participated the summer 2012 program). QD shows no Lighthouse impact, but, like QB, the sample size is small. Detailed results for these three sites are omitted.

7.4 Causal Mechanisms

This study generates two sources of causal interpretation for the Lighthouse impact on educational aspiration. One is the document generated from the Delphi survey, the other contains information collected in the field, including interviews and student diaries. Delphi was applied before the treatment, while interviews/diaries were obtained during or after the treatment.

7.4.1 Delphi-Based Discussion

Based on the opinions collected from Delphi experts, if there is an impact on educational aspiration, then it is mainly attributable to “the power of role models”. Let’s call this the role-model effect—when a student develop trust in a volunteer, they will subconsciously start to copy the volunteer’s behavior, including the schooling decisions of that volunteer. One Delphi expert provided a more specific theory of direct and indirect effect. Directly, once a student participates in Lighthouse, they forgo the chance of summer migrant work, receive the opportunity of talking to volunteers about education decisions, and thus have a higher possibility of returning to school after the vacation. Indirectly, it is admitted that Lighthouse volunteers who finished the training and went to the sites have more optimistic attitude and social responsibility than their peers, which gives local students a positive picture of college life, making them want to be one of this group in the future. In the internet age, it is quite easy for students to hear about the corrupt college life and job-degree mismatch that are reported all over the media. They, and especially those with higher hopes of getting into college (higher performers), need real college students in their life to confirm the good sides of college life.

The Delphi responses also touch on educational aspiration from two other angles. Firstly, while Lighthouse is not about persuading students to accept additional schooling, it is anti-dropout, and it finds channels to financially support those at-risk of dropout. Students are also willing to talk to the volunteers about their decision. Of course, the dropout group is just a small group among Lighthouse

participants. Secondly, some Delphi experts have suggested that the Lighthouse program may affect the household's perception of college, but they are not confident about how strong this effect could be. After all, many parents are either busy with farm work or still working in cities during the summer.

7.4.2 Interview/Diary-Based Discussion

In summer 2012, three of my research assistants stayed with and talked to volunteers, teachers, students, and households. They obtained approval for scanning 99 diaries from eight Lighthouse students. It is true that these messages could be subjective, and the students offering their diaries might be active students who have a very positive view of Lighthouse, but nevertheless, interviews and diaries are better than Delphi documents in terms of giving detailed examples. In addition to descriptions of how the students gained confidence through speeches and team games, and how they started to love their hometown through the presentation of local goods and going out to clean the streets, there are interesting examples of how the volunteers and students became closer to each other. One case in point is a discussion about Jay Chou, an iconic pop singer from Taiwan. One student said he did not like Jay Chou, so a volunteer began to tell him stories of how Jay Chou grew to be a famous singer by overcoming many challenges. That volunteer was the first person from a different generation to talk with the student about such a non-school topic in an inspiring way. There are also several records describing the student's gratitude for home visits, as many of these students live in remote villages. They felt they were being cared for. Such examples share one feature: that the students and volunteers build strong connections outside the class. Personal interactions are good for gaining trust.

The household views are also solid and positive. Some households mentioned that their children went home earlier, were not reluctant to do homework anymore, or were more confident, outgoing and considerate. Again, we need to be cautious about selection bias and the fact that this could be a very short term effect that will diminish if no follow-up is available.

Since the PSM already discovered that the Lighthouse impact is concentrated on educational aspiration, there must be some negative effects to offset the positive outcomes. One RA was assigned to collect negative views from interviews, and those negative views belonged to four categories. Some students came to Lighthouse just because they wanted to accompany their friends, or because their parents need someone to “babysit” their children during the summer. While some said they did enjoy the time, some said the participation was just a boring task. Some students felt isolated by other students. In one activity, my assistant observed a student crying because her suggestion was ignored by her team members. Some students think the program is not intellectual. This is particularly evident for higher-grade students, as they sometimes took courses with younger students on subjects that were too easy for them. Some students felt they did not get enough care from the volunteers. Not all volunteers are capable of treating every student equally. Introverted students found it hard to get as much attention as outgoing students, yet these introverted students probably needed more help from the volunteers. The coexistence of positive and negative experiences explains why quantitative results reject many anticipated Lighthouse impacts.

7.5 Summary and Discussion of Findings Regarding Lighthouse Impact

7.5.1 Summary of Findings Regarding Lighthouse Impact

Participation in Lighthouse is determined by several factors, especially higher academic performance, shorter schooling distance, affirmative household attitude on summer camp, and larger migrant networks. Personality also matters a great deal, although this could also be a treatment effect. The rigorous NN matching suggests that educational aspiration is the only measurable outcome that is statistically significant. Affiliation need, confidence, curiosity, and extraversion are treatment determinants that could be misrecognized as impacts if no matching is

done. Courage, ambition and career expectation turn out to be neither treatment effects nor determinants.

After confirming educational aspiration as the key outcome, this study considers it further by applying a more efficient propensity score calculation and two other matching methods, kernel matching and radius matching. After putting all PSM results together, it becomes clear that an increase in aspiration can decrease over time. This suggests that more follow-ups are needed to maintain the impact.

By-background analyses show that such aspiration increase mainly applies to students with higher academic performance, which is encouraging since it is absolutely right for these students to pursue more schooling. The aspiration increase may also be more evident among male students, but the current sample does not provide enough statistical support for the finding. It is indisputable that the effect does not vary by wealth.

By-site analyses provide theories of why some sites perform better. The novelty for local people may help in greater program effect, although that is hard to measure. The passion, confidence and acceptance (not participation) of training content by volunteer teams can be important to program quality. It is alarming that no team appreciated much the pre-program teaching training.

Finally, this chapter relies on the Delphi survey, on-site interviews, and student diaries to consider why educational aspiration is the key outcome. The most possible explanation of this outcome is that students tried to copy the volunteer schooling decisions after trust was built. Lighthouse volunteers have different styles, but they all share the identity of being a college student. Student trust of volunteers is easier to build through personal communication. On the other hand, individual cases show a mixed picture of how the students reacted to the program for personal reasons or the capacity of volunteers. This may explain why only one effect survives the matching.

7.5.2 Untestable Elements across the PSM Implementation

Despite the attempts to ensure causal findings, it is admitted that, like all other identification strategies, PSM still has its weakness. More specially, untestable elements exist in three parts of my PSM implementation.

First of all, since the matching is conducted on observables, there is a risk of missing some unobservables that are actually key treatment determinants. With extensive variable exploration in the study, I am confident that such risk is minimized, but we can never fully rule it out. Imputed datasets are after all not the real datasets. I conducted Rosenbaum Bounds sensitivity analyses for all imputed data after NN matchings, which show that on average the presence of unobserved factors that would make individuals 17% more likely to be in the “most recent participation” group, or 11% more likely to be in the “any participation” group, could invalidate the results⁸⁰.

In terms of treatment outcome, it is not easy to discover all possible outcomes. It is true that the Delphi survey has identified 25 outcome candidates (Figure 4-3), but we cannot tell if these are all possible impacts. More importantly, many of these outcomes are not feasible for variable construction (e.g. creativity, management skill), and some are for the community’s long-term benefit (e.g. establishment of student organization, teacher support). One way to partially verify the completeness is to put a treatment dummy into the model for PCED determinants. If the treatment dummy remains significantly associated with the relative odds of a PCED, *ceteris paribus*, then maybe some mediator (treatment outcome) is missing. Under the simplest specification of traditional variables in Chapter 6, the coefficients of the treatment dummy are significant at the 1% level for the options “work” and “undecided” (see notes for Table 6-10 and 6-11). Once we include the treatment dummy in the full-specification model, the coefficient for the “undecided” option is no longer significant, but the coefficient for the option “work” remains significant at the 5% level. It is possible that I have missed a determinant for working decisions that happens to be a neglected outcome of

⁸⁰ These are calculated by taking the means of critical values for 5% significant level. Detailed results are available upon request.

the Lighthouse program. It is equally possible that Lighthouse's participation prevents students from going out for a summer job, and we know that summer jobs can lead to a choice of work as student's PCED. Having a camp to attend thus has a greater impact, but it is not really a Lighthouse impact. Unfortunately, it is hard to test which explanation is more compelling.

Finally, it is the hardest to measure what really happened during the treatment, especially the level of engagement for each participant, and their level of engagement in other similar activities. I looked into these issues by collecting detailed participation information from Lighthouse volunteers⁸¹, and by adding questions on the availability of funding support and other Lighthouse-like programs to the student questionnaire (module G), however the collected information turned out to be too difficult to organize. In all Lighthouse schools, it is not unusual to see that some students only attended half the program because of other duties, but expressed great appreciation for the participation, or that a student was requested to attend some other short-term camps organized by universities (semi-governmental) because they lived close to the school. To proxy these uncertainties, the PSM has to rely on other variables, such as the burden of other household chores/farming/city visits or jobs, academic performance, schooling distance, ethnicity, and so forth.

In short, there are elements for treatment propensity, outcome, and process that are hard to test precisely. Although proper actions were taken in response to this concern, we should bear in mind that it could still be the source of bias in the PSM results.

⁸¹ Since each volunteer was assigned as the supervisor of some students, they knew in detail the engagement of these students, such as the number of absent days due to farm duty.

Chapter 8 Conclusions and Policy Implications

8.1 Summary of Key Findings

This study reports on substantial findings about PCED determinants as well as the impact of social emotional support provided by a GNGO. The two sets of findings are logically connected. While the analysis of PCED determinants suggests educational aspiration as a key factor, the impact evaluation confirms that the Lighthouse program can help to improve this.

8.1.1 PCED Determinants

The findings about PCED determinants in the full-specification MNL can be summarized as the following statements. Certain popular factors do have predictable influences on PCED. For example, being female, older, with more siblings, poorer, and performing worse in tests all lead to a relatively low preference for AHS; students with health issues tend to choose either VHS or AHS, since these are the channels towards a career with less physical labor; and a homeroom teacher's preference between AHS and VHS can affect their students' choice of schooling track. Parental background does not turn out to be as important as previous studies have suggested, except for the presence of parents— living in an incomplete family actually appears to urge students to think seriously about their PCED. The backgrounds of homeroom teachers matter more than those of subject teachers, and so do the expectations of relative future earnings by PCED when compared to the relative costs. A number of subjective factors (career expectations, school perceptions, personality, family attitudes, and teacher PCED preference) show connections to PCED even though numerous other variables are held constant. Among the subjective factors, educational aspiration clearly stands out as the strongest determinant, and among additional variables proposed by the Delphi survey, knowledge of vocational education policy, urban experience, the local entertainment industry, household chores, and teenage love are all connected to PCED. It is also worth noting that students with lower grades have more diverse PCEDs, while many of those in the final school grade are pursuing AHS.

The main regression model passes the robustness test. It is true that p values fluctuate across different samples and/or specifications, but these do not bring about large coefficient changes. Nevertheless, the unstable statistical significance does bring into question the reliability of some variables (e.g. level of ambition in particular), and suggests that some variables may actually be more important than the main model suggests if sampling, specification, or missing data are no longer issues (e.g. migrant network).

In addition to robustness, this study also explores the heterogeneity of PCED determinants. It is not surprising to see different variables disproportionately affect students of different gender, wealth, or academic performance. Overall, basic characteristics (gender, age and ethnicity) and parental background have more of an effect on children from advantaged backgrounds (male, richer, high-performance), while sibling and peer/teacher/school factors matter more for the disadvantaged group (female, poorer, low-performance). Other PCED determinants show mixed effects. These patterns are neither easily predictable but nor are they counter-intuitive. The ultimate value in uncovering this variation is to help with decisions about targeting interventions.

Finally, putting the standardized regression output in scatter graph form shows that PCED is affected by certain variables with diverse effect size and statistical significance. Among these variables, educational aspiration is one of the most influential and alterable determinants that matters in all education decisions.

This thorough investigation of PCED determinants has resulted in findings that challenge existing literature on gender and parental background, that further extend our knowledge of monetary reward/cost and subjective factors, and that confirm new possible determinants previously overlooked. These findings apply to the rural areas of coastal China, a region that has not been well covered by earlier research.

8.1.2 Impact of Lighthouse Intervention

Participation in Lighthouse is determined by several factors, particularly higher academic performance, shorter schooling distance, positive household attitudes to summer camp, and larger migrant networks. Personality also matters, although it could also be a treatment effect. Rigorous NN matching suggests that educational aspiration is the only measurable outcome that is statistically significant. It is unfortunate that only one outcome was confirmed, but it is encouraging that this outcome happens to be one of the strongest PCED determinants.

Among the other tested outcomes, need for affiliation, confidence, curiosity, and extraversion turn out to be treatment determinants that could be mistakenly identified as impacts. Courage, ambition and career expectations are neither treatment effects nor determinants.

After confirming educational aspiration as the key outcome, this study investigates further by applying a more efficient propensity prediction and two other common matching methods: kernel matching and radius matching. After putting all the PSM results together, it becomes clear that the increase in aspiration fades over time. This suggests the need of follow-up actions to maintain the impact.

Analyses by student background show that such aspiration improvement mainly applies to students with higher academic performance, which is encouraging since it is absolutely proper for those students to pursue more schooling. The increase in aspiration may also be more evident among male students, but the current sample does not provide sufficient statistical support for this claim. Finally, it is indisputable that the effect does not vary by wealth.

Analyses by sites provide theories for why some sites perform better. The novelty of the program for local people may increase its effect, although that is hard to measure. The passion, confidence and acceptance (not participation) of training content to volunteer teams can be important for program quality. It is alarming that no team particularly appreciated the pre-program teaching training.

Based on the Delphi survey, on-site interviews, and student diaries, the most likely explanation for the increase in aspiration is that students tried to copy volunteer schooling decisions once trust was built. Lighthouse volunteers have different styles, but they are all college students. Student trust in the volunteers is easier to build through interactions outside class. On the other hand, individual cases show a mixed picture of how the students reacted to the program, whether due to personal reasons or the ability of the volunteers. This may explain why only one effect survives the matching.

It is notable that there are elements for treatment propensity, outcome, and process that are hard to test precisely. Although the correct actions were taken in response to this concern, the analysis may still miss important treatment determinants, significant treatment outcomes, or parallel programs that are not well proxied by the modeling. It should be kept in mind that these untestable elements could be the source of bias in the PSM results.

8.2 Significance and Implications

This study makes three major contributions to the field. It can be translated into comprehensive advocacy for education policies related to PCED, such as dropout prevention and the promotion of VHS. It may also suggest the value of, or at least the required improvement to, China's educational GNGOs, which are young and remain confined by governmental regulations. Last but not least, this is a unique showcase of how qualitative-quantitative sequential mixed-method works better in exploratory analyses.

8.2.1 Education Policy

This study is a complement to previous literature on education decisions. By looking at the four expected PCEDs together, the findings are better connected to the reality of rural education. Although expected PCED cannot fully predict actual PCED, my two-school subsample show that students expecting to continue schooling do tend to have further education (VHS or AHS) as actual

PCED. By including a comprehensive list of variables in the regression, the findings can be interpreted in a much more straightforward way (e.g. we no longer need to worry whether schooling distance is a proxy for school quality). And y looking at the rural area of coastal China, not only is the geographical gap in literature filled, but light is also shed on issues that may apply to the vast area of inner China as the country continues its urbanization. It is also notable that a PCED discussion could be relevant to countries other than China. For example, in 2011 India took the initiative to introduce vocational education at the secondary school level from Grade 8. It is probably that someday rural India will have a PCED distribution similar to that of today's rural China. This study can therefore serve as a reference guide.

Findings from this study can be translated into substantial policy suggestions. Here are some examples, and more detailed ones can be derived from the regression results:

1. If we want to promote AHS, resources should be mobilized towards girls, older students, students with more siblings, relatively disadvantaged students in classes with a higher mean of parental education, and poorer students.
2. As students from incomplete families (single parent, migrant parent or no parents) tend to think about their PCED more seriously, community support could be provided for this group to help realize their PCED.
3. Intervention in subjective factors could prevent dropout and discourage early migrant workers. In particular, programs can target educational aspirations, career expectations, perceptions towards schooling, courage, curiosity, family's appreciation of study, and teacher PCED preferences.
4. Students with health issues prefer to continue their schooling, either AHS or VHS, so assistance should be provided in the fulfillment of their plans, from both the demand (e.g. special grant) and the supply sides (e.g. disabled-access-friendly high schools).
5. If we want to promote VHS, then information about policy incentives should be better disseminated to not only students and households, but also homeroom teachers, since their

preference can affect a student's school track. Of course, the government should also supervise the fulfillment of these incentives. For example, in October 2015, the Communist Party of China Central Committee announced a gradual elimination of VHS fees, so it will be crucial to inform the public and implement a clear time table so the policy can have a real impact.

6. At least in northwest Guangdong, policies designed for encouraging schooling should consider local factors such as the communication of vocational education policies, student urban experiences, the local entertainment industry, the burden of household chores, and the phenomenon of teenage love.
7. The interventions should not just be made during school semesters— what happens during long vacations can easily make students change their minds.
8. Assuming the government wants to invest more in helping the disadvantaged group of female, poorer and low-performance students, then there should be more attention to sibling, peer, teacher, and school factors, rather than just basic student characteristics (gender, age and ethnicity) and parental background.

8.2.2 Educational Grassroots NGO

Other than educational policy advocacies, this study can also inform the Chinese government on the value of GNGOs. During the writing of this dissertation, registration has been getting easier for GNGOs, but regulations are still strict. This calls for a convincing confirmation of GNGO impact, or at least a rigorous evaluation that can provide suggestions for the improvement of GNGOs. My evaluation clearly shows that Lighthouse's socio-emotional support has an impact on educational aspirations, so the value of GNGOs is confirmed. More importantly, the findings also imply ways of improving impact throughout the life circle of a Lighthouse program.

1. Lighthouse could design a mechanism that maintains engagement without over-relying on specific Lighthouse sites. For example, it could have two years of full summer camp followed

by a one year short program for each Lighthouse school. This study demonstrates the possibility of diminishing impact from sites of continuing engagement, and that the relationship with local stakeholders seems to be less important in terms of ensuring the impact on individual participants. When Lighthouse was a young organization with weak social outreach, it was understandable that it tried to retain the number of Lighthouse schools, but now it may be more efficient to act with flexibility.

2. During recruitment, Lighthouse should welcome young volunteers (freshmen and sophomores), and worry less about universities, majors or where the volunteers grew up. Young members have greater passion, less worry about jobs or other commitments, and more time to become experienced volunteers. It is true that young volunteers are less experienced, but they can be trained.
3. It may be necessary to overhaul the training on instructional skills, making it more learner-friendly and practical for students with no teaching background.
4. Since increased aspiration mainly affects students with higher academic performance, it is advisable to encourage their participation. On the other hand, the matching result also implies that volunteers should pay more attention to low-performance students during the program. Since there are untested effects, it is unfair to conclude that Lighthouse does not affect low-performance students, however, based on the observations of my research team, it is true that some students were not good at expressing themselves, and some volunteers were not good at helping this type of student.
5. The volunteer team, especially the sub-group in charge of “public relationships”, should focus more on team morale rather than relationships with local school and government. A good relationship with local people remains important, but it is less relevant to the impact on Lighthouse participants, and it can be addressed by experienced volunteers and staff from the Lighthouse secretary.

-
6. The volunteers should be encouraged to spend time on informal interactions like home visits and letter communications, which appear to work well in building the emotional attachment between students and the volunteers.
 7. A structural procedure for follow-up services should be established. Different Lighthouse sites have their own traditions for follow-up, but there should be minimum standards for all sites to follow in order to reduce the diminishing of impact from the Lighthouse. This also makes the handover between old and new volunteer teams easier, and links back to my first point about designing a mechanism that maintains engagement without over-relying on specific sites.

8.2.3 Sequential Mixed-Methods

The third contribution of this study is its methodology. The qualitative-quantitative sequential mixed-methods approach should have resulted in more accurate answers to my research questions. I purposefully designed this research to allow for an examination of different methodological combinations:

1. **Purely qualitative.** If this study relied only on the Delphi survey to answer the two research questions, there would have been two problems. Firstly, some variables would have remained overlooked. For example, Delphi suggested 46 PCED determinants, or 57 with school and grade dummies counted, but when combining Delphi and the literature there were actually 84 variables. Secondly, inaccuracy exists when it comes to measurement. Delphi ratings suggested family income, parental attitudes towards different decisions, high school cost, and whether parents were migrant workers as the top four PCED determinants, but according to regression results only family income may qualify to be “top”, and that is when we do not distinguish the concepts of wealth and income. Delphi ratings also suggested Lighthouse outcomes that actually turned out to be insignificant, such as need for affiliation, confidence, curiosity and extraversion.

-
2. **Purely quantitative.** If this study relied only on MNL and PSM to answer the two research questions, there would also be two problems. Firstly, in the same way as purely qualitative methods, purely quantitative methods also overlook variables, especially those specific to the local context. My list of PCED determinants would have missed factors that do not apply much to other rural areas, such as teenage love and the development of the entertainment industry. My propensity score calculation and treatment outcome selection would have built on intuition, and thus be quite easily challenged. The second problem of being purely quantitative is somewhat connected to the first problem— without a solid list of PCED determinants, treatment determinants, or an outcome list, the interpretation of quantitative results would be full of uncertainties. For example, we would worry about whether some subjective factors were just mediators or proxies of other variables, or whether there would be difficulties when explaining the causal mechanism of Lighthouse impact due to the lack of qualitative documents.
 3. **Parallel or quantitative-qualitative mixed-methods.** When a sequential design is not feasible (often due to time limits), parallel mix-methods can be applied, and the findings can then be converged to generate insights; when the focus is on an explanation of certain phenomenon, conducting qualitative research after the quantitative models can serve the purpose quite well. Both types of mixed-methods are less satisfactory when it comes to exploratory topics. There are few studies on which to rely for suggestions about four-option PCED determinants in coastal China, and even less information about the enrollment, operation and outcomes of GNGO's socio-emotional support. Parallel and quantitative-qualitative mixed-methods are therefore not suitable for my research questions.

In comparison, the “Delphi- MNL- PSM” model adopted by this study overcomes the weaknesses of both pure quantitative and qualitative methods. If I had used non-mixed-methods, I would have drawn quite different conclusions that would probably have been biased or incomplete. It is true that my model takes more time than parallel mix-methods, and it is weaker in the interpretation of

results when compared to quantitative-qualitative mixed-methods (e.g. a practice of “MNL- PSM- Focus group”), but, by providing sufficient insights to guide the questionnaire design, the methodological challenges of comprehensive PCED determinants and treatment selection bias are directly addressed.

8.3 Limitations and Suggestions for Further Studies

This study has its limitations in timing, missing data, external validity, implementation of research methods and its heavy rely on self-report questionnaires, but they can be largely eliminated by conducting further proper studies.

The timing of data collection (one month after summer vacation) made it difficult to examine actual PCED and long-term Lighthouse impact. Ideally, we would like to see both expected and actual PCED for all surveyed students, but the reality is that I was only able to collect that data for two small schools. Even for those two schools, it is premature to say that the actual PCED were confirmed. Since the data were collected one month after the new semester, students may not have fully settled down with their PCED. For instance, those who went to AHS may later drop out or switch to VHS. Even for students choosing to stay in town (either dropout or work), it will take time to confirm the details of their lives, including farming, marriage, and so forth. This study tested the short- and mid-term effects of Lighthouse impact, but it can say very little about long-term impacts. Despite this, my research team was able to use the best available time window approved by local government.

A straightforward response to the timing issue is to conduct follow-up studies. More specifically, I can test which PCEDs the same group of surveyed students really made, as well as the way their measurable outcomes vary from those in other years after the program. There are stories of how the earlier generations of Lighthouse students succeeded in their education and career, but they are unlikely to pass the test for selection bias. Structured follow-up research is needed to uncover the whole story.

The second limitation of my dissertation study is missing data. Both students and households found it challenging when asked about “money” issues, such as income, credit constraints, and expected PCED costs and rewards. There was a missing data rate of close to 50% for some of these financial variables. Indeed, these factors are hard to estimate in rural China, and needless to say people are sometimes reluctant to provide such private information. Multiple imputations are used to address the missing-data problem, but imputation can never perfectly replace real data.

With the current research results, future study could shorten the questionnaire to reduce missing data. As long as the data collection takes place in the same towns, questions that were shown to be irrelevant in this study can be taken out, simplified, or combined. It is common sense that respondents will act more seriously for shorter questionnaires. I can provide multiple choices responses for questions about money variables, instead of asking for estimates. The ranges can be decided by looking at the distribution of estimates in the current sample.

The third major limitation is external validity. This issue mainly applies to the impact evaluation because those evaluation results may not apply to other educational GNGOs. External validity is not a major concern for PCED determinants, and in fact its geographical focus makes it a valuable complement to the literature. Despite this, I did act in response to the worry of external validity for both research questions. During the first round of Delphi, I asked each panel member to write down at least three Chinese provinces or cities with which they are very familiar, which would enable separate examination of the ranking of PCED determinants for the group, focusing on surveyed towns and the group with a national perspective. I also asked panel members to identify and rate 31 problems faced by Lighthouse and other educational GNGOs. By doing this, even if the Lighthouse impact is a unique case, I can explain why it is unique and what other educational GNGOs could do to obtain the same achievements or avoid the same problems. This part of the Delphi research is not reported here because it is relevant only if my studies are replicated for other areas or other programs.

Consequently, further studies could conduct research into PCED determinant in other regions, such as northern Suzhou (the rural part of another coastal province) or rural inner China regions. It would also be a good idea to conduct impact evaluations for other educational GNGOs with programs similar to Lighthouse, such as EV (mainly Beijing but covers the whole country), Shoulder Action (covers Fujian and Guangdong), and Yinghuo (covers Southwestern China).

The forth limitation is my implementations of Delphi and PSM are imperfect. Ideally, the Delphi survey should help experts achieve consensus, but as the example in Figure 4-4 shows, the divergence between experts remained evident in the third round. To some extent, this phenomenon confirms the fact that qualitative methods are good for providing rough insights rather than giving precise measurements. It is also noticeable that the quality of Delphi results also depends on my capacity of communication as well as how representative my Delphi experts are, yet these can never be perfect. For PSM, there are untested elements for the calculation of treatment propensity, the measurement of outcomes, and the proxy of coexisting events, which have been discussed in Section 7.5.2.

While it is unrealistic to pursue perfect Delphi or PSM, action could be taken to maximize the validity and reliability of research findings. For Delphi, the simple solution is to give up measurement and focus instead on generating more messages. For PSM, double-robustness can be achieved by combining it with DID (to conduct DID for students with similar propensity scores). It will be a great step forwards if I am able to collect pre-treatment data for all surveyed students in future studies.

Finally, the heavy rely on self-report items on variable construction can lead to either upward or downward bias for the answers to both research questions. Duckwork and Yeager (2015) summarized the five limitations of self-report questionnaires. First, respondent may read or interpret the item in a way that differs from researcher intent. Second, they may not be astute or accurate reporters of behaviors or internal states for a variety of reasons. Third, questionnaire scores may not reflect subtle changes over short periods of time. Forth, the frame of reference (i.e., implicit

standards) used when making judgments may differ across respondents. Last but not least, respondents may provide answers that are desirable but not accurate.

My design of questionnaire did consider the problem of self-report. For example, Lighthouse program was mentioned in the end of the questionnaire, so Lighthouse students was not hinted to provide positive answer on their socio-emotional status. Yet, many of these problems can hardly be fully resolved without more analyses applying different measurement tools and ways of variable construction. Self-reports can still provide a useful substitute for objective data even though there are systematic errors in reporting related to factors like gender and grade (Crockett et al., 1987). In future studies, if we can detect some of the PCED determinants or social-emotional support outcomes from various self-report questionnaires, we can at least claim the effect ranges.

References

- An, X. (2005). Educational engagement, social capital and educational development in poor areas. *Education and Economy*, 2005(4), 31-35. (In Chinese)
- An, X., Hannum, E., & Sargent, T. (2007). Teacher qualifications, teaching quality and student educational outcomes. *China: An International Journal*, 5, 309-334.
- Angrist, J. & Pischke, J. (2008). *Mostly harmless econometrics: An empiricist's companion*. Princeton, NJ: Princeton University Press.
- Almlund, M., Duckworth, A., Heckman, J. & Kautz, T. (2011). *Personality psychology and economics*. NEBR Working Paper No. 16822. Cambridge, MA.
- Al-Samarrai, S. & Peasgood, T. (1998). Educational attainments and household characteristics in Tanzania. *Economics of Education Review*, 17, 395-417.
- Appleton, S., Hoddinott, J., & Knight, J. (1996). Primary education as an input into post-primary education: A neglected benefit. *Oxford Bulletin of Economics & Statistics*, 58, 211-219.
- Aypay, A. (2003). The tough choice at high school door: An investigation of the factors that lead students to general or vocational schools. *International Journal of Educational Development*, 23, 517-527.
- Banerjee, A., Kremer, M., Lanjouw, J., & Lanjouw, P. (2002). *Teacher-student ratios and school performance in Udaipur, India: A prospective evaluation*. Mimeo, Harvard University.
- Becker, G. (1981). *A treatise on the family*. Cambridge, MA: Harvard University Press.
- Becker, G. & Lewis, H. (1973). On the interaction between the quantity and quality of children. *Journal of Political Economy*, 81, 279-288.
- Behrman, J. (1999). Labor markets in developing countries. In Ashenfelter, O. and Card, D. (eds.), *Handbook of Labor Economics*. (pp. 2859-2949). Amsterdam: North Holland Publishing.
- Bertocchi, G. & Spagat, M. (2004). The evolution of modern educational systems: Technical vs. general education, distributional conflict, and growth. *Journal of Development Economics*, 73, 559-582.
- Boucher, S., Stark, O., & Taylor, J. (2006). *A gain with a drain? Evidence from rural Mexico on the new economics of the brain drain*. Working Paper.

-
- Brookhart, A. et al. (2006). Variable selection for propensity score models. *American Journal of Epidemiology*, 163, 1149-1156.
- Brown, P. (2006). Parental education and investment in children's human capital in rural China. *Economic Development and Cultural Change*, 54, 759-789.
- Brown, P. & Park, A. (2002). Education and poverty in rural China. *Economics of Education Review*, 21, 523-541.
- Brunello, G & Checchi, D. (2007). Does school tracking affect equality of opportunity? New international evidence. *Economic Policy*, 22, 781-861.
- Burde, D. & Linden L. (2010). *The effect of village-based schools: Evidence from a RCT in Afghanistan*. Working Paper.
- Muller, C. (2015). Measuring education and skill. *The ANNALS of the American Academy of Political and Social Science*, 657, 136-148.
- Chen, D. (2009). *Vocational schooling, labor market outcomes and college entry*. Policy Research Working Paper Series 4814, the World Bank.
- Chen, G. & Hamori, S. (2009). Economic returns to schooling in urban China: OLS and the instrumental variables approach. *China Economic Review*. 20, 143-152.
- Chen, H. & Pei, Q. (2006). Review of recent studies on China's non-government organizations. *Summit on Public Administration*, 2006(1), 244-253. (In Chinese)
- Chen, X. et al. (2009). The effect of migration on children's educational performance in rural China. *Comparative Economic Studies*, 51, 323-343.
- Cochran, W. & Rubin, D. (1973). Controlling bias in observational studies. *Sankhya*, 35, 417-446.
- Connelly, R. & Zheng, Z. (2003). Determinants of school enrollment and completion of 10 to 18 year olds in China. *Economics of Education Review*, 22, 379-388.
- Cox, D. & Oakes, D. (1984). *Analysis of survival data*. London: Chapman & Hall.
- Crockett, L., Schulenberg, J., & Petersen, A. (1987). Congruence between objective and self-report data in a sample of young adolescents. *Journal of Adolescent Research*, 2, 383-392.
- Cui, K. (2003). A review of studies on China's NGOs in recent years. *Southeast Academic Research*, (3), 149-155. (In Chinese)

-
- Dahl, R.A. (1961). *Who governs? Democracy and power in an American city*. New Connecticut: Yale University Press.
- Duckworth, A. & Yeager, D. (2015). Measurement matter: assessing personal qualities other than cognitive ability for educational purposes. *Educational Researcher*, 44, 237-251.
- de Tray, D. (1974). Child quality and the demand for children. In Schultz, T. (ed.), *Economics of the Family* (pp. 91-119). Chicago: University of Chicago Press.
- de Brauw, A. & Giles, J. (2008). *Migrant opportunity and the educational attainment of youth in rural China*. Policy Research Working Paper Series 4526, the World Bank.
- de Brauw, A. & Rozelle, S. (2008). Reconciling the returns to rural education in off-farm wage employment in rural China. *Review of Development Economics*, 12, 57-71.
- Dehejia, R. & Ichino, A. (2002). Estimation of average treatment effects based on propensity scores. *The Stata Journal*, 2, 358-377.
- Deng, G. (2004). The evolvement and future trend of China's NGO (selection of speech).
<http://www.drcnet.com.cn/DRCNet.Common.Web/DocViewSummary.aspx?docid=235312&leafid=100>
- Deolalikar, A. (1993). Gender differences in the returns to schooling and in school enrollment rates in Indonesia. *Journal of Human Resources*, 28, 899-932.
- Dewey, J., Husted, T., & Kenny, L. (2000). The ineffectiveness of school input: A product of misspecification? *Economics of Education Review*, 19, 27-45.
- Ding, X. & Li, Y. (2007). An analysis of employment for secondary vocational education graduates in urban China. *Beida Economics of Education Research (Electronic Quarterly Journal)*, 5(4), 1-15. (In Chinese)
- Domencich, T. & McFadden, D. (1975). *Urban travel demand: A behavioral analysis*. Amsterdam: North Holland Publishing.
- Dong, Z. & Shen, B. (1997). A preliminary analysis of rural student's schooling track decisions. *Journal of Hubei University (Philosophy and Social Sciences)*, 1997(6), 72-76. (In Chinese)
- Duflo, E. (2001). Schooling and labor market consequences of school construction in Indonesia: Evidence from an unusual policy experiment. *American Economic Review*, 91, 795-813.

-
- Durlak, J. et al. (2011). The impact of enhancing students' social and emotional learning: a meta-analysis of school-based universal interventions. *Child Development*, 82, 405-432.
- Dustmann, C. (2004). Parental background, secondary school track choice, and wages. *Oxford Economic Papers*, 56, 209-230.
- El-Hamidi, F. (2006). General or vocational schooling? Evidence on school choice, returns, and 'sheepskin' effects from Egypt 1998. *Journal of Policy Reform*, 9, 157-176.
- Falk, A. & Ichino, A. (2006). Clean Evidence on Peer Effects. *Journal of Labor Economics*, 24, 39-57.
- Fang, C. (2005). Family background and educational tracking: An analysis of the non-academic factors in the process of educational tracking. *Society*, 2005(4), 105-118. (In Chinese)
- Fang, X. (2007). *Split-flows of education and the social stratification: Survey in Chifeng City*. Master Thesis, Southwest University. (In Chinese)
- Glick, P. & Sahn, D. (2000). Schooling of girls and boys in a West African country: The effects of parental education, income, and household structure. *Economics of Education Review*, 19, 63-87.
- Goux, D., Gurgand, M., & Maurin E. (2014). *Adjusting your dreams? The effect of school and peers on dropout behaviour*. Institute for the Study of Labor (IZA) Discussion Paper No. 7948.
- Guo, D. (2010). *Return to education in China: A literature review*. Working Paper.
- Hamilton, C.H. (2004). *Of voluntary failure and change*. Working Paper.
- Han, L. (2001). *Off-farm employment and the demand for schooling in rural China*. China Economics Annual Conference Paper. (In Chinese)
- Hannum, E. (2003). Poverty and basic education in rural China: Communities, households, and girls' and boys' enrollment. *Comparative Education Review*, 47, 141-159.
- Hannum, E. & Adams, J. (2007). Girls in Gansu, China. In Lewis, M. & Lockheed, M. (Eds), *Exclusion, Gender and Education: Case Studies from the Developing World*. (pp. 71-98). Washington D.C.: Center for Global Development.
- Hannum, E. & Adams, J. (2008). Beyond cost: Rural perspectives on barriers to education. In Davis, D. & Wang, F. (Eds), *Poverty and Wealth in Postsocialist China: An Overview*. (pp. 156-171). Stanford: Stanford University Press.

-
- Hannum, E. & Park, A. (2007). *Education and reform in China*. New York, NY: Routledge.
- Hannum, E., Kong, P., & Zhang, Y. (2009). Family sources of educational gender inequality in rural China: A critical assessment. *International Journal of Educational Development*, 29, 474-486.
- Hanushek, E. (1989). The impact of differential expenditures on school performance. *Educational Researcher*, 18, 45-51.
- Hanushek, E. (1997). Assessing the effects of school resources on student performance: An update. *Educational Evaluation and Policy Analysis*, 19, 141-164
- Hanushek, E., Lavy, V., Hitomi, K. (2008). Do students care about school quality? Determinants of dropout behavior in developing countries. *Journal of Human Capital*, 2, 69-105.
- Hanushek, E. & Woessmann, L. (2006). Does educational tracking affect performance and inequality? Differences-in-differences evidence across countries. *The Economic Journal*, 111, C63-C76.
- Hartog, J. & Vijverberg, W. (2007). Schools, skills and risk. *Economics of Education Review*, 26, 759-771.
- Haveman, R. & Wolfe, B. (1995). The determinants of children's attainments: A review of methods and findings. *Journal of Economic Literature*, 33, 289-308.
- He, C. (2006). Non-governmental organizations and the development of China's education. *Chinese Education and Society*, 39, 21-40.
- Heckman, J., Ichimura, H. & Todd, P. (1998). Matching as an econometric evaluation estimator. *Review of Economic Studies*, 65, 261-294.
- Hedges, L., Laine, R. & Greenwald, R. (1994). Does money matter? A meta-analysis of studies of the effects of differential school inputs on student outcomes. *Educational Researcher*, 23, 5-14.
- Heineck, G. & Wölfel, O. (2011). *Parental risk attitudes and children's secondary school track choice*. Working Paper.
- Hildebrandt, T. (2011). The political economy of social organization registration in China. *The China Quarterly*, 208, 970-989.
- Hogan, V. & Walker, I. (2007). Education choice under uncertainty: Implication for public policy. *Labour Economics*, 14, 894-912.

-
- Houtenville, A. & Conway, K. (2008). Parental effort, school resources, and student achievement. *Journal of Human Resources*, 43, 437-453.
- Hsia, R. & White, L.T. (2002). Working amid corporatism and confusion: foreign NGOs in China. *Nonprofit and Voluntary Sector Quarterly*, 31, 329-351.
- Hu, Y. & Du, Y. (2008). The empirical research of educational production function on rural junior middle schools in western China. *Education and Economics*, 2008(3), 1-7. (In Chinese)
- Jia, X. (2004). What can NGOs do in educational support? *People's Standing Committee (Renmin Zhengxie Bao)*, 1st September. (In Chinese)
- Jiang, X. (2002). The formation of high school track decision: A survey in Beijing. *Educational Science Research*, 2002(9), 20-23. (In Chinese)
- Jiang, Z. ed. (2004). Voluntary teaching hit by reality, volunteers grow from frustration. *Shanghai Morning Post*, 7th September. (In Chinese)
- Jiang, Z. & Dai, H. (2005). Reducing the rate of dropout in rural middle school and reforming the system of compulsory education. *Chinese Journal of Population Science*, 2005(4), 59-66. (In Chinese)
- Kang, X. (1999). *The transfer of power*. Hangzhou: Zhejiang People's Publishing House. (In Chinese)
- Kao, G. & Thompson, J. (2003). Racial and ethnic stratification in educational achievement and attainment. *Annual Review of Sociology*, 29, 417-442.
- Keane, M. & Wolpin, K. (1997). The career decisions of young men. *Journal of Political Economy*, 105, 473-522.
- Kochar, A. (2004). Urban influences on rural schooling in India. *Journal of Development Economics*. 74, 113-136.
- Kremer, M., Moulin, S., & Namunyu, R. (2002). *Unbalanced decentralization*. mimeo, Harvard University.
- Krugman P. & Wells, R. (2006). *Economics*. New York: Worth Publishers.
- Le Grand, J. (1991). The theory of government failure. *British Journal of Political Science*, 21, 423-442.
- Lee, L. & Park, A. (2010). *Parental migration and child development in China*. Working Paper. Gansu Survey of Children and Families, University of Pennsylvania.

-
- Leamer, E. (1983). Let's Take the Con Out of Econometrics. *American Economic Review*, 73, 31-43.
- Li, D. & Tsang, M. (2003). Household decisions and gender inequality in education in rural China. *China: An International Journal*, 1, 224-248.
- Li, E. (2006). International non-government organization under perspectives of multi-dimension. *Journal of Public Management*, 3, 80-85. (In Chinese)
- Li, H. (2009). A fundamental analysis of the theory of non-government organization. *Wuhan University Journal*, 62, 360-364. (In Chinese)
- Li, H., Liu P., & Zhang, J. (2012). Estimating returns to education using twins in urban China. *Journal of Development Economics*, 97, 494-504.
- Li, L. (2009). An empirical study of the selection of high school track. *Vocational & Technical Education Forum*, 2009(22), 8-10. (In Chinese)
- Li, L. (2011). A study of the non-monetary benefits of secondary vocational education. *Tsinghua Journal of Education*, 32, 83-88. (In Chinese)
- Li, L. & Cheng, G. (2009). How the change of cost and benefit of vocational high school influence the schooling track decision. *Vocational & Technical Education Forum*, 2009(34), 11-15. (In Chinese)
- Li, S. (2003). China's government organized NGO: Agreeing to disagree. *Journal of Xuehai*, 2003(1), 91-97. (In Chinese)
- Li, S. & Ding, S., (2003). Long-term change in private returns to education in urban China. *Social Science in China*. 2003(6), 58-72. (in Chinese)
- Li, Y. & Ding, X. (2008). Survival analysis on job-searching time for secondary vocational education graduates. *Education and Economy*, 2008(2), 26-31.
- Liang, X. (2009). The state of China's educational NGO.
<http://learning.sohu.com/20091129/n268549653.shtml>
- Lighthouse (2004). *Strategy Evaluation of Lighthouse*. (In Chinese). Guangdong: Lighthouse.
- Lighthouse (2009). *An introduction to Lighthouse*. (In Chinese). Guangdong: Lighthouse.
- Liu, Z. (2007). Why so many rural children leave school? An empirical study with a multilevel model. *Journal of Beijing Normal University*, 2007(2), 70-80. (In Chinese)

-
- Liu, M., Murphy, R., Tao, R., & An, X. (2009). Education management and performance after rural education finance reform: Evidence from western China. *International Journal of Educational Development*, 29, 463-473.
- Liu, C. et al. (2010). The effect of primary school mergers on academic performance of students in rural China. *International Journal of Educational Development*, 30, 570-585.
- Lu, Y. (2007). *NGOs in China: Development dynamics and challenges*. Unpublished paper, China Policy Institute, University of Nottingham.
- Lu, Y. (2008). *Non-governmental organizations in China*. London: Routledge.
- Lu, Y. (2012). Education of children left behind in rural China. *Journal of Marriage and Family*, 74, 328-341.
- Lu, Y. & Treiman, D. (2008). The effect of sibship size on educational attainment in China: Period variations. *The American Sociological Review*, 73, 813-834.
- Luo, R. et al. (2012). Nutrition and educational performance in rural China's elementary schools: Results of a randomized control trial in Shaanxi Province. *Economic Development and Cultural Change*, 61.
- Lopez-Acevedo, G. & Salinas, A. (2000). *Marginal willingness to pay for education and the determinants of enrollment in Mexico*, Working Papers Series 2405, The World Bank.
- Lopez-Mayan, C. (2010). *Demand for post-compulsory education: The choice between academic and vocational tracks*. Working Paper.
- Ma, M. & Shi, X. (2010). *The impact of class quality on students' educational performance: Evidence from a natural experiment in China*. Working Paper.
- Ma, Q. (2009). *Non-governmental organizations in contemporary China: Paving the way to civil society?* London: Routledge.
- Malamud, O. & Pop-Eleches, C. (2008). *General education vs. vocational training: Evidence from an economy in transition*. Working Paper 14155. Cambridge, MA: National Bureau of Economic Research.
- McElroy, M. (1990). The empirical content of Nash-bargained household behavior. *Journal of Human Resources*, 25, 559-583.

-
- McGuire, W., Fleisher, B. & Sheldon, I. (2007). Off-farm employment opportunities and educational attainment in rural China. China's Educational Trade: Issues and Prospects Symposium, Beijing, China.
- McKean, R. (1965). The unseen hand in government. *The American Economic Review*, 55, 496-506.
- McKenzie, D. & Rapoport, H. (2006). *Can migration reduce educational attainment? Evidence from Mexico*. Working Paper Series 3952, the World Bank.
- Mo, D. et al. (2011). *School dropouts and conditional cash transfers: Evidence from a randomized controlled trial in rural China's junior high schools*. Working Paper. Rural Education Action Project, Stanford University.
- Moenjak, T. & Worswick, C. (2003). Vocational education in Thailand: A study of choice and returns. *Economics of Education Review*, 22, 99-107.
- Murnane, R. & Willett, J. (2010). *Methods matter: Improving causal inference in educational and social science research*. New York, NY: Oxford University Press.
- Murphy, R. (2007). *Paying for education in rural China*. In V. Shue & C. Wong eds. *Paying for progress in China*. New York: Routledge, 69-95.
- Park, A. & Hannum, E. (2002). *Do teachers affect learning in developing countries?: Evidence from matched student-teacher data from China*. Working Paper.
- Park, A., Shi, X., Hsieh, C. & An, X. (2010). *Does school quality matter? Evidence from a natural experiment in rural China*. Working Paper.
- Psacharopoulos, G. (1994). Returns to investment in education: A global update. *World Development*, 22, 1325-1343.
- Riddell, R. et al. (1995). *Non-governmental organizations and rural poverty alleviation*. New York: Oxford University Press.
- Roberts, B. (2009). Back to the future: Personality and assessment and personality development. *Journal of Research in Personality*, 43, 137-145.
- Rubin, D. (1987). *Multiple imputation for nonresponse in surveys*. New York: Wiley.
- Rosenbaum, P. (2002). *Observational Studies (2nd ed.)*. New York: Springer.

-
- Rosenbaum, P. & Rubin, D. (1983). The central role of the propensity score in observational studies for causal effects. *Biometrika*, 70, 41–55.
- Rosenzweig, M. & Evenson, R. (1977). Fertility, schooling and economic contribution of children in rural India: An econometric analysis. *Econometrica*, 45, 1065-1080.
- Saich, A. (2000). Negotiating the state: the development of social organizations in China. *The China Quarterly*, 161, 124-141.
- Saich, A. (2004). *Governance and politics of China (2nd ed.)*. Basingstoke: Palgrave Macmillan.
- Salamon, L. (1981). Rethinking public management: third-party government and the changing forms of government action. *Public Policy*, 29, 255-275.
- Salamon, L. (1987). Of market failure, voluntary failure, and third-party government: toward a theory of government-nonprofit relations in the modern welfare state. *Nonprofit and Voluntary Sector Quarterly*, 16, 29-49.
- Salamon, L. (1995). *Partners in public service: Government—non profit relations in the modern welfare state*. Baltimore: Johns Hopkins University Press.
- Salamon, L. & Anheier, H. (1997). Toward a common definition. In Salamon, L. & Anheier, H. (Eds), *Defining the nonprofit sector: a cross-national analysis*. (pp. 29-50) Manchester: Manchester University Press.
- Santrock, J (2007). *Adolescence* (11th ed.). New York: McGraw-Hill.
- Sawada, Y. & Lokshin, M. (2001). *Household schooling decisions in rural Pakistan*. Policy Research Working Paper Series 2541, the World Bank.
- Schultz, T. (1973). The value of children: An economic perspective. *The Journal of Political Economy*, 81, 2-13.
- Schultz, T. (1993). Investments in the schooling and health of women and men: Quantities and returns. *Journal of Human Resources*, 28, 694-734.
- Shen, Y. (2005). A quantitative analysis of the influence of party and government on social organizations. *Seeker*, 2005(1), 74-75. (In Chinese)
- Sipahimalani, V. (1999). *Education in rural India: An empirical analysis of household decisions*, PhD Dissertation, Yale University.

-
- Skoufias, E. & Parker, S. (2001). Conditional cash transfers and their impact on child work and schooling: Evidence from the PROGRESA program in Mexico. *Economia*, 2, 45-96.
- Skulmoski, G., Hartman, F. & Krahn, J. (2007). The Delphi Method for Graduate Research. *Journal of Information Technology Education*, 6, 1-21.
- Song, L., Appleton, S. & Knight, J. (2006). Why do girls in rural China have lower school enrollment? *World Development*, 34, 1639-1653.
- Song, Y., Luo, P., & Wei, J. (2011). *Streaming intention, educational choice, and the determinants for rural junior secondary student: Evidence from 41 poverty counties of a western province*. Report by China Institute for Educational Finance Research, Peking University. (In Chinese)
- Stuart, E. (2010). Matching methods for causal inference: A review and a look forward. *Stat Science*, 25, 1-21.
- Sun, Z. (2003). Determinants of the level of rural education: As exemplified by the Chifeng rural areas. *Chinese Journal of Population Science*, 2003(2), 59-65. (In Chinese)
- Sun, Z. (2004). *Cost, benefit, and household educational decisions in rural China*. Beijing: Beijing Normal University Press. (In Chinese)
- Sun, Z. & Du, Y. (2009). Does education system affect rural resident's schooling and earnings? – evidence from survey data in Rong'an county, Guangxi province. *Chinese Journal of Population Science*, 2009(4), 100-110. (In Chinese)
- Sun, Z., Du, Y., & Li, T. (2010). The increment and distribution effects of compulsory education finance reform on education expenditure. *Peking University Education Review*, 8, 83-100. (In Chinese)
- Sutton, M. & Arnone, R. eds. (2004). *Civil society or shadow state?: State/NGO relations in education*. Greenwich: Information Age Publishing.
- Tang, B. (2006). Review of studies on China's non-profit organizations. *Social Science Journal*, 2006(4), 55-60. (In Chinese)
- Tang, J. & Zhu, L. (2007). Twenty years of voluntary service in Guangdong: review and prospect. *Journal of Guangdong Youth Leaders College*, 21, 29-35. (In Chinese)
- Tansel, A. (2002). Determinants of school attainment of boys and girls in Turkey: Individual, household, and community factors. *Economics of Education Review*, 21, 455-470.

-
- Train, K. (2003). *Discrete choice methods with simulation*. Cambridge, UK: Cambridge University Press.
- Tsang, M. & Ding, Y. (2005). Resource utilization and disparities in compulsory education in China. *The China Review*, 5, 1-31.
- Tsang, M. & Min, W. (1990). Vocational education and productivity: A case study of the Beijing General Auto Industry Company. *Economics of Education Review*, 9, 351-364.
- Tsinghua University NGO Research Institute (2005). *The role of NGOs in aiding education*. <http://chinaelections.net/NewsInfo.asp?NewsID=1184> Originally from www.ngocn.net
- Tunali, I. (2005). *General vs. vocational secondary school choice and labor market outcomes in Turkey, 1988-98*. SOLE/EALE Conference Paper, San Francisco.
- Wang, B. (2005). A historical reflection on vocational and technical education in China. *Journal Educational Studies*, 1, 3-8. (In Chinese)
- Wang, J., Li, Y. & He, E. (1997). The design and standardization of the Mental Health Inventory of Middle-School Students. *Science of Social Psychology*, 1997(4), 15-20. (In Chinese)
- Wang, J., He, E., & Qiu, B. (1999). The relationship between mental characteristics and academic performance for secondary school students. *Chinese Journal of School Health*, 20, 1. (In Chinese)
- Wang, M. (2009). Universal high school and mass higher education. In Cai, F. (Ed.), *Report on China's Population and Labor* (pp. 163-174). Beijing: Social Sciences Academic Press. (In Chinese)
- Wang, M. & Jia, X. (2002). An analysis of China's NGO. *Management World*, (8), 30-43. (In Chinese)
- Wang, M. & Jia, X. (2003). Problems for the legislation of China's NGO. *Journal of Tsinghua University*, 18, 100-106. (In Chinese)
- Wang, P. et al. (2009). *The number, composition and characteristics of the new-generation migrant worker*. Beijing: National Bureau of Statistics of China. (In Chinese)
- Wang, S. (1999). *Diversification and unification*. Hangzhou: Zhejiang People's Publishing House. (In Chinese)
- Wei, X. et al., (1999). Education and earnings in rural China. *Education Economics*, 7, 167-187.
- Whiting, S.H. (1991). The politics of NGO development in China. *Voluntas: International Journal of Voluntary and Nonprofit Organizations*, 2, 16-48.

-
- Willis, R. & Rosen, S. (1979). Education and self-selection. *The Journal of Political Economy*, 87, 7-36.
- Xie, H. (2004). The legitimate corner and the corresponding countermeasures of Chinese civil organizations. *Chinese Journal of Law*, 2004(2), 17-34. (In Chinese)
- Xing, C. & Li, S. (2010). *The great leap-forward of higher education, educational opportunity, and income inequality*. Working Paper. (In Chinese)
- Xue, H. & Min, W. (2008). A study of educational production function in western region of China. *Education and Economics*, 2008(2), 18-25. (In Chinese).
- Yang, D. ed. (2009). *Blue book of education (Annual report on China's education 2009)*. Beijing: Social Science Documents Publishing House. (In Chinese)
- Yang, D. ed. (2010). *Blue book of education (Annual report on China's education 2010)*. Beijing: Social Science Documents Publishing House. (In Chinese)
- Yang, G. (2009). *The power of the internet in China: Citizen activism online*. New York: Columbia University Press.
- Yang, J. (1998). General or vocational? The tough choice in the Chinese education policy. *International Journal of Educational Development*, 18, 289-304.
- Yang, J. (2008). Educational choices under uncertainty – An empirical study based on option model. *Journal of Beijing Normal University*, 2008(4), 117-128. (In Chinese)
- Yao, H. (2007). *A systems framework for analyses of China's educational policy change: Design and application*. Masters Thesis. (In Chinese)
- Yao, H., Simpson, S., Yang, S., & Li, S. (2012). *National replication vs. regional replication: How reliable is the OLS-based evidence of college wage premium?* Association for Education Finance and Policy Conference Paper, Boston.
- Yeager, D. & Walton, G. (2011). Social-psychological interventions in education: They're not magic. *Review of Educational Research*, 81, 267-301.
- Yi, H. et al. (2011). Dropping out: What are students leaving junior high in China's poor rural area? *International Journal of Educational Development*, doi:10.1016/j.ijedudev.2011.09.002
- Yu, K. (2006). Civil society in China: Concepts, classification and institutional environment. *Social Science in China*, (1), 109-122. (In Chinese)

-
- Yu, Y. (2009). The impact of characteristics of multiple-offspring family on rural children's education – Analysis based on the micro samples of four villages in Jiangsu province. *SDU Economic Papers*, 2009(2), 36-50. (In Chinese)
- Zhang, H. (2009). *An investigation of the education streaming preference of Grade 3 students in rural China*. Master Thesis, Qinghai Normal University. (In Chinese)
- Zhang, Y. (2011). *Influence of home environment on children's schooling: From teacher's perspective*. Working Paper. Gansu Survey of Children and Families, University of Pennsylvania.
- Zhang, Y. (2011). *The determinants of national college entrance exam performance in China: With an analysis of private tutoring*, PhD Dissertation, Columbia University.
- Zhao, Y. (1997). Labor migration and returns to rural education in China. *American Journal of Agricultural Economics*, 79, 1278-1287.
- Zhou, W. (2005). Ten years of "Go-to-the-Countryside".
<http://politics.people.com.cn/GB/1026/3883939.html>
- Zhu, J. (2004). Grassroots NGOs and the growth of Chinese civic society. *Open Times*, 2004(6), 36-47. (In Chinese)
- Zhu, J. (2008). *The power of action*. Beijing: The Commercial Press. (In Chinese)
- Zhu, R. (2006). *Studies of rural junior middle school's education streaming situation from its streaming intention*. Master Thesis, East China Normal University. (In Chinese)

Appendix

Appendix A: Lighthouse Intervention: From Volunteer Recruitment to Revisit

A1. 2012 Recruitment/Training/Evaluation Schedule for New Volunteers

March

- Recruitment
- Application screening

April

- Interviews and admission. Usually 1 in 6 ~ 1 in 8 accepted.
- Introduction of Lighthouse (operation, idea, developmental strategy, etc.).

May

- First round of team building. This is a 3-day intensive session. The volunteers will be together for more than 12 hours per day.
- Teaching Training – education ideas
- Teaching Training – teaching skills and informal instruction
- Teaching Training – trial lecture

June

- Teaching Training – student affairs
- Optional trainings. In 2011, ten courses were provided by former Lighthouse volunteers, professional trainers, or other NGO trainers, including: applied drama, social gender, picture book education, creative music, photographing, outdoor living skill, state of rural education, Getting-Things-Done (GTD), connected to community, inquiry learning, and communication.

July

- Volunteer disciplines and first-aid treatment
- Second round of team building
- Specific training held by former volunteers from the same Lighthouse location

July-August

- Summer Camp starts, accompanied with simultaneous monitoring and evaluation by former volunteers and Lighthouse staff

September

- Workshops for each volunteer team
- Summative meeting

October

- Revisit during the National Day holiday

A2. Sample of the One Month Curriculum

Curriculum for one of the classes in Yonggu 2011 ^a						
First Week		MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
			Arrival	Recruitment	Recruitment	Team Building
		MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
8:00-8:10		Morning Reading(English pronunciation, news broadcast, story share)				
8:10-8:50	1	Class meeting	Local product ^b 1	Local product 4	Local product 7	Local product 10
9:00-9:40	2	Team game	Local product 2	Local product 5	Local product 8	Local product 11
9:40-10:00		3-minute class-break exercise				
10:00-10:40	3	Silent music	Local product 3	Local product 6	Local product 9	Local product 12
2:00-2:40	4	Basic marketing	Physical experiments	Elective courses ^c	Sales	Local products exhibition
2:50-3:30	5	Small story, big idea			Handcraft	
3:40-4:20	6	Standard exercise			Standard exercise	
Long Distance Household Visit						
		MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
8:00-8:10		Morning Reading(English pronunciation, news broadcast, story share)				
8:10-8:50	1	Class meeting	Funny math	English speaking	Performing life	History (Three Kingdoms)
9:00-9:40	2	Drawing	Story of a boat	Communication		About teamwork
9:40-10:00		3-minute class-break exercise				
10:00-10:40	3	Outdoor drawing	Fruit life	Logo design	Making a mask	Social gender 1
2:00-2:40	4	Making a water	Communication	Elective	Language and	Treasure-hunt

		rocket		courses	expression	
2:50-3:30	5	Discovery your community	Outdoor sketch			
3:40-4:20	6					The world of voice
Long Distance Household Visit						
		MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
8:00-8:10		Morning Reading(English pronunciation, news broadcast, story share)				
8:10-8:50	1	Class meeting	Funny math	Funny English	Life Auction	Art festival
9:00-9:40	2	Learn to reject	Bird's moving			
9:40-10:00		3-minute class-break exercise				
10:00-10:40	3	Ads design	Geography	Cartoon drawing	Social gender 3	
2:00-2:40	4	Marketing	Social gender 2	Learn to reject	Art festival drill	
2:50-3:30	5	Marketing practice	Water purifier	Sales		
3:40-4:20	6			Class meeting		Summary

- a. The curriculums vary among Lighthouse schools, but follow principals received from the training.
- b. "Local Product" is a series of inquiry learning classes promoting the students care of local development
- c. Elective courses include Taekwondo, dance, drawing, and singing.

Appendix B: Questionnaires (Students/Households/Teachers/Principals/Volunteers)

B1. Questionnaire for Students

Questionnaire for Students

This survey is for research only

We protect your privacy

Dear student,

The data generated from this questionnaire will be used by researchers in economics and education to analyze the determinants of post-compulsory education decisions. We hope to hear about your real opinions and situation because real information can help us conduct accurate analyses. The questionnaire takes approximately 40 minutes. Your support is greatly appreciated!

Haogen Yao, Doctoral Student
Teachers College, Columbia University

Privacy Protection

1. This survey collects information related to the post-compulsory education decision. The investigators will collect them in right after you finish. Please try your best to answer all the questions
2. Your answers will be analyzed together with thousands of other student answers, and therefore no one can tell your identity from our findings.
3. We ask for your name and student ID only for the convenience of the follow-up survey.
4. We will strictly protect your privacy. We will never release your questionnaire to individuals or organizations other than the researchers of this project.

Instructions

Please “√” the figure you choose, or write your answer on “_____”. The multiple-choice questions are single-answer unless given specific instruction.

A. Basic Information

A1. Your name: _____

A2. Your class ID: _____

A3. School name: _____

A4. Grade: _____

A5. Class: _____

A6. Home address: _____

A7. What is your next step? ①Dropout ②Work after graduating ③Continue to vocational high school
④Continue to academic high school ⑤Other or not sure

A8. If you chose ① in A7, what exactly is it? ①Farming ②Local work ③Migrant work ④Other or not sure

A9. If you chose ② in A7, what exactly is it? ①Local work ②Migrant work ③Other or not sure

A10. If you chose ③ in A7, what exactly is it? ①Technical school ②Specialized school ③Vocational school ④Not sure ⑤Does not matter

A11. Ideally, what is your expected educational level in the future? ①Lower secondary ②Vocational high ③Academic high ④College ⑤Graduate level

A12. What vocation do you think you might enter in the future (up to 3)? a. Agriculture b. Mining c. Manufacturing d. Production and supply of electricity, gas, and water e. Construction f. Geological exploration and water management g. Transportation, storage, and post and telecommunication h. Wholesale, retail, and catering i. Finance and insurance j. Real estate k. Social services l. Health, sport, and social welfare m. Education, culture/art, and radio/movie/television n. Research and technical service o. Government, party and social organization p. Not sure or never think about it

B. Individual Characteristics

B1. Your birth year: _____

B2. Gender: ①Male ②Female

B3. Ethnicity: ①Han ②Minority

B4. Graduated from _____ elementary school

B5. Have you been a class leader in middle school? ①Yes ②No

B6. Are you a league member? ①Yes ②No

B7. Are you a boarding student? ①Yes ②No

B8. How long it takes for you to go to the school from home? _____mins, by

①foot ②bike ③auto ④other

B9. Have you suffered these health problems (multiple answer)? ①Trachoma/myopia ②Anemia ③Hepatitis ④Easily tired or dizzy ⑤Easily cold or hurt ⑥Other health problem ⑦Fine

B10. In the past three months, have you asked for leave because of health problem?

①No ②Yes, 1 time ③2~4 times ④More than 4 times

B11. Your usual academic ranking in class: No.____

B12. How many hours do you spend on housework (including agricultural work) per day? Total _____hours

B13. How many hours do you spend on study after class? Total_____hours

B14. How many hours do you spend on entertainment after class: Total _____hours

B15. List your two best friends (can be your relatives) in the same school (if dropped out or transferred, specify): _____: _____°

B16. Have you lived or worked in one of the Pearl Delta cities for longer than 1 month? ①Yes ②No

C. Family Structure

C1. How many people in your household? _____

C2. The state of your family:

- ①Parent divorced ② One parent passed away ③Both parents passed away ④Both at home
⑤Father a migrant worker ⑥Mother a migrant worker ⑦Other

C3. Number of older brothers (Please also include those from step-parents): _____

C4. Number of older sisters: _____

C5. Number of younger brothers: _____

C6. Number of younger sisters: _____

C7. If you have siblings, how many are in elementary school? _____

C8. Including yourself, how many of your siblings are in lower secondary school now? _____ (1 if only you)

C9. If you have siblings, how many are in upper secondary school (can be vocational)? _____

C10. If you have siblings, how many are in college (can be vocational)? _____

C11. If you have siblings, how many are working as a worker or farmer? _____

C12. If you have siblings, how many are already married? _____

D. School and Education

D1. Please give your answer for the statements below. There is no correct or incorrect answer. Please do not spend too much time on a single statement. Please think of your daily life rather than unusual days.

		Totally disagree	Disagree	Agree a little	Basically agree	Agree	Totally agree
a.	If I study hard, the teacher will praise me.	1	2	3	4	5	6
b.	The teacher often pays attention to me in class.	1	2	3	4	5	6
c.	Most teachers like to listen to me talk.	1	2	3	4	5	6
d.	The teaching quality at my school is very good.	1	2	3	4	5	6
e.	The teachers at my school care a lot about the students.	1	2	3	4	5	6
f.	Teachers at our school treat students very fairly.	1	2	3	4	5	6
g.	Going to school is very important for my future.	1	2	3	4	5	6
h.	We believe we can learn our lessons well.	1	2	3	4	5	6
i.	Teachers always assign us a lot of homework.	1	2	3	4	5	6
j.	We usually discuss problems together in class animatedly.	1	2	3	4	5	6
k.	In class the teacher generally lectures and we	1	2	3	4	5	6

	listen.						
l.	Most subjects are easy for me.	1	2	3	4	5	6
m.	The teacher encourages us to ask questions.	1	2	3	4	5	6
n.	If I work hard, I can do well in my studies.	1	2	3	4	5	6
o.	I am happy in school.	1	2	3	4	5	6
p.	I often do not want to attend school.	1	2	3	4	5	6
q.	I like to participate	1	2	3	4	5	6
r.	I often feel bored	1	2	3	4	5	6
s.	I often feel lonely	1	2	3	4	5	6
t.	I enjoy learning new things	1	2	3	4	5	6
u.	Teachers like me.	1	2	3	4	5	6
v.	What I learn in class is useful	1	2	3	4	5	6

D2. Have you had something stolen in the school? ①Yes ②No

D3. Have you played truant? ①Yes ②No

D4. Have you been involved with gambling or illegal lottery? ①Yes ②No

D5. Do you have enough breakfast everyday? ①Yes ②No

D6. Do you have enough lunch everyday? ①Yes ②No

D7. Do you feel hungry or dizzy during class? ①Usually ②Sometimes ③Never

D8. Do you find it difficult to read the blackboard or do homework because of myopia? ①Yes ②No

D9. Have these things happened to you before or during this semester?

		Never	Sometimes	Often	Very often
a.	Students violate school discipline.	1	2	3	4
b.	During tests students cheat	1	2	3	4
c.	Students copy others' homework.	1	2	3	4
d.	Some students disrupt the class.	1	2	3	4
e.	There are in-campus fights.	1	2	3	4
f.	Some students bully other students.	1	2	3	4

D10. The subject taught by your favorite teacher _____

D11. In which subject did you have the best performance? _____

E. Description of your Life

The following statements are a general description of life. Please read each statement carefully and indicate the extent to which each statement reflects your life (by specifying totally disagree, disagree, agree, or fully agree. There is no correct or incorrect answer, please do not spend too much time on one specific statement.

		Totally disagree	Disagree	Agree a little	Basically agree	Agree	Totally agree
1	In most ways, my life meets my hopes and expectations	1	2	3	4	5	6

2	I am satisfied with my life	1	2	3	4	5	6
3	I have gotten a lot of the things I want	1	2	3	4	5	6
4	I am confident about my future	1	2	3	4	5	6
5	If I cannot do something I do not continue to try to do it	1	2	3	4	5	6
6	I always achieve what I most want to do	1	2	3	4	5	6
7	In the future I will be able to live a better life than most people	1	2	3	4	5	6
8	I can prepare myself well for my future life	1	2	3	4	5	6
9	My future life won't be very happy	1	2	3	4	5	6
10	I won't be able to get what I truly want in the future	1	2	3	4	5	6
11	My future life will be better than the present	1	2	3	4	5	6
12	A lot of the things that I do are very important and meaningful	1	2	3	4	5	6
13	I enjoy my current life	1	2	3	4	5	6
14	I have many things to be proud of about myself	1	2	3	4	5	6
15	I often feel unhappy	1	2	3	4	5	6
16	I can always do things well	1	2	3	4	5	6
17	I often feel lonely	1	2	3	4	5	6
18	I often win praise from others for the things that I do.	1	2	3	4	5	6
19	I often quarrel with others	1	2	3	4	5	6
20	I often lose my temper with others	1	2	3	4	5	6
21	I don't like to let others know about my affairs	1	2	3	4	5	6
22	I like to brag	1	2	3	4	5	6
23	I can't concentrate on what I am doing	1	2	3	4	5	6
24	I often have many different kinds of ideas in my mind	1	2	3	4	5	6
25	I blush easily	1	2	3	4	5	6
26	I can't do anything well unless adults are there	1	2	3	4	5	6
27	I like to show off my strengths in front of others	1	2	3	4	5	6
28	I am very indifferent to others	1	2	3	4	5	6
29	I am very shy.	1	2	3	4	5	6
30	I steal things from others or my home	1	2	3	4	5	6
31	I always want to attract others' attention	1	2	3	4	5	6
32	Sometimes I break things on purpose	1	2	3	4	5	6
33	I am very obedient to my parents	1	2	3	4	5	6
34	I do not observe school discipline	1	2	3	4	5	6
35	I get along well with classmates	1	2	3	4	5	6
36	My classmates often make fun of me	1	2	3	4	5	6
37	I do not feel sad, even if I have done something that I shouldn't have	1	2	3	4	5	6

38	I feel unhappy if I see that others are better than me	1	2	3	4	5	6
39	Often, even if I know I am wrong, I do not like to listen to others' advice	1	2	3	4	5	6
40	I sometimes worry that I could do something bad.	1	2	3	4	5	6
41	I think I should be good at all things	1	2	3	4	5	6
42	Sometimes my mood changes suddenly. I might be happy one moment and then for some unknown reason I suddenly no longer feel happy	1	2	3	4	5	6
43	I think that a lot of people like me	1	2	3	4	5	6
44	I feel inferior to others	1	2	3	4	5	6
45	I act impulsively	1	2	3	4	5	6
46	I feel I am happy	1	2	3	4	5	6
47	I am often suspicious of others	1	2	3	4	5	6
48	I don't like to play with naughty children	1	2	3	4	5	6
49	I often swear at others and use dirty language	1	2	3	4	5	6
50	I prefer to be alone	1	2	3	4	5	6
51	I often make fun of others	1	2	3	4	5	6
52	I sometimes tell lies	1	2	3	4	5	6
53	I often feel nervous	1	2	3	4	5	6
54	I am often tired	1	2	3	4	5	6
55	I often don't talk when I am with my classmates, most of the time I listen to them talking	1	2	3	4	5	6
56	I lose my temper easily	1	2	3	4	5	6
57	I am stubborn and don't listen to others opinions	1	2	3	4	5	6
58	I sometimes threaten and even hurt others	1	2	3	4	5	6
59	There is always something to worry about	1	2	3	4	5	6
60	My performance in school is good	1	2	3	4	5	6
61	I like to do house and farm work	1	2	3	4	5	6
62	I am curious about everything	1	2	3	4	5	6
63	I am/was falling in love with someone	1	2	3	4	5	6
64	I have been losing my patience when answering the questions above	1	2	3	4	5	6

F. Decision Process and Family Attitude

F1. Given the scenarios below, what is the monthly after-tax earning you will have at 35. Please give an estimate of how much you think you will earn.

- a. drop out and start farming now _____RMB
- b. dropout and work _____RMB

-
- c. farming after graduating_____RMB
 - d. work locally after graduating_____RMB
 - e. work as migrant after graduating_____RMB
 - f. work after graduating from academic high_____RMB
 - g. work after graduating from vocational high_____RMB
 - h. work after graduating from college_____RMB

F2. Do you know about policy incentives for vocational education? ①Very much ②Yes ③A little ④No

F3. How do you feel about the local economy? ①bad, no hope ②bad, but getting better ③okay ④good, but getting worse ⑤good ⑥not sure

F4. Who is influential in your post-compulsory education decision

	Totally disagree	Disagree	Agree a little	Basically agree	Agree	Totally agree
a. Myself	1	2	3	4	5	6
b. Elders	1	2	3	4	5	6
c. Friends	1	2	3	4	5	6
d. Teachers	1	2	3	4	5	6
e. Previous graduates	1	2	3	4	5	6
f. Media	1	2	3	4	5	6
g. Other people such as volunteers	1	2	3	4	5	6

F5. Please choose

	Totally disagree	Disagree	Agree a little	Basically agree	Agree	Totally agree
a. My family care about where I will end up	1	2	3	4	5	6
b. My family care about my performance	1	2	3	4	5	6
c. My family care about my emotional state	1	2	3	4	5	6
d. My family respect my decision and opinion	1	2	3	4	5	6
e. My family beat and scold	1	2	3	4	5	6

G. Other

G1. How popular are these activities around your school?

	Very popular	Somewhat popular	Rare	Not sure
a. KTV	1	2	3	4
b. Gambling or illegal lottery	1	2	3	4
c. Job recruitment advertisement	1	2	3	4
d. Teenagers leaving town for work	1	2	3	4
e. Internet bar	1	2	3	4
f. Vocational school advertisement	1	2	3	4

G2. How popular are these activities around your home?

	Very popular	Somewhat popular	Rare	Not sure
a. KTV	1	2	3	4
b. Gambling or illegal lottery	1	2	3	4
c. Job recruitment advertisement	1	2	3	4
d. Teenage leaving town for work	1	2	3	4
e. Internet bar	1	2	3	4
f. Vocational school advertisement	1	2	3	4

G3. Since September 2009, if you receive donations, the total amount has been: _____RMB

G4. Since September 2009, if you receive non-material educational support, how often has this been? _____

G5. Since September 2009, if you have been in the summer Lighthouse Project, how often have you gone? _____

G6. Since September 2009, if you have been in the winter Lighthouse Project, how often have you gone? _____

G7. In the past two years, if you have received services that are similar to Lighthouse and lasted longer than 10 days, how many times has this happened?_____ Please specify the service _____

G8. What was your total score for your last final? _____

G9. Did you participate in Lighthouse in the past summer? ①Yes ②No

End of the questionnaire, THANK YOU!

B2. Questionnaire for Households

Questionnaire for Households

This survey is for research only

We protect your privacy

Dear Parents/Guardian,

Greetings. The data generated from this questionnaire will be used by researchers in economics and education to analyze the determinants of post-compulsory education decisions. We hope to hear about your real opinions and situation because real information can help us conduct accurate analyses. The questionnaire takes approximately 30 minutes. Your support is greatly appreciated!

Haogen Yao, Doctoral Student
Teachers College, Columbia University

Privacy Protection

1. This survey collects information related to the post-compulsory education decision. Please try your best to answer all the questions.
2. Your answers will be analyzed together with answers from thousands of other households, and therefore no one can identify you from our findings.
3. We will strictly protect your privacy. We will never release your questionnaire to individuals or organizations other than the researchers of this project.

Instructions

Please “√” the figure you choose, or write your answer on “_____”. The multiple-choice questions are single-answer unless given specific instruction. We understand that some students might not be able to go home until the weekend, or that both parents could be out at work, and therefore we allow a weekend for answering the questions by parents or the guardian.

H. Students Basic Information

- A1. The student's name: _____
- A2. Class ID: _____
- A3. School name: _____
- A4. Grade: _____
- A5. Class: _____

H. (Birth) Parental Basic Information

- H1. Mother's education: ①no schooling ②elementary unfinished ③elementary ④lower secondary unfinished ⑤lower secondary ⑥upper secondary unfinished ⑦vocational high school ⑧academic high school ⑨college or above
- H2. Mother's occupation: ①local off-farm worker ②migrant worker ③farmer ④cadre ⑤self-employment ⑥unemployed ⑦other _____
- H3. Mother's political status: ①Communist Party member ②Communist Youth League member ③other
- H4. What next mother wants the student to do? ①no need to finish lower secondary ②work after finishing it ③continue to vocational high school ④continue to academic high school ⑤other
- H5. The highest schooling level the mother wants them to get: ①lower secondary ②vocational high ③academic high ④college ⑤graduate education ⑥not sure or whatever
- H6. How many living siblings does the mother have (including herself)? _____
- H7. During the past year, how many months has the mother been home? ____ month
- H8. Last year, mother's post-tax income (wage, welfare, subsidy, cash value of the farm product, investment) was about _____RMB
- H9. Mother's health status: ①healthy ②can ensure normal life and work ③cannot ensure normal life or work ④hard to tell
- H10. Mother's age: a) ____ years old; Mother's age at first marriage: b) ____years old
- H11. Father's education: ①no schooling ②elementary unfinished ③elementary ④lower secondary unfinished ⑤lower secondary ⑥upper secondary unfinished ⑦vocational high school ⑧academic high school ⑨college or above
- H12. Father's occupation: ①local off-farm worker ②migrant worker ③farmer ④cadre ⑤self-employment ⑥unemployed ⑦other_____
- H13. Father's political status: ①Communist Party member ②Communist Youth League member ③other
- H14. What father wants the student to do next?
①no need to finish lower secondary ②work after finishing it ③continue to vocational high school ④continue to academic high school ⑤other
- H15. Based on student's capacity and the household's situation, what is the highest schooling level the father wants them to get? ①lower secondary ②vocational high ③academic high ④college ⑤graduate education ⑥not sure or whatever
- H16. How many living siblings does the father have (including himself)? _____

- H17. During the past year, how many months has the father been at home? _____month
- H18. Last year, father's post-tax income (wage, welfare, subsidy, cash value of the farm product, investment) was about _____RMB
- H19. Father's health status: ①healthy ②can ensure normal life and work ③cannot ensure normal life or work ④hard to tell
- H20. Father's age: a)_____years old; Father's age at first marriage: b)_____years old

I. Household (under the same *Hukou*) information

- I1. How many people under your Hukou? _____
- I2. Last year, the total income of the household was about_____RMB
- I3. Last year, how much was paid for the schooling of all children in the household?_____RMB
- I4. If the household is in urgent need of money, what is the maximum you can get from the local credit association? _____RMB
- I5. If the household is in urgent need of money, how much in total do you think you can get from relatives/friends?_____RMB
- I6. How many types of magazine or newspaper does the household have? _____
- I7. Does the household have books (Yes/No). If so, how many (magazine, newspaper, and textbook excluded)? _____

I8. In the last three month, has any household member (including you) had the problems below?		Number of people	I9. Durable consumer goods		#
a	lasting disease such as hepatitis, trachoma		a	sewing machine	
b	hereditary disease		b	radio	
c	physical disability that can influence work capacity		c	recorder	
d	have problem but not sure what		d	TV	
I10. The house you are living in is ①Mud brick building ②Cement building			e	bicycle	
			f	camera	
			g	watch	
			h	washer	
			i	refrigerator	
			j	fan	
			k	motorcycle	
			l	jewel	
			m	mattress	
			n	table/chair/sofa	
			o	cabinet	
			p	office desk	
			q	case	

	r	desk phone	
	s	cell phone	
	t	VCD or DVD player	
	u	music center	
	v	desktop	
	w	laptop	
	x	internet	
	y	family car. Year_____	
		Price at purchase _____	

J. Other

J1. This questionnaire was mainly completed by ①the student ②sibling ③parent ④grand parent ⑤ other

J2. Do you think you care about

	Totally disagree	Disagree	Agree a little	Basically agree	Agree	Totally agree
a. where the student will end up with	1	2	3	4	5	6
b. their academic performance	1	2	3	4	5	6
c. their emotional status	1	2	3	4	5	6
d. helping with their study	1	2	3	4	5	6
e. chatting and listening to their thoughts	1	2	3	4	5	6

J3. About the student's summer arrangements

	Totally disagree	Disagree	Agree a little	Basically agree	Agree	Totally agree
a. Let them decide; Respect their decision	1	2	3	4	5	6
b. Need them to share the burden of house/farm work	1	2	3	4	5	6
c. let them go (come) to the city to work or live for a while	1	2	3	4	5	6
d. let them participate local activities, such as free summer camp	1	2	3	4	5	6

J4. Given the scenarios below, what is the month after-tax earning the student can get at their 35. Please answer based on your own perception. Do not worry about how accurate they are.

- i. drop out and start farming now _____RMB
- j. dropout and work _____RMB
- k. farming after graduate_____RMB
- l. work locally after graduate_____RMB
- m. work as migrant after graduate_____RMB
- n. work after graduating from academic high_____RMB
- o. work after graduating from vocational high_____RMB
- p. work after graduating from college_____RMB

J5. Given the scenarios below, answer based on your perception

- a. Each year the household needs to spend _____ RMB more to support a student in lower secondary school
- b. Each year the household needs to spend _____ RMB more to support a student in academic high school
- c. Each year the household needs to spend _____ RMB more to support a student in vocational high school
- d. Each year the household needs to spend _____ RMB more to support a student in college

J6. Do you know about policy incentives for vocational education? ①very much ②yes ③a little ④no

J7. How you feel about the local economy? ①bad, no hope ②bad, but getting better ③so so ④good, but getting worse ⑤good ⑥not sure

End of the questionnaire, THANK YOU!

B3. Questionnaire for Homeroom Teachers

Questionnaire for Homeroom Teachers

This survey is for research only

We protect your privacy

Please “√” the figure you choose, or write down your answer on “_____”. The multiple-choice questions are single-answer unless given specific instructions. We will strictly protect your privacy. We will never release your questionnaire to individuals or organizations other than the researchers of this project.

Haogen Yao, Doctoral Student
Teachers College, Columbia University

K. Teacher information

K1. You are the homeroom teacher of grade_____class_____. You are teaching _____, there are _____ students in your class.

K2. Gender: ①Male ②Female

K3. Ethnic: ①Han ②Minority

K4. Age: _____

K5. Educational level: ①high school or below ②non-teacher specialized college ③teacher training college
④non-teacher academic college ⑤normal academic college ⑥master's or above

K6. Political status: ①Communist Party member (including probationary member) ②Communist League member ③Democratic Party member ④general public

K7. You are from: ①the town ②other town in the county ③other city in the county ④Other
Cantonese city ⑤Other province

K8. How many years have you been a fulltime teacher (not include time as a substitute teacher or intern)?

K9. How many years have you been a fulltime teacher in your current school (not including time as a substitute teacher or intern)? _____

K10. How many years have you been a substitute teacher or intern? _____

K11. How many years have you been a substitute teacher or intern in your current school? _____

K12. Do you have a leadership position in your current school? ①Yes ②No

K13. Your monthly basic wage: _____RMB

K14. For the last year, your monthly average bonus/subsidies: _____ RMB

K15. Other income per month (RMB) ①None ②0~200 ③200~500 ④500~1000 ⑤Over 1000

K16. During the past 6 months, have you received payments on time? ①Yes ②No

L. Other

L1. Based on your experience, what is your recommendation for an average student when they are approaching the end of compulsory education? 1 for strongly disagree and 10 for strongly recommend.

- a) Farming ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩
- b) Local job ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩
- c) Migrant job ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩
- d) Academic high ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩
- e) Technical high ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩
- f) Specialized high ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩
- g) middle vocational ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩

Please choose

		totally disagree	disagree	Agree a little	basically agree	agree	totally agree
L2.	You frequently inform students of information related to the above choices during class.	1	2	3	4	5	6
L3.	You frequently inform students of information related to the above choices in private conversation	1	2	3	4	5	6
L4.	Your students will talk to you about this	1	2	3	4	5	6
L5.	You are satisfied with your current job	1	2	3	4	5	6

L6. Please complete the basic information about the Chinese teacher for your class

a. From: ①the town ②other town in the county ③other city in the county ④other Cantonese city ⑤other province

b. Educational level: ①high school or below ②non-teacher specialized college ③teacher training college ④non-teacher academic college ⑤normal academic college ⑥master's or above

c. years as a fulltime teacher (not including time as a substitute teacher or intern): _____

L7. Please complete the basic information for the math teacher for your class

a. From: ①the town ②other town in the county ③other city in the county ④other Cantonese city ⑤ other province

-
- b. Educational level: ①high school or below ②non-teacher specialized college ③teacher training college
④non-teacher academic college ⑤normal academic college ⑥master's or above
- c. years as a fulltime teacher (not including time as a substitute teacher or intern): _____

L8. Please complete the basic information for the English teacher for your class

- a. From: ①the town ②other town in the county ③other city in the county ④other Cantonese city ⑤
other province
- b. Educational level: ①high school or below ②non-teacher specialized college ③teacher training college
④non-teacher academic college ⑤normal academic college ⑥master's or above
- c. years as a fulltime teacher (not including time as a substitute teacher or intern): _____

End of the questionnaire, THANK YOU!

B4. Questionnaire for Principals

Questionnaire for Principals

This survey is for research only

We protect your privacy

Dear Principal,

The data generated from this questionnaire will be used by researchers in economics and education to analyze the determinants of post-compulsory education decisions. We hope to hear about your real opinions and situation because real information can help us conduct accurate analyses. You may ask others to fill this in on your behalf. Your support is greatly appreciated!

Haogen Yao, Doctoral Student
Teachers College, Columbia University

Privacy Protection

1. This survey collects information related to the post-compulsory education decision. The investigators will collect them right after you have finished. Please try your best to answer all the questions.
2. Your answers will be analyzed together with other principals' answers, and therefore no one can tell your identification from our findings.
3. We will strictly protect your privacy. We will never release your questionnaire to individuals or organizations other than the researchers of this project.

Instructions

Please "✓" the figure you choose, or write your answer on "_____". The multiple-choice questions are single-answer unless given specific instructions.

Other than answering the questions, we also ask for information on:

- (1) The mid-term exam scores of all students in Chinese, math, and English
- (2) A list of where the Grade 9 cohort ended up last year
- (3) Student scores in this summer's High School Entrance Exam

M. Basic Information

M1. You are from: ①the town ②other town in the county ③other city in the county ④other Cantonese city ⑤other province

M2. Your educational level: ①high school or below ②non-teacher specialized college ③teacher training college ④non-teacher academic college ⑤normal academic college ⑥master's or above

M3. How many years have you been a fulltime teacher (not including time as a substitute teacher or intern)? _____

M4. How many years have you been a principal? _____

M5. How many years have you been a vice-principal? _____

M6. How many years have you been a principal at your current school? _____

N. Teachers and Students

Item		Number
N1. teachers/staff		
N2. fulltime teachers		
N3. substitute/intern teachers		
Teacher's educational level (equivalent education level counts)	N4. specialized high school	
	N5. specialized college	
	N6. academic college	
	N7. Master's/doctorate	
In recent 2 years, the teachers	N8. transfer out	
	N9. resign	
	N10. transfer in	
	N11. newly allocated	
N12. 2009 newly enrolled students		
N13. 2010 newly enrolled students		
N14. 2011 newly enrolled students		
N15. current Grade 7 students		
N16. current Grade 8 students		
N17. current Grade 9 students		
Graduates last year	N18. total	
	N19. participated the HSEE	
	N20. pass the HSEE cutoff of nearby academic high schools	
	N21. enrolled in academic high schools	
	N22. enrolled in vocational high schools	

O. School Revenue and Expenditure

Revenue related

a. Funds allocated from the government _____RMB

b. From students (school uniform, accommodation, books, etc.) _____RMB

c. Social donations _____RMB

d. Other _____RMB

e. If receiving facilities (e.g. computer, sport facility), please specify

Expenditure related

- f. Funds assigned for teacher salary _____ RMB
- g. Funds assigned for other staff salary _____ RMB
- h. Administrative expenses, including those for public relationship and reception _____ RMB
- i. Funds used as incentives/staff development (bonus, training, welfare, tour) _____ RMB
- j. Funds used as grants and aid for students _____ RMB
- k. Funds for student activities _____ RMB
- l. Investment of fixed assets (facilities, building, car, library, etc.) _____ RMB
- m. Maintenance of fixed assets (facilities, building, car, library, etc.) _____ RMB
- n. Other _____ RMB

P. Other

P1. Does the school offer free lunches or lunch subsidies? ①Yes ②No

P2. If yes for P1, how much per person? _____ RMB

P3. Does the school offer a school bus? ①Yes ②No

P4. Based on your experience, what is your recommendation for the average student when they are approaching the end of compulsory education? 1 for strongly disagree and 10 for strongly recommend.

- | | | | | | | | | | | |
|----------------------|---|---|---|---|---|---|---|---|---|---|
| h) Farming | ① | ② | ③ | ④ | ⑤ | ⑥ | ⑦ | ⑧ | ⑨ | ⑩ |
| i) Local job | ① | ② | ③ | ④ | ⑤ | ⑥ | ⑦ | ⑧ | ⑨ | ⑩ |
| j) Migrant job | ① | ② | ③ | ④ | ⑤ | ⑥ | ⑦ | ⑧ | ⑨ | ⑩ |
| k) Academic high | ① | ② | ③ | ④ | ⑤ | ⑥ | ⑦ | ⑧ | ⑨ | ⑩ |
| l) Technical high | ① | ② | ③ | ④ | ⑤ | ⑥ | ⑦ | ⑧ | ⑨ | ⑩ |
| m) Specialized high | ① | ② | ③ | ④ | ⑤ | ⑥ | ⑦ | ⑧ | ⑨ | ⑩ |
| n) Middle vocational | ① | ② | ③ | ④ | ⑤ | ⑥ | ⑦ | ⑧ | ⑨ | ⑩ |

P5. Please list the four most popular high schools your students go to, including vocational schools

End of the Questionnaire, THANK YOU !

B5. Questionnaire for Volunteers

Volunteers Questionnaire

This questionnaire will be distributed and collected by the leaders of each team in the middle of the Lighthouse summer program, which is in early August. It can be matched with the data from other questionnaires.

v1. Which Lighthouse school are you in?

v2. Gender:

v3. Age:

v4. Where did you live before college (specific to county or district) ?

v5. Which college are you from?

v6. Major:

v7. Grade:

v8. Are you an “old” Lighthouse volunteer?

v9. Did you have similar service experience (last for more than two weeks)?

v10. What is your role in the team?

v11. Did you participate in the first round of team building? ①the whole process ②part ③no

v12. Did you participate in the teaching training? ①the whole process ②part ③no

v13. Did you participate in the second round of team building? ①the whole process ②part ③no

v13. Please give your answers for the statements below. There is no correct or incorrect answer. Please do not spend too much time on a single statement. Please think of your daily life rather than unusual days.

		Totally disagree	Disagree	Agree a little	Basically agree	Agree	Totally agree
a	Team members stay with each other well	1	2	3	4	5	6
b	Team runs efficiently	1	2	3	4	5	6
c	Students are supportive	1	2	3	4	5	6
d	Households are supportive	1	2	3	4	5	6
e	Teachers are supportive	1	2	3	4	5	6
f	Schools and local government are supportive	1	2	3	4	5	6
g	What we are doing is meaningful for students	1	2	3	4	5	6
h	We are the best Lighthouse team this year	1	2	3	4	5	6
i	Teaching training is quite helpful	1	2	3	4	5	6
j	Team building is quite helpful	1	2	3	4	5	6
k	Lighthouse instructional framework is supportive	1	2	3	4	5	6

Appendix C: Delphi Ratings for Figure 4-3 and Figure 4-4

C1. Ratings of Importance and Realization of Possible Lighthouse Impacts (for Figure 4-3)

	Importance		Realization	
	Mean	S.D.	Mean	S.D.
Ability of life planning	7.6	2.3	4.8	2.3
Ambition	8.0	2.1	5.7	2.8
Better learning habits	7.8	2.3	4.7	2.1
Better learning methods	7.8	2.0	5.2	1.7
Clear interest	6.7	2.8	5.1	1.9
Communicative Competence	8.7	1.6	7.1	1.4
Confidence	9.4	1.1	7.8	1.4
Courage	8.2	1.5	7.2	1.7
Creativity and imagination	8.2	1.9	6.8	1.9
Curiosity	7.9	2.0	7.2	1.4
Educational aspiration	7.6	2.2	5.8	2.0
Getting someone to rely on	7.5	2.1	6.9	1.9
Interpersonal relationship	8.2	1.6	7.1	1.2
Management skills	6.3	1.9	5.9	1.7
Practice ability	8.0	1.6	6.6	2.3
Problem solving	8.1	1.7	6.3	1.4
Reproducible pattern of voluntary teaching	7.3	2.5	5.3	3.2
School utilization of social resources	9.3	0.9	5.7	2.2
Scope of knowledge	8.4	1.8	7.5	1.4
Sense of social responsibility	7.9	1.6	5.4	1.8
Student organizational establishment	7.2	2.7	5.1	2.3
Supplement to the formal curriculum	9.1	1.1	6.0	3.0
Support for teachers	9.2	1.3	4.6	2.8
Team spirit	8.4	2.2	7.9	1.9
Thinking capacity	7.9	2.0	5.7	1.9

C2. Ratings of Work Determinants in 2nd and 3rd Rounds (for Figure 4-4)

	2nd round		3rd round	
	Mean	SD	Mean	SD
Agricultural income	7.1	1.5	7.3	1.9
Health status of household member	5.9	2.5	7.2	1.7
Friends' PCED	6.2	2.0	6.9	1.6
Perception of earning by PCED in the community	6.9	2.5	6.6	2.3
Historical PCED distribution in the school	5.9	2.2	6.5	1.9
Mother's migrant status	6.9	2.1	6.4	2.0
Teacher's care for students	5.9	2.5	6.3	2.3
Teacher's attitude towards each PCED	4.8	3.1	6.2	2.5
Cost of high school	7.4	2.1	6.1	2.2
Urban life experience	6.0	2.8	6.0	2.2
Birth order	5.4	2.4	5.9	2.3
Teacher's sense of responsibility	6.1	2.9	5.9	2.2
Connection between curriculum and real life	6.3	2.4	5.9	2.2
Rate of admission to colleges in nearby AHS	5.6	2.3	5.9	1.9
Teacher experience	5.6	2.5	5.9	2.3
Availability of family business for inheriting	6.6	2.7	5.8	2.7
Number of siblings	5.8	2.7	5.7	2.6
Perception of AHS-VHS gap	4.8	3.0	5.6	2.2
Gender	5.6	2.6	5.4	1.8
Governmental investment	5.9	2.4	5.0	2.2
interpersonal relationship in the school	5.4	2.9	4.9	1.9
Rate of admission to colleges in nearby VHS	4.2	2.6	4.8	2.3
Teacher education level	5.3	2.4	4.6	2.1

These are the 23 determinants of relatively large divergence, ranked by the mean ratings in the 3rd round.

Appendix D: Summary Statistics for the Six Lighthouse School Sample

Variable	Obs	Mean	Std. Dev.	Min	Max
female	4462	0.62	0.49	0	1
f_income	4462	0.43	0.49	0	1
f_performance	4462	0.34	0.47	0	1
f_cost	4462	2.10	2.05	0	6
age	4462	0.33	0.47	0	1
minority	4462	0.09	0.28	0	1
single_p	3634	0.07	0.26	0	1
migrant_p	4289	0.54	0.50	0	1
no_p	4277	0.22	0.42	0	1
medu	3530	2.28	1.16	1	6
fedu	3326	3.62	1.39	1	6
peasant	3741	0.33	0.47	0	1
politicalc	4143	1.21	0.55	1	3
parent_leader	3741	0.03	0.17	0	1
parentbadhealth	2857	0.04	0.19	0	1
sibship	4462	3.25	1.55	1	6
witheldersister	4462	0.61	0.49	0	1
eldercohort	4462	0.29	0.46	0	1
mignetwork	4462	0.33	0.47	0	1
peerpedu	4462	2.00	0.43	1	3
tch_origin	4462	1.92	1.10	1	4
tch_edu	4462	0.51	0.50	0	1
tch_admin	4462	0.07	0.25	0	1
tch_exp	4462	2.43	1.15	1	4
tch_mthgain	4462	3.57	1.76	1	6
tch_paydelayed	4462	0.31	0.46	0	1
subtch_origin	4462	3.05	1.10	1	4
subtch_edu	4462	2.65	1.21	1	4
subtch_exp	4462	2.38	1.03	1	4
classsize	4462	2.45	1.01	1	4
distance	4224	3.06	1.71	1	6
survival	4462	0.47	0.50	0	1
school1	4462	0.00	0.00	0	0
school2	4462	0.10	0.30	0	1
school3	4462	0.08	0.27	0	1
school4	4462	0.17	0.37	0	1
school5	4462	0.18	0.38	0	1
school6	4462	0.11	0.31	0	1
school7	4462	0.36	0.48	0	1
school8	4462	0.00	0.00	0	0
wealth	4462	2.05	0.94	1	4
housesize	3727	2.31	1.13	1	4
income	2794	3.45	1.67	1	6
credit_financiali	2059	3.23	1.67	1	6
credit_relative	2375	3.25	1.63	1	6

stu_eduaspiration	3519	3.20	1.33	1	5
expect_norm	3287	0.23	0.42	0	1
expect_advanced	3287	0.36	0.48	0	1
percep_schquality	4379	3.41	1.63	1	6
percep_schaffiliation	4393	3.47	1.70	1	6
percep_schvalue	4368	2.37	1.15	1	4
percep_scheffort	4368	2.14	0.98	1	4
confidence	4442	3.32	1.69	1	6
courage	4439	3.29	1.73	1	6
curiosity	4442	3.01	1.74	1	6
ambition	4432	3.11	1.71	1	6
familyonstudy	4249	2.96	1.48	1	5
familyonemo	4252	3.32	1.73	1	6
tchr_contvsstop	4302	2.85	1.09	1	4
tchr_genvsvoc	4462	1.98	1.26	1	4
sick	3908	0.39	0.49	0	1
sick_class	4408	0.48	0.50	0	1
cost_vocvsjunior	2050	3.51	1.70	1	6
cost_genvsvoc	2039	3.27	1.78	1	6
cost_colvsngen	2018	3.47	1.71	1	6
earn_workvsdrop	2869	3.43	1.68	1	6
earn_vocvswork	2831	3.51	1.69	1	6
earn_genvsvoc	2827	3.36	1.65	1	6
earn_colvsngen	2817	3.31	1.64	1	6
knowvoc	4042	1.63	0.66	1	4
performance	3090	2.52	1.12	1	4
business	3741	0.06	0.23	0	1
interpersonal	4459	3.55	1.69	1	6
urbanlife	3922	0.32	0.47	0	1
outreach_voc	4103	0.13	0.34	0	1
outreach_fac	4126	0.11	0.32	0	1
local_negative	4144	0.08	0.28	0	1
local_entertain	4173	0.07	0.26	0	1
gambling	4296	0.09	0.28	0	1
schatmos	4462	0.56	0.50	0	1
chore	3844	2.23	1.31	1	4
love	4411	0.10	0.30	0	1
grade_7	4462	0.38	0.49	0	1
grade_8	4462	0.34	0.47	0	1
grade_9	4462	0.28	0.45	0	1
extraversion	4459	3.38	1.70	1	6
affiliationneed	4409	2.99	1.54	1	6
atti_chore_farm	4406	3.62	1.28	1	6
other_act	3531	3.06	1.57	1	6
peertreated	4462	3.08	0.83	1	4
attoncamp	3622	2.83	1.65	1	6

Note: The six surveyed Lighthouse schools are QB, QD, HQ, HS, HT and HY.

Appendix E: Output for Multinomial Logit with Multiple Imputations

E1. Main Model (full sample/full variable list)

1: dropout	Coef.	Std. Err	z	P>z	RRR
female	1.11	0.49	2.24	0.03	3.03**
f_income	-0.1	0.36	-0.29	0.78	0.9
f_performance	-0.06	0.41	-0.14	0.89	0.94
f_cost	-0.06	0.14	-0.43	0.68	0.94
age	0.34	0.36	0.94	0.37	1.4
minority	-1.4	2.15	-0.65	0.54	0.25
single_p	-0.94	0.51	-1.85	0.08	0.39*
migrant_p	-0.1	0.34	-0.29	0.77	0.9
no_p	0.13	0.37	0.34	0.74	1.13
medu	-0.11	0.12	-0.9	0.38	0.9
fedu	0.06	0.15	0.38	0.71	1.06
peasant	-0.33	0.35	-0.93	0.37	0.72
politicalc	0.32	0.29	1.11	0.29	1.38
parent_leader	0.48	0.66	0.74	0.47	1.62
parentbadhealth	1.16	0.79	1.47	0.19	3.19
sibship	0.18	0.11	1.64	0.12	1.2
witheldersister	-0.2	0.38	-0.51	0.62	0.82
eldercohort	-0.15	0.37	-0.41	0.69	0.86
mignetwork	-0.09	0.29	-0.3	0.77	0.92
peerpedu	0.65	0.36	1.78	0.08	1.91*
tch_origin	0.1	0.15	0.65	0.52	1.11
tch_edu	0.12	0.35	0.36	0.72	1.13
tch_admin	0	0.61	0	1	1
tch_exp	-0.34	0.17	-2.02	0.06	0.71*
tch_mthgain	0.01	0.12	0.06	0.96	1.01
tch_paydelayed	-0.34	0.34	-1.01	0.33	0.71
subtch_origin	-0.09	0.13	-0.67	0.5	0.92
subtch_edu	-0.02	0.16	-0.1	0.92	0.98
subtch_exp	0.12	0.13	0.9	0.37	1.12
classsize	0.05	0.28	0.18	0.86	1.05
distance	0.18	0.09	2.05	0.06	1.2*
survival	-1.39	1.16	-1.2	0.26	0.25
school1	-0.9	0.63	-1.43	0.16	0.41
school2	-0.76	1.04	-0.73	0.48	0.47
school3	0.35	2.84	0.12	0.91	1.41
school4	-0.95	1.04	-0.91	0.39	0.39
school5	0	(omitted)			
school6	0.28	0.86	0.32	0.75	1.32
school7	1.7	0.96	1.77	0.1	5.5*
school8	0	(omitted)			
wealth	-0.47	0.14	-3.41	0	0.62***
housesize	-0.05	0.12	-0.47	0.64	0.95
income	-0.12	0.13	-0.87	0.41	0.89
credit_financiali	0.05	0.15	0.34	0.75	1.05
credit_relative	0.07	0.13	0.51	0.62	1.07
stu_eduaspiration	-0.77	0.1	-7.73	0	0.46***
expect_norm	0.54	0.29	1.84	0.08	1.72*
expect_advanced	-0.3	0.58	-0.52	0.62	0.74
percep_schquality	-0.02	0.13	-0.16	0.88	0.98
percep_schaffiliation	-0.24	0.1	-2.37	0.03	0.79**
percep_schvalue	-0.25	0.18	-1.41	0.19	0.78
percep_scheffort	-0.17	0.14	-1.17	0.24	0.84

confidence	0.14	0.09	1.47	0.15	1.15
courage	-0.21	0.07	-2.99	0	0.81***
curiosity	-0.14	0.1	-1.45	0.17	0.87
ambition	0.17	0.07	2.34	0.02	1.18**
familyonstudy	-0.18	0.11	-1.66	0.12	0.83
familyonemo	0.08	0.1	0.86	0.41	1.09
tchr_contvsstop	-0.05	0.14	-0.38	0.7	0.95
tchr_genvsvoc	-0.19	0.11	-1.76	0.08	0.82*
sick	-0.58	0.39	-1.48	0.17	0.56
sick_class	0.17	0.26	0.67	0.51	1.19
cost_vocvsjunior	0	0.15	0.01	0.99	1
cost_genvsvoc	-0.08	0.13	-0.63	0.55	0.92
cost_colvsge	-0.05	0.11	-0.51	0.62	0.95
earn_workvsdrop	0.1	0.1	1	0.34	1.11
earn_vocvswork	-0.17	0.13	-1.35	0.21	0.84
earn_genvsvoc	-0.43	0.11	-3.91	0	0.65***
earn_colvsge	-0.4	0.09	-4.33	0	0.67***
knowvoc	0.04	0.23	0.17	0.87	1.04
performance	-0.32	0.19	-1.72	0.11	0.73
business	-0.97	0.83	-1.16	0.26	0.38
interpersonal	0.01	0.09	0.07	0.94	1.01
urbanlife	-0.31	0.31	-1	0.33	0.73
outreach_voc	-0.31	0.38	-0.82	0.41	0.73
outreach_fac	-0.12	0.47	-0.25	0.81	0.89
local_negative	-0.42	0.57	-0.73	0.48	0.66
local_entertain	0.31	0.5	0.62	0.54	1.37
gambling	0.3	0.45	0.66	0.52	1.34
chore	0.14	0.13	1.11	0.3	1.15
love	1.28	0.36	3.56	0	3.59***
grade_7	1.14	0.38	3.01	0	3.11***
grade_8	0.59	0.52	1.13	0.27	1.8
grade_9	0	(omitted)			

2: work	Coef.	Std. Err	z	P>z	RRR
female	0.66	0.29	2.25	0.03	1.93**
f_income	0.05	0.2	0.23	0.82	1.05
f_performance	0.08	0.2	0.39	0.7	1.08
f_cost	-0.07	0.08	-0.9	0.39	0.93
age	0.28	0.13	2.19	0.03	1.32**
minority	0.02	0.81	0.03	0.98	1.02
single_p	-0.25	0.22	-1.12	0.27	0.78
migrant_p	-0.03	0.15	-0.18	0.86	0.97
no_p	0.04	0.22	0.19	0.86	1.04
medu	-0.08	0.05	-1.4	0.17	0.93
fedu	-0.09	0.05	-1.89	0.07	0.91*
peasant	-0.15	0.13	-1.12	0.27	0.86
politicalc	-0.01	0.13	-0.07	0.95	0.99
parent_leader	-0.07	0.37	-0.2	0.85	0.93
parentbadhealth	0.13	0.29	0.44	0.67	1.13
sibship	0.15	0.05	2.97	0.01	1.16***
witheldersister	-0.25	0.15	-1.71	0.09	0.78*
eldercohort	0	0.14	0.02	0.98	1
mignetwork	-0.15	0.12	-1.27	0.21	0.86
peerpedu	0.43	0.16	2.66	0.01	1.53***
tch_origin	-0.12	0.07	-1.84	0.07	0.88*
tch_edu	0.35	0.17	2.11	0.04	1.42**
tch_admin	-0.05	0.27	-0.19	0.85	0.95
tch_exp	-0.16	0.07	-2.42	0.02	0.85**
tch_mthgain	0.05	0.04	1.33	0.18	1.05

tch_paydelayed	0.09	0.16	0.59	0.57	1.1
subtch_origin	0.08	0.06	1.23	0.22	1.08
subtch_edu	-0.07	0.07	-0.98	0.33	0.93
subtch_exp	-0.07	0.07	-0.91	0.37	0.94
classsize	0.07	0.09	0.79	0.43	1.07
distance	0.03	0.04	0.67	0.51	1.03
survival	-0.53	0.35	-1.51	0.13	0.59
school1	-0.56	0.32	-1.76	0.09	0.57*
school2	-1.52	0.37	-4.06	0	0.22***
school3	-0.01	0.86	-0.01	0.99	0.99
school4	-0.27	0.3	-0.91	0.37	0.76
school5	0	(omitted)			
school6	0.12	0.33	0.36	0.72	1.13
school7	0.08	0.31	0.25	0.81	1.08
school8	0	(omitted)			
wealth	-0.19	0.07	-2.71	0.01	0.83***
housesize	0.01	0.07	0.13	0.9	1.01
income	-0.12	0.06	-2.17	0.05	0.88*
credit_financiali	0.07	0.04	1.57	0.12	1.07
credit_relative	-0.03	0.05	-0.55	0.59	0.97
stu_eduaspiration	-0.93	0.06	-15.58	0	0.39***
expect_norm	0.41	0.13	3.11	0	1.51***
expect_advanced	-0.49	0.12	-3.98	0	0.62***
percep_schquality	0.05	0.04	1.17	0.25	1.05
percep_schaffiliation	-0.13	0.04	-2.96	0	0.88***
percep_schvalue	0.01	0.06	0.15	0.88	1.01
percep_scheffort	-0.15	0.08	-1.98	0.06	0.86*
confidence	0.01	0.04	0.32	0.75	1.01
courage	-0.05	0.04	-1.45	0.15	0.95
curiosity	-0.04	0.03	-1.28	0.2	0.96
ambition	0.1	0.04	2.25	0.03	1.1**
familyonstudy	-0.12	0.05	-2.57	0.01	0.89**
familyonemo	-0.04	0.05	-0.94	0.36	0.96
tchr_contvsstop	-0.11	0.07	-1.56	0.12	0.9
tchr_genvsvoc	-0.17	0.06	-2.83	0.01	0.85***
sick	-0.34	0.13	-2.73	0.01	0.71***
sick_class	0.14	0.11	1.25	0.21	1.15
cost_vocvsjunior	0.03	0.06	0.48	0.64	1.03
cost_genvsvoc	-0.14	0.07	-2	0.08	0.87*
cost_colvsge	-0.11	0.08	-1.34	0.22	0.9
earn_workvsdrop	0.05	0.05	1.09	0.3	1.05
earn_vocvswork	-0.01	0.04	-0.22	0.83	0.99
earn_genvsvoc	-0.2	0.05	-3.69	0	0.82***
earn_colvsge	-0.18	0.04	-4.09	0	0.84***
knowvoc	0.16	0.1	1.55	0.14	1.18
performance	-0.39	0.06	-6.09	0	0.68***
business	-0.65	0.36	-1.81	0.09	0.52*
interpersonal	-0.07	0.04	-1.81	0.07	0.94*
urbanlife	-0.32	0.12	-2.56	0.01	0.73**
outreach_voc	-0.01	0.18	-0.06	0.95	0.99
outreach_fac	0.3	0.19	1.6	0.11	1.35
local_negative	0.39	0.21	1.86	0.07	1.47*
local_entertain	0.04	0.23	0.17	0.86	1.04
gambling	-0.09	0.26	-0.35	0.73	0.91
chore	0.15	0.04	3.59	0	1.16***
love	0.54	0.2	2.73	0.01	1.71***
grade_7	0.62	0.18	3.51	0	1.85***
grade_8	0.52	0.18	2.87	0.01	1.68***
grade_9	0	(omitted)			

3: VHS	Coef.	Std. Err	z	P>z	RRR
female	0.61	0.24	2.56	0.01	1.85**
f_income	0.08	0.15	0.56	0.58	1.08
f_performance	0.19	0.15	1.28	0.2	1.21
f_cost	-0.05	0.05	-1.13	0.26	0.95
age	0.06	0.09	0.69	0.49	1.07
minority	-0.64	0.68	-0.93	0.36	0.53
single_p	-0.32	0.17	-1.82	0.07	0.73*
migrant_p	0.03	0.1	0.26	0.79	1.03
no_p	-0.13	0.14	-0.94	0.36	0.88
medu	0.01	0.04	0.18	0.86	1.01
fedu	0.01	0.03	0.2	0.84	1.01
peasant	-0.07	0.11	-0.62	0.54	0.93
politicalc	0.06	0.09	0.74	0.47	1.06
parent_leader	-0.3	0.27	-1.11	0.28	0.74
parentbadhealth	0.15	0.21	0.72	0.48	1.17
sibship	0.08	0.04	2.11	0.04	1.09**
witheldersister	-0.03	0.12	-0.28	0.78	0.97
eldercohort	0.1	0.1	0.94	0.35	1.1
mignetwork	-0.05	0.09	-0.59	0.55	0.95
peerpedu	0.2	0.12	1.72	0.09	1.22*
tch_origin	0	0.06	0	1	1
tch_edu	0.28	0.12	2.33	0.02	1.32**
tch_admin	-0.03	0.2	-0.16	0.87	0.97
tch_exp	-0.14	0.05	-3	0	0.87***
tch_mthgain	0.06	0.03	1.9	0.06	1.06*
tch_paydelayed	0.02	0.1	0.21	0.83	1.02
subtch_origin	0.02	0.05	0.35	0.72	1.02
subtch_edu	-0.05	0.06	-0.99	0.32	0.95
subtch_exp	0.03	0.05	0.56	0.58	1.03
classsize	0.01	0.06	0.18	0.86	1.01
distance	0.02	0.03	0.7	0.48	1.02
survival	-0.87	0.27	-3.26	0	0.42***
school1	-0.91	0.23	-3.91	0	0.4***
school2	-1.46	0.29	-5.08	0	0.23***
school3	-0.57	0.77	-0.74	0.46	0.57
school4	-0.56	0.23	-2.41	0.02	0.57**
school5	0	(omitted)			
school6	0.04	0.23	0.19	0.85	1.04
school7	0.52	0.23	2.28	0.02	1.67**
school8	0	(omitted)			
wealth	-0.04	0.05	-0.79	0.44	0.96
housesize	-0.06	0.05	-1.26	0.21	0.94
income	-0.11	0.03	-3.6	0	0.89***
credit_financiali	0.03	0.05	0.74	0.48	1.03
credit_relative	-0.04	0.04	-1.16	0.25	0.96
stu_eduaspiration	-0.29	0.04	-7.21	0	0.75***
expect_norm	-0.01	0.1	-0.11	0.91	0.99
expect_advanced	0.02	0.11	0.22	0.83	1.02
percep_schquality	0.04	0.03	1.28	0.2	1.04
percep_schaffiliation	-0.04	0.03	-1.3	0.2	0.96
percep_schvalue	0.1	0.04	2.41	0.02	1.11**
percep_scheffort	-0.08	0.05	-1.48	0.14	0.92
confidence	0.07	0.03	2.39	0.02	1.08**
courage	-0.08	0.03	-2.95	0	0.93***
curiosity	-0.06	0.03	-2.3	0.02	0.94**
ambition	0.06	0.03	2.32	0.02	1.07**
familyonstudy	-0.02	0.04	-0.58	0.56	0.98

familyonemo	-0.01	0.04	-0.38	0.71	0.99
tchr_contvsstop	0.02	0.06	0.27	0.79	1.02
tchr_genvsvoc	-0.15	0.04	-3.37	0	0.86***
sick	-0.04	0.1	-0.44	0.66	0.96
sick_class	0.02	0.09	0.27	0.79	1.02
cost_vocvsjunior	0	0.05	-0.03	0.97	1
cost_genvsvoc	-0.16	0.04	-3.88	0	0.86***
cost_colvsngen	-0.04	0.04	-0.99	0.33	0.96
earn_workvsdrop	0.05	0.04	1.48	0.16	1.05
earn_vocvswork	-0.04	0.03	-1.23	0.23	0.96
earn_genvsvoc	-0.28	0.04	-7.79	0	0.76***
earn_colvsngen	-0.14	0.03	-4.8	0	0.87***
knowvoc	0.25	0.08	3.18	0	1.28***
performance	-0.17	0.05	-3.41	0	0.84***
business	-0.08	0.18	-0.43	0.67	0.93
interpersonal	0.05	0.03	1.7	0.09	1.05*
urbanlife	-0.1	0.1	-1.09	0.28	0.9
outreach_voc	-0.04	0.15	-0.24	0.81	0.96
outreach_fac	0.16	0.15	1.11	0.27	1.18
local_negative	0.29	0.18	1.62	0.11	1.34
local_entertain	0.37	0.18	2.05	0.04	1.44**
gambling	0.04	0.16	0.28	0.78	1.05
chore	0.04	0.03	1.15	0.25	1.04
love	0.17	0.16	1.04	0.3	1.18
grade_7	0.34	0.14	2.42	0.02	1.41**
grade_8	0.5	0.14	3.69	0	1.65***
grade_9	0	(omitted)			

5: undecided	Coef.	Std. Err	z	P>z	RRR
female	0.75	0.26	2.93	0.01	2.12***
f_income	0.08	0.17	0.49	0.63	1.08
f_performance	0.06	0.17	0.35	0.73	1.06
f_cost	-0.1	0.05	-1.84	0.07	0.91*
age	0.21	0.11	1.98	0.05	1.24**
minority	0.42	0.6	0.7	0.49	1.52
single_p	-0.42	0.18	-2.32	0.02	0.66**
migrant_p	-0.34	0.11	-3.01	0	0.71***
no_p	-0.43	0.14	-3.14	0	0.65***
medu	-0.07	0.05	-1.51	0.14	0.93
fedu	-0.02	0.04	-0.48	0.63	0.98
peasant	-0.09	0.12	-0.73	0.47	0.92
politicalc	-0.07	0.1	-0.71	0.48	0.93
parent_leader	0.08	0.29	0.27	0.79	1.08
parentbadhealth	-0.11	0.3	-0.37	0.71	0.89
sibship	0.07	0.04	1.64	0.1	1.07
withheldersister	-0.04	0.12	-0.36	0.72	0.96
eldercohort	0.2	0.11	1.71	0.09	1.22*
mignetwork	-0.19	0.11	-1.77	0.08	0.83*
peerpedu	0.42	0.15	2.76	0.01	1.51***
tch_origin	0	0.06	-0.03	0.98	1
tch_edu	0.14	0.13	1.06	0.29	1.15
tch_admin	0.27	0.22	1.23	0.22	1.31
tch_exp	-0.12	0.05	-2.21	0.03	0.89**
tch_mthgain	0.07	0.03	1.94	0.05	1.07*
tch_paydelayed	0.14	0.11	1.29	0.2	1.15
subtch_origin	0.13	0.06	2.16	0.03	1.14**
subtch_edu	0.01	0.06	0.12	0.91	1.01
subtch_exp	0.04	0.06	0.74	0.46	1.04
classsize	-0.05	0.08	-0.68	0.5	0.95

distance	-0.01	0.03	-0.15	0.88	0.99
survival	-1	0.3	-3.3	0	0.37***
school1	-0.91	0.25	-3.69	0	0.4***
school2	-0.59	0.33	-1.76	0.09	0.56*
school3	-1.6	0.66	-2.42	0.02	0.2**
school4	-0.45	0.27	-1.64	0.11	0.64
school5	0	(omitted)			
school6	0.57	0.27	2.13	0.04	1.77**
school7	0.73	0.27	2.74	0.01	2.07***
school8	0	(omitted)			
wealth	-0.16	0.06	-2.88	0.01	0.85***
housesize	0.02	0.06	0.25	0.8	1.02
income	-0.12	0.05	-2.68	0.02	0.88**
credit_financiali	0.08	0.06	1.34	0.22	1.08
credit_relative	-0.03	0.05	-0.73	0.48	0.97
stu_eduaspiration	-0.42	0.05	-7.86	0	0.66***
expect_norm	0.26	0.12	2.23	0.03	1.3**
expect_advanced	-0.26	0.13	-1.95	0.07	0.77*
percep_schquality	0.04	0.04	1.11	0.28	1.05
percep_schaffiliation	-0.1	0.04	-2.65	0.01	0.91***
percep_schvalue	-0.04	0.05	-0.81	0.42	0.96
percep_scheffort	-0.12	0.05	-2.27	0.02	0.88**
confidence	0.05	0.03	1.36	0.17	1.05
courage	-0.1	0.03	-3.19	0	0.91***
curiosity	-0.08	0.03	-2.98	0	0.92***
ambition	0.01	0.03	0.34	0.74	1.01
familyonstudy	-0.11	0.04	-2.76	0.01	0.9***
familyonemo	0.01	0.04	0.25	0.81	1.01
tchr_contvsstop	0.03	0.07	0.39	0.7	1.03
tchr_genvsvoc	-0.19	0.05	-4.12	0	0.83***
sick	-0.14	0.11	-1.29	0.2	0.87
sick_class	0.04	0.1	0.44	0.66	1.04
cost_vocvsjunior	0.04	0.04	0.85	0.41	1.04
cost_genvsvoc	-0.05	0.05	-0.95	0.36	0.95
cost_colvsgen	-0.05	0.04	-1.42	0.16	0.95
earn_workvsdrop	0.09	0.03	2.74	0.01	1.1**
earn_vocvswork	-0.1	0.05	-2.08	0.06	0.91*
earn_genvsvoc	-0.24	0.04	-6.37	0	0.79***
earn_colvsgen	-0.16	0.03	-4.75	0	0.85***
knowvoc	-0.1	0.09	-1.15	0.26	0.9
performance	-0.34	0.06	-5.91	0	0.71***
business	-0.33	0.21	-1.55	0.12	0.72
interpersonal	0.02	0.03	0.51	0.61	1.02
urbanlife	-0.26	0.12	-2.21	0.03	0.77**
outreach_voc	-0.09	0.16	-0.57	0.57	0.91
outreach_fac	0.27	0.16	1.64	0.1	1.3
local_negative	0.06	0.17	0.34	0.73	1.06
local_entertain	0.09	0.2	0.46	0.65	1.09
gambling	0.12	0.17	0.72	0.48	1.13
chore	0.01	0.04	0.31	0.75	1.01
love	0.44	0.17	2.57	0.01	1.56**
grade_7	0.55	0.15	3.65	0	1.73***
grade_8	0.74	0.17	4.48	0	2.1***
grade_9	0	(omitted)			

Note: N=6298. Option AHS is the base outcome. * p<0.1, ** p<0.05, *** p<0.01.

E2. Regression by Group (RRR reported)

1: Dropout	Gender		Wealth		Test Performance	
	Female	Male	Richer	Poorer	Higher	Lower
female			25.19*	2.31	1.73	2.86
f_income			0.37	1.05	1.19	1.1
f_performance			0.53	1.04		
f_cost			1.02	0.94	1.05	0.92
age	1.39	1.53	1.57	1.37	1.31	1.63
minority	0.24	0.17	0	0.36	0.79	0.16
single_p	0.4	0.33	0.01	0.42	0.79	0.16**
migrant_p	0.99	0.86	0.61	1	0.56	1.01
no_p	1.35	0.86	0.77	1.39	0.79	1.23
medu	0.8	1.01	0.87	0.9	0.86	0.95
fedu	1.1	1.04	1.09	1.07	1.05	1.02
peasant	0.68	0.7	0.83	0.69	0.62	0.8
politicalc	1.46	1.5	2.06	1.44	1.93	1.05
parent_leader	1.15	2.7	6.72	1.33	1.85	1.4
parentbadhealth	3	4.6	0.96	4.47	2.62	3.82
sibship	1.15	1.28	1.08	1.22	1.14	1.23
witheldersister	0.94	0.69	0.26	0.99	0.52	1.22
eldercohort	0.98	0.61	0.34	1.04	0.56	1.2
mignetwork	0.88	0.93	0.62	1.01	0.91	1.11
peerpedu	2.26	1.69	0.67	2.17**	1.92	2.45
tch_origin	1.21	1.06	0.89	1.12	0.89	1.17
tch_edu	1.39	0.67	3.65	1.08	2.51	0.78
tch_admin	1.17	0.52	0.11	1.42	1.73	0.26
tch_exp	0.67*	0.74	0.51	0.73	0.7	0.65*
tch_mthgain	0.99	1.03	0.89	0.98	1.01	1.08
tch_paydelayed	0.71	0.62	1.14	0.57	0.51	0.83
subtch_origin	0.86	0.84	0.82	0.91	1	0.86
subtch_edu	0.95	1.08	0.69	1	0.95	1.03
subtch_exp	1.37*	0.87	1.75	1.04	1.21	1.08
classsize	1.14	0.87	0.47	1.23	1.45	0.9
distance	1.24**	1.23	1.51*	1.18	1.1	1.25**
survival	0.18	0.25	0.01	0.41	0.44	0.1
school1	0.26	0.48	0.13	0.49	0.45	0.2
school2	0.22	0.97	0.06	0.83	0.11	0.81
school3	1.41	1.73	4.5E+08	1.81	0.3	1.32
school4	0.51	0.18	0.04	0.52	0.8	0.16
school5						
school6	1.28	1.31	0	1.54	0.28	2.6
school7	10.98	3.2	29.11	4.5	2.05	13.17
school8						
wealth	0.69**	0.52***			0.51***	0.65*
housesize	0.97	0.86	0.81	0.96	1	0.91
income	0.82	0.99	1	0.86	0.81	0.9
credit_financiali	1.1	0.96	0.67	1.14	1.08	1.03
credit_relative	1.1	1.05	1.64	1.01	1.13	1.08
stu_eduaspiration	0.45***	0.44***	0.3***	0.46***	0.44***	0.46***
expect_norm	1.8	1.78	1.87	1.63	2.06	1.4
expect_advanced	0.72	0.82	0.67	0.68	0.56	0.68
percep_schquality	0.99	0.95	0.71	1.01	1.08	0.9
percep_schaffiliation	0.79*	0.75	0.9	0.73*	0.75	0.77**
percep_schvalue	0.82	0.65	0.88	0.75	0.68	0.84
percep_scheffort	0.85	0.9	0.93	0.79	0.95	0.75
confidence	1.19	1.09	1.59	1.09	1.22	1.1
courage	0.82**	0.76**	0.74	0.82**	0.81	0.81*
curiosity	0.87	0.84	0.87	0.85	0.79	0.9
ambition	1.2**	1.18	1.01	1.21**	1.28	1.15
familyonstudy	0.83	0.82	0.85	0.89	0.88	0.81

familyonemo	1.05	1.26	1.13	1.05	1.08	1.18
tchr_contvsstop	0.97	0.99	1.3	0.92	0.67	1.06
tchr_genvsvoc	0.83	0.77	0.81	0.8*	0.98	0.69**
sick	0.65	0.41	0.47	0.56	0.72	0.53
sick_class	1.16	1.14	3.61	1.01	1.3	1
cost_vocvsjunior	1.02	0.95	1.04	1	1.06	0.92
cost_genvsvoc	0.93	0.86	1.19	0.89	0.99	0.88
cost_colvsge	0.97	0.87	1.32	0.91	0.99	0.93
earn_workvsdrop	1.13	1.03	1.04	1.14	1.05	1.14
earn_vocvswork	0.78*	0.94	0.69	0.83	0.81	0.87
earn_genvsvoc	0.66***	0.6**	0.5***	0.65***	0.63**	0.67***
earn_colvsge	0.65***	0.65**	0.6**	0.67***	0.71**	0.62***
knowvoc	0.87	1.24	1.42	1.01	1.49	0.89
performance	0.74	0.67*	0.85	0.71		
business	0.29	0.5	2	0	0.46	0.34
interpersonal	1	0.97	0.89	1.01	0.91	1.08
urbanlife	0.72	0.73	0.37	0.79	0.78	0.73
outreach_voc	0.93	0.48	1.03	0.79	0.17	1.34
outreach_fac	0.96	0.67	1.95	0.68	0.86	0.62
local_negative	0.69	0.57	0.58	0.51	0	0.94
local_entertain	0.79	2.31	0.64	1.43	1.11	1.52
gambling	1.4	1.22	1.65	1.37	1.21	1.31
chore	1.2	1.08	1.39	1.13	1.5**	0.98
love	3.26*	4.52**	8.49	3.91**	3.52**	5.36**
grade_7	3.94**	2.15	29.95	2.88**	4.2**	2.34
grade_8	2.02	1.49	9.52	1.62	1.02	2.28
grade_9						

	Gender		Wealth		Test Performance	
2: Work	Female	Male	Richer	Poorer	Higher	Lower
female			2.16	1.79	3.44***	0.98
f_income			1.06	1.05	0.83	1.49
f_performance			1.12	1.02		
f_cost			0.86	0.98	0.88	1.03
age	1.4*	1.17	1.48*	1.24	1.22	1.49**
minority	1.26	0.82	0.57	1.1	1.1	0.71
single_p	0.82	0.73	1.02	0.73	0.76	0.67
migrant_p	0.99	0.95	0.91	0.98	1.05	0.92
no_p	1.01	1.05	0.87	1.22	1.13	0.98
medu	0.92	0.92	0.95	0.92	0.84**	1.01
fedu	0.94	0.88	0.87*	0.93	0.93	0.87*
peasant	0.81	1	0.8	0.86	0.96	0.83
politicalc	1.11	0.84	0.86	1.1	1.01	0.87
parent_leader	0.87	0.98	0.39	1.39	1.12	0.87
parentbadhealth	1.33	0.88	0.75	1.36	1.05	1.3
sibship	1.2***	1.12	1.15*	1.17**	1.16**	1.17**
witheldersister	0.67**	0.99	0.85	0.74	0.57***	1.11
eldercohort	0.93	1.16	0.88	1.07	0.82	1.39
mignetwork	0.8	1.01	0.91	0.85	0.79	1.11
peerpedu	1.69**	1.27	0.98	1.76***	1.41	1.6*
tch_origin	0.95	0.81	1.01	0.82**	0.91	0.82**
tch_edu	1.71**	1.02	1.37	1.54*	1.47*	1.63*
tch_admin	1.06	0.73	0.64	1.32	0.63	0.79
tch_exp	0.8**	0.9	0.88	0.83**	0.92	0.79**
tch_mthgain	1.04	1.11*	1.04	1.05	0.93	1.2***
tch_paydelayed	1.24	0.88	1.04	1.14	0.95	1.24
subtch_origin	1.05	1.09	1.07	1.07	1.08	1.09
subtch_edu	0.89	1.03	0.84	0.99	0.92	0.86
subtch_exp	1.07	0.8*	1.14	0.85*	1.04	0.89
classsize	1.08	1.05	0.96	1.16	1.07	1.03
distance	1.07	0.98	1.04	1.02	0.99	1.03

survival	0.43*	0.72	0.71	0.59	0.99	0.25**
school1	0.45*	0.7	1.01	0.44**	0.85	0.33***
school2	0.23**	0.14***	0.07***	0.32***	0.15***	0.24***
school3	1.1	0.66	1.86	1.18	0.83	0.89
school4	0.79	0.62	0.8	0.75	0.84	0.56
school5						
school6	1.1	1.09	1.11	1.17	0.71	2
school7	1.89	0.56	1.31	0.9	0.77	1.8
school8						
wealth	0.81**	0.86			0.84*	0.81**
housesize	1.04	0.97	1.02	1	1.05	0.94
income	0.87***	0.89	0.92	0.86	0.89	0.87*
credit_financiali	1.07	1.05	1.06	1.07	1.08	1.04
credit_relative	0.96	0.99	0.9	1.01	0.98	0.99
stu_eduaspiration	0.41***	0.36***	0.38***	0.39***	0.38***	0.39***
expect_norm	1.48**	1.57**	1.42*	1.59	1.63***	1.31
expect_advanced	0.73*	0.49***	0.76	0.53***	0.7*	0.52***
percep_schquality	1.07	1.04	1.01	1.07	1.07	1.04
percep_schaffiliation	0.87**	0.89*	0.91	0.85***	0.86**	0.89*
percep_schvalue	1.02	1.02	0.99	1.04	0.99	1.03
percep_scheffort	0.92	0.75**	0.89	0.82**	0.85	0.81**
confidence	0.94	1.12	0.97	1.02	1.02	0.97
courage	1	0.89**	0.92	0.97	0.93	0.98
curiosity	0.93	0.99	0.97	0.96	0.97	0.96
ambition	1.07	1.16*	1.14*	1.09*	1.14**	1.11*
familyonstudy	0.89*	0.87*	0.81**	0.92	0.92	0.87**
familyonemo	0.96	0.95	0.99	0.94	0.92	1.02
tchr_contvsstop	0.88	0.92	0.9	0.91	1	0.83*
tchr_genvsvoc	0.84**	0.81**	0.81**	0.84**	0.9	0.79**
sick	0.72**	0.66*	0.61**	0.74*	0.62**	0.77
sick_class	1.02	1.36	1.14	1.21	1.36	0.95
cost_vocvsjunior	1.04	0.97	1.06	1.03	1.05	0.98
cost_genvsvoc	0.89*	0.8**	0.88	0.86	0.88	0.84*
cost_colvsge	0.88	0.88	0.88	0.9	0.9	0.88
earn_workvsdrop	1.05	1.05	1.04	1.06	1.05	1.05
earn_vocvswork	0.93	1.09	0.98	0.99	0.98	1.02
earn_genvsvoc	0.8**	0.85*	0.77***	0.84**	0.81***	0.85**
earn_colvsge	0.82***	0.85**	0.79***	0.85***	0.87**	0.81***
knowvoc	1.1	1.3*	1.01	1.27*	1.1	1.26*
performance	0.69***	0.67***	0.69***	0.68***		
business	0.44*	0.64	0.52	0.48	0.32**	0.71
interpersonal	0.93	0.93	0.88*	0.96	0.9*	0.97
urbanlife	0.73**	0.72*	0.8	0.69**	0.64***	0.82
outreach_voc	0.96	1.06	0.76	1.22	0.82	1.26
outreach_fac	1.42	1.08	1.36	1.25	1.78*	0.86
local_negative	1.67	1.33	2.18**	1.2	1.28	1.89*
local_entertain	0.98	1.08	0.97	1	0.87	1.16
gambling	0.62	1.04	0.92	0.91	0.92	0.85
chore	1.22***	1.06	1.21**	1.14**	1.32***	1.03
love	1.26	2.08***	1.51	1.94**	1.76**	1.9**
grade_7	1.63**	1.98**	1.59	2.06***	2.47***	1.78*
grade_8	1.42	2.03**	1.39	1.83***	1.52*	2.07**
grade_9						

3: VHS	Gender		Wealth		Test Performance	
	Female	Male	Richer	Poorer	Higher	Lower
female			2.84***	1.44	3.19***	1.03
f_income			1.23	1.05	0.94	1.47
f_performance			0.96	1.35		
f_cost			0.86**	1.01	0.9*	1.06
age	1.1	1	1.2	0.99	1.13	1.05

minority	0.64	0.24	1.31	0.37	1.06	0.23
single_p	0.75	0.63	0.72	0.72	0.81	0.59*
migrant_p	1.06	0.99	0.99	1.02	1.08	0.97
no_p	0.93	0.76	0.69*	1.04	0.94	0.83
medu	1	1.02	1.01	1.01	1	1.04
fedu	1.07	0.92	1.02	1	1.02	0.98
peasant	0.9	1.03	1.04	0.84	0.93	0.94
politicalc	1.09	1.06	0.96	1.2	1.04	1.02
parent_leader	0.78	0.68	0.63	0.88	0.78	0.66
parentbadhealth	1.1	1.4	0.93	1.32	1.18	1.24
sibship	1.11**	1.06	1.09	1.08	1.04	1.13**
witheldersister	0.86	1.16	1.02	0.95	0.91	1.11
eldercohort	1	1.35*	1.03	1.17	0.95	1.49**
mignetwork	0.89	1.04	0.98	0.95	0.89	1.15
peerpedu	1.26	1.28	1.13	1.24	1.13	1.22
tch_origin	1.05	0.95	1.06	0.96	1.03	0.94
tch_edu	1.5***	0.98	1.4*	1.35**	1.19	1.57**
tch_admin	1.25	0.49**	0.8	1.16	1.26	0.56*
tch_exp	0.87**	0.8**	0.89	0.86**	0.84***	0.91
tch_mthgain	1.05	1.13**	1.1*	1.03	1.02	1.13**
tch_paydelayed	1.19	0.77	1.04	1	0.99	1.1
subtch_origin	0.97	1.06	1.11	0.96	1.09	0.96
subtch_edu	0.92	0.98	0.84*	1.02	0.97	0.89
subtch_exp	1.09	0.98	1.03	1.02	1.03	1.05
classsize	1.03	0.91	1.01	1.02	1.03	0.96
distance	1.02	1.02	1.02	1.02	1.02	0.99
survival	0.45**	0.19***	0.51	0.39***	0.51*	0.25***
school1	0.4***	0.31***	0.58	0.3***	0.5*	0.28***
school2	0.25***	0.13***	0.11***	0.27***	0.2***	0.23***
school3	0.56	0.67	0.21	0.74	0.3	0.67
school4	0.65	0.37***	0.59	0.57*	0.64	0.37**
school5						
school6	0.8	1.67	0.76	1.35	0.97	1.39
school7	1.97**	2.46**	1.34	1.8*	1.44	2.03*
school8						
wealth	0.95	0.97			0.94	0.97
housesize	0.92	0.97	0.97	0.93	0.98	0.87
income	0.9***	0.89***	0.91	0.88**	0.9**	0.88**
credit_financiali	1.03	1.04	1.04	1.03	1.04	1.02
credit_relative	0.96	0.96	0.94	0.98	0.94	0.99
stu_eduaspiration	0.74***	0.76***	0.79***	0.72***	0.72***	0.77***
expect_norm	0.96	1.09	1.14	0.91	1.02	0.89
expect_advanced	1.03	1.1	1.22	0.92	1.16	0.86
percep_schquality	1.04	1.05	1.08	1.03	1.05	1.03
percep_schaffiliation	0.93	1	0.99	0.94	0.95	0.98
percep_schvalue	1.11*	1.12	1	1.2***	1.14**	1.09
percep_scheffort	1	0.79***	1	0.87**	0.91	0.9
confidence	1.04	1.13**	1.13**	1.04	1.16***	0.96
courage	0.93*	0.91**	0.89***	0.94	0.9***	0.97
curiosity	0.93**	0.97	0.93*	0.95	0.93**	0.96
ambition	1.08**	1.05	1.03	1.09**	1.03	1.13***
familyonstudy	0.97	0.98	0.93	1.01	0.98	0.99
familyonemo	1	0.97	0.98	0.99	0.95	1.05
tchr_contvsstop	0.98	1.07	1.07	0.98	1.03	1
tchr_genvsvoc	0.87**	0.81***	0.95	0.8***	0.91	0.79***
sick	1	0.92	0.94	0.97	0.9	1
sick_class	0.95	1.14	0.99	1.05	1.09	0.92
cost_vocvsjunior	0.98	0.99	1	1	1.02	0.93
cost_genvsvoc	0.85***	0.82**	0.87***	0.84***	0.86***	0.82**
cost_colvsngen	0.98	0.9**	0.96	0.96	0.98	0.93

earn_workvsdrop	1.05	1.07	1.03	1.07	1.04	1.07
earn_vocsvwork	0.93**	1.02	0.97	0.95	0.93*	0.99
earn_genvsvoc	0.76***	0.75***	0.73***	0.77***	0.75***	0.77***
earn_colvsge	0.87***	0.87***	0.87***	0.87***	0.9**	0.85***
knowvoc	1.32***	1.24	1.17	1.33***	1.27**	1.3**
performance	0.9*	0.81***	0.86*	0.83***		
business	0.72	1.32	1.17	0.74	0.88	0.97
interpersonal	1.03	1.09*	1.04	1.06	1.01	1.11**
urbanlife	0.91	0.93	0.84	0.93	0.84	1.02
outreach_voc	0.93	1.05	0.77	1.18	0.83	1.21
outreach_fac	1.15	1.14	1.25	1.06	1.66**	0.71
local_negative	1.46	1.31	1.54	1.22	1.11	1.82*
local_entertain	1.46	1.39	1.74**	1.24	1.42	1.47
gambling	0.62	1.3	1.03	1.1	1.11	0.91
chore	1.05	1.03	1.04	1.04	1.07*	1
love	0.88	1.51*	1.14	1.22	1.12	1.35
grade_7	1.41**	1.44*	1.22	1.53**	1.78***	1.04
grade_8	1.61***	1.87***	1.45*	1.7***	1.53***	1.85**
grade_9						

	Gender		Wealth		Test Performance	
5: Undecided	Female	Male	Richer	Poorer	Higher	Lower
female			2.66**	1.85*	2.96***	1.27
f_income			1.08	1.1	0.98	1.39
f_performance			1.05	1.04		
f_cost			0.86	0.95	0.88*	0.98
age	1.29*	1.13	1.54**	1.11	1.28*	1.29
minority	1.81	1.05	1.41	1.64	3.43	0.82
single_p	0.64*	0.62	0.59	0.68	0.68*	0.54*
migrant_p	0.73**	0.68**	0.67**	0.7**	0.68**	0.71*
no_p	0.68**	0.58**	0.53***	0.73*	0.66**	0.67**
medu	0.93	0.92	0.93	0.93	0.88**	1.01
fedu	1.02	0.92	0.95	1	1	0.94
peasant	0.86	1.01	0.83	0.93	0.89	0.97
politicalc	1.01	0.83	0.95	0.95	0.96	0.85
parent_leader	1.18	0.96	1.03	1.23	1.01	1.19
parentbadhealth	0.87	1	0.89	0.92	1	0.92
sibship	1.09	1.06	1.1	1.06	0.97	1.16**
witheldersister	0.86	1.14	1.02	0.93	0.8	1.2
eldercohort	1.11	1.47*	1.2	1.27	1.03	1.67**
mignetwork	0.76**	0.94	0.75	0.88	0.72**	1.1
peerpedu	1.74***	1.2	1.7**	1.46**	1.43*	1.49*
tch_origin	1.11	0.88	1.04	0.97	1.03	0.93
tch_edu	1.14	1.18	1.23	1.18	1.12	1.3
tch_admin	1.57	0.86	0.9	1.85*	1.41	0.96
tch_exp	0.87**	0.89	0.89	0.89*	0.92	0.87*
tch_mthgain	1.07	1.1*	1.04	1.07	1.02	1.15**
tch_paydelayed	1.32*	0.93	1	1.23	1.27	1.12
subtch_origin	1.08	1.2	1.14	1.14*	1.23**	1.08
subtch_edu	0.99	1.01	0.93	1.06	0.98	0.97
subtch_exp	1.15*	0.95	1.06	1.04	1.01	1.1
classsize	0.94	0.95	1	0.93	0.97	0.89
distance	1.02	0.97	0.96	1.01	1.02	0.96
survival	0.29***	0.39*	0.38**	0.36**	0.44*	0.21***
school1	0.35***	0.47**	0.37**	0.37***	0.51*	0.28***
school2	0.54	0.43*	0.59	0.61	0.42**	0.59
school3	0.17**	0.23	0.22	0.19**	0.08***	0.24
school4	0.66	0.55	0.71	0.63	0.64	0.53
school5						
school6	1.35	2.47*	1.29	2.28**	1.46	2.79**
school7	3.37***	1.28	1.99	2.05**	1.75	2.97**

school8						
wealth	0.83**	0.88			0.81***	0.85*
housesize	0.98	1.06	0.97	1.04	1.05	0.95
income	0.87**	0.9	0.87*	0.88*	0.86**	0.9*
credit_financiali	1.08	1.09	1.05	1.11	1.08	1.07
credit_relative	0.97	0.96	0.97	0.97	0.96	0.99
stu_eduaspiration	0.66***	0.64***	0.7***	0.63***	0.62***	0.67***
expect_norm	1.43*	1.19	1.51**	1.22	1.43*	1.12
expect_advanced	0.84	0.69*	0.83	0.74**	0.86	0.66**
percep_schquality	1.04	1.07	1	1.06	1.06	1.03
percep_schaffiliation	0.9**	0.92	1	0.86***	0.91*	0.91
percep_schvalue	0.98	0.93	0.91	1	0.98	0.95
percep_scheffort	0.99	0.73***	0.87	0.88*	0.97	0.77**
confidence	1	1.13**	1.04	1.05	1.06	0.99
courage	0.92**	0.88**	0.87***	0.93*	0.89***	0.92
curiosity	0.92**	0.93	0.93	0.92**	0.95	0.9**
ambition	1.01	1.03	1	1.03	0.98	1.06
familyonstudy	0.88**	0.91	0.85**	0.94	0.89*	0.91*
familyonemo	1.03	0.98	1.08	0.97	0.96	1.08
tchr_contvsstop	1.04	0.99	1.06	1.01	1.05	1
tchr_genvsvoc	0.84***	0.78***	0.94	0.77***	0.9	0.75***
sick	0.92	0.78	0.96	0.84	0.77*	0.93
sick_class	1.07	0.98	0.93	1.1	1.15	0.91
cost_vocvsjunior	1.01	1	1.03	1.04	1.05	1
cost_genvsvoc	0.93	0.93	0.96	0.94	0.94	0.92
cost_colvsge	0.92*	0.94	0.97	0.93	0.97	0.91
earn_workvsdrop	1.09*	1.1**	1.1	1.1**	1.1*	1.1*
earn_vocvswork	0.9*	0.91	0.97	0.87***	0.88*	0.94
earn_genvsvoc	0.79***	0.77***	0.77***	0.79***	0.77***	0.83***
earn_colvsge	0.84***	0.86*	0.84***	0.85***	0.88**	0.83***
knowvoc	0.9	0.93	0.86	0.93	0.85	0.98
performance	0.73***	0.69***	0.7***	0.72***		
business	0.68	0.68	0.77	0.64	0.66	0.77
interpersonal	1.03	1	1.01	1.02	1.01	1.03
urbanlife	0.8	0.75	0.7*	0.81	0.79	0.78
outreach_voc	0.89	0.99	0.84	1.01	0.86	1.05
outreach_fac	1.37	1.07	1.61*	1.13	1.94***	0.75
local_negative	1.12	1.05	1.59	0.85	0.96	1.25
local_entertain	1.17	0.93	0.9	1.12	1.34	0.97
gambling	0.57*	1.43*	1.06	1.19	0.98	1.1
chore	1.01	1.01	1	1.02	1.05	0.95
love	1.24	1.83**	1.27	1.73**	1.55*	1.78**
grade_7	1.84***	1.61**	1.53*	1.88***	2.51***	1.4
grade_8	2.16***	2.01***	1.77**	2.3***	2.27***	2.17***
grade_9						

Note: Option AHS is the base outcome. * p<0.1, ** p<0.05, *** p<0.01. Wealth=1 & 2 for poorer, 3 & 4 for richer; Performance (1st imputation) =1 & 2 for lower, 3 & 4 for higher. By-performance regression is based on the first imputation because performance variable has missing data

E3. Standard Deviations under Multiple Imputations (for Standardized Coefficients)

Here full-sample (N=6298) MI standard deviations (SD) for independent variables are calculated with Rubin's combination rules. The X-standardized coefficients in Figure 6-1 are calculated as coefficient * SD, and the corresponding RRR are calculated as $\exp(\text{coefficient} * \text{SD})$.

Variables	SD	Variables	SD	Variables	SD
female	0.49	classsize	1.06	tchr_contvsstop	1.07
f_income	0.49	distance	1.73	tchr_genvsvoc	1.29
f_performance	0.48	survival	0.50	sick	0.48
f_cost	2.04	school1	0.35	sick_class	0.50
age	0.47	school2	0.26	cost_vocvsjunior	1.70
minority	0.24	school3	0.23	cost_genvsvoc	1.79
single_p	0.27	school4	0.32	cost_colvsgen	1.71
migrant_p	0.50	school5	0.33	earn_workvsdrop	1.69
no_p	0.42	school6	0.27	earn_vocvswork	1.70
medu	1.26	school7	0.44	earn_genvsvoc	1.65
fedu	1.38	school8	0.36	earn_colvsgen	1.68
peasant	0.47	wealth	0.94	knowvoc	0.66
politicalc	0.55	housesize	1.13	performance	1.12
parent_leader	0.18	income	1.68	business	0.23
parentbadhealth	0.23	credit_financiali	1.68	interpersonal	1.69
sibship	1.57	credit_relative	1.65	urbanlife	0.46
withheldersister	0.49	stu_eduaspiration	1.34	outreach_voc	0.34
eldercohort	0.46	expect_norm	0.42	outreach_fac	0.32
mignetwork	0.47	expect_advanced	0.48	local_negative	0.26
peerpedu	0.56	percep_schquality	1.65	local_entertain	0.26
tch_origin	1.07	percep_schaffiliation	1.70	gambling	0.27
tch_edu	0.50	percep_schvalue	1.16	chore	1.31
tch_admin	0.25	percep_scheffort	0.99	love	0.30
tch_exp	1.12	confidence	1.68	grade_7	0.49
tch_mthgain	1.72	courage	1.74	grade_8	0.47
tch_paydelayed	0.48	curiosity	1.74	grade_9	0.45
subtch_origin	1.14	ambition	1.71		
subtch_edu	1.19	familyonstudy	1.48		
subtch_exp	1.04	familyonemo	1.72		

Appendix F: Propensity Score Matching with Adjusted Specification

F1. Regression Results with Adjusted Variable List

	Most Recent Participation		Any Participation		Educational Aspiration	
	dy/dx	P>z	dy/dx	P>z	dy/dx	P>z
performance	0.007	0.044	0.014	0.017	-0.037	0.000
atti_chore_farm	-0.003	0.299	-0.002	0.619	0.014	0.000
percep_schvalue	0.002	0.581	0.008	0.105	-0.027	0.000
chore	0.002	0.316	-0.007	0.095	-0.009	0.001
attoncamp	0.010	0.000	0.013	0.000	-0.012	0.000
mignetwork	0.019	0.003	0.029	0.010	-0.033	0.000
f_performance	0.014	0.058	0.014	0.294	-0.034	0.000
fedu	-0.001	0.710	-0.002	0.553	-0.017	0.000
sibship	0.002	0.499	0.011	0.010	0.007	0.015
witheldersister	-0.008	0.242	-0.007	0.558	-0.021	0.017
tch_origin	-0.003	0.467	-0.015	0.013	0.008	0.044
subtch_origin	-0.003	0.416	-0.005	0.359	-0.012	0.002
survival	-0.003	0.768	0.030	0.084	-0.075	0.000
school1						
school2	-0.036	0.025	0.108	0.000	-0.033	0.030
school3	0.022	0.084	0.145	0.000	-0.015	0.359
school4	-0.027	0.029	0.020	0.303	-0.051	0.000
school5						
school6	0.072	0.000	0.064	0.002	0.037	0.015
school7						
school8						
sick	0.018	0.008	0.002	0.891	-0.024	0.003
sick_class	-0.007	0.263	0.019	0.081	0.016	0.038
cost_colvsgen	0.002	0.298	0.011	0.000	-0.007	0.001
earn_workvsdrop	-0.003	0.145	-0.003	0.412	-0.006	0.004
earn_vocvswork	-0.004	0.092	-0.004	0.236	-0.006	0.031
earn_genvsvoc	-0.005	0.047	-0.001	0.871	-0.007	0.016
earn_colvsgen	-0.002	0.429	0.002	0.609	-0.009	0.001
interpersonal	0.002	0.213	-0.004	0.264	-0.009	0.000
urbanlife	0.001	0.896	0.031	0.006	-0.043	0.000
love	-0.010	0.351	0.031	0.069	0.040	0.001
grade_7	-0.007	0.398	-0.014	0.340	-0.021	0.037
grade_8	-0.017	0.038	-0.031	0.023	0.027	0.005
grade_9						
AIC	1522.8		3673.8		12442.4	
BIC	1714.9		3865.9		12653.7	

Note: Average marginal effects and corresponding p values reported. Two schools with no Lighthouse interventions were excluded from the sample. Probit model is run when the dependent variable is the **most recent** participation or any participation. Ordered probit model is run when the dependent variable is a student's education aspiration.

F2. Nearest Neighborhood Matching Results with Adjusted Variable List (t Scores)_ Most Recent Participation

	Imputation_1		Imputation_2		Imputation_3		Imputation_4		Imputation_5	
	Unmatched	Matched	Unmatched	Matched	Unmatched	Matched	Unmatched	Matched	Unmatched	Matched
confidence	0.55	-0.05	0.53	-0.24	0.54	0.42	0.56	0.18	0.55	2.3
courage	1.23	0.03	1.2	-0.7	1.2	0.29	1.22	0.18	1.22	0.9
curiosity	2.2	0.46	2.23	0.72	2.22	2.46	2.2	1.14	2.18	0.93
ambition	-0.17	-0.16	-0.18	-0.59	-0.15	-0.72	-0.15	-0.26	-0.15	0.45
extraversion	1.83	0.14	1.82	-1.18	1.83	-0.05	1.83	-0.42	1.83	0.7
affiliationneed	2	1.88	2.2	1.06	1.97	0.68	1.96	0.89	1.95	1.76
stu_eduaspiration	4.81	3.01	4.81	2.19	4.45	2.56	4.78	1.09	4.7	2.35
expect_norm	-2.21	-1.66	-1.4	-0.24	-1.3	-1.01	-1.46	-0.33	-0.57	0
Total on support	4290		4404		4368		4388		4201	
On support _Untreated #	4085		4200		4160		4180		3992	
On support _Treated #	205		204		208		208		209	

Note: t scores for the average treatment effect on the treated (ATT) reported.

F3. Nearest Neighborhood Matching Results with Adjusted Variable List (t Scores)_ Any Participation

	Imputation_1		Imputation_2		Imputation_3		Imputation_4		Imputation_5	
	Unmatched	Matched	Unmatched	Matched	Unmatched	Matched	Unmatched	Matched	Unmatched	Matched
confidence	2.13	1.72	2.09	1.63	2.1	1.15	2.2	1.34	2.14	1.23
courage	0.55	0.48	0.55	1.88	0.57	1.84	0.6	0.72	0.57	1.06
curiosity	2.58	0.56	2.64	0.87	2.61	0.69	2.57	0.29	2.54	0.54
ambition	0.31	-0.29	0.26	1.01	0.33	-0.19	0.29	-0.33	0.32	0.19
extraversion	-0.27	0.04	-0.28	1.36	-0.27	0.81	-0.27	-0.07	-0.27	0.82
affiliationneed	0.82	0.44	0.88	0.24	0.78	-0.38	0.77	-0.25	0.8	0.25
stu_eduaspiration	5.12	3.02	4.05	2.13	4.14	0.72	3.79	2.98	3.82	1.51
expect_norm	-0.43	-0.77	-0.13	-0.83	0.22	0.89	0	-0.41	0.31	-0.41
Total on support	4421		4425		4419		4419		4426	
On support _Untreated #	3743		3747		3742		3742		3748	
On support _Treated #	678		678		677		677		678	

Note: t scores for the average treatment effect on the treated (ATT) reported.

F4. Results from Various Matching Methods and Samples (for Figure 7-2 and Figure 7-3)

Six Lighthouse Schools				
	Most Recent Participation		Any Participation	
	ATT	t score	ATT	t score
Nearest Neighborhood	0.39	3.01	0.24	3.02
	0.28	2.19	0.17	2.13
	0.34	2.56	0.06	0.72
	0.14	1.09	0.24	2.98
	0.31	2.35	0.12	1.51
Kernel	0.25	2.82	0.20	3.59
	0.23	2.69	0.14	2.41
	0.20	2.26	0.14	2.45
	0.25	2.77	0.13	2.31
	0.26	2.80	0.13	2.32
Radius	0.29	3.42	0.21	3.87
	0.30	3.59	0.15	2.74
	0.25	2.95	0.15	2.76
	0.32	3.85	0.14	2.48
	0.29	3.31	0.15	2.61
HS				
	Most Recent Participation		Any Participation	
	ATT	t score	ATT	t score
Nearest Neighborhood	0.48	1.45	-0.28	-1.19
	0.34	0.94	0.02	0.10
	0.35	1.04	0.11	0.46
	0.27	0.76	-0.10	-0.43
	0.03	0.09	0.16	0.68
Kernel	0.55	2.27	0.11	0.66
	0.44	1.76	0.12	0.70
	0.55	2.29	0.20	1.17
	0.50	1.97	0.11	0.66
	0.43	1.66	0.07	0.44
Radius	0.58	2.46	0.18	1.07
	0.53	2.14	0.10	0.64
	0.56	2.38	0.13	0.82
	0.56	2.24	0.16	0.97
	0.52	2.06	0.09	0.57
HT				
	Most Recent Participation		Any Participation	
	ATT	t score	ATT	t score
Nearest Neighborhood	0.46	2.05	0.25	1.00
	0.40	1.79	0.39	1.69
	-0.03	-0.12	0.11	0.47
	0.01	0.06	-0.17	-0.77
	0.48	1.95	0.47	1.95

Kernel	0.42	2.48	0.22	1.24
	0.31	1.82	0.16	0.90
	0.17	0.95	0.12	0.64
	0.27	1.46	-0.04	-0.22
	0.32	1.73	0.24	1.33
Radius	0.47	2.96	0.26	1.56
	0.32	2.08	0.23	1.35
	0.23	1.38	0.16	0.90
	0.27	1.64	0.03	0.20
	0.31	1.82	0.25	1.45
HY				
Most Recent Participation				
		ATT	t score	
Nearest Neighborhood	-0.20	-0.99	0.10	0.78
	0.02	0.07	0.07	0.56
	-0.09	-0.40	-0.06	-0.48
	-0.25	-1.22	0.05	0.43
	0.34	1.35	0.22	1.56
Kernel	-0.02	-0.16	0.12	1.31
	-0.08	-0.44	0.03	0.27
	-0.01	-0.08	0.01	0.13
	0.06	0.42	0.06	0.60
	0.05	0.30	0.05	0.56
Radius	0.04	0.27	0.13	1.47
	0.05	0.28	0.03	0.35
	0.06	0.37	0.04	0.44
	0.11	0.76	0.07	0.76
	0.06	0.38	0.06	0.62

Appendix G: Statistics for Lighthouse Teams

G1. Number of Members by Team Characteristics

	QB	QD	HQ	HS	HT	HX	HY
Gender							
Female	10	15	11	13	12	10	10
Male	3	5	7	6	5	6	3
Grade							
Freshman	1	6	3	7	2	5	3
Sophomore	11	11	13	12	13	7	8
Junior	2	3	2	0	2	4	2
Pre-college living location							
Guangzhou or Shenzhen	3	1	1	5	3	6	3
Elsewhere in province	8	17	14	13	11	5	5
Other provinces	3	2	1	0	2	3	2
Zhaoqing or Qingyuan	0	0	2	1	1	2	3
Major							
Education	2	3	2	2	4	2	3
Natural science	2	3	6	7	6	5	3
Non-edu social science	6	8	8	7	6	5	7
Non-edu humanities	4	6	2	3	1	4	0
Experienced (former Lighthouse volunteer or similar experience for over two weeks)							
Yes	0	3	4	0	1	3	1
No	14	17	14	19	16	13	12
Participation in first team building							
No	0	0	0	0	0	0	1
Part of	0	5	1	5	0	0	0
Whole process	14	15	17	14	17	16	12
Participation in teaching training							
No	0	1	0	3	0	1	0
Part of	6	6	2	3	3	4	1
Whole process	8	13	16	13	14	11	12
Participation in second team building							
No	0	0	0	0	1	0	0
Part of	0	3	0	4	2	1	2
Whole process	14	17	18	15	14	15	11

Note: HX is a primary school, so it is not included in this study. There is other information such as university, detailed major, detailed pre-college location, role in the team, and detailed trainings participated, which is omitted here because of the lack of statistical value.

G2. Perceptions regarding Team Operation (Unweighted)

Unweighted	QB		QD		HQ		HS		HT		HX		HY	
	Mean	SD.	Mean	SD.	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Team members stay with each other well	4.6	0.5	4.5	1.1	5.4	0.6	5.0	0.6	5.1	0.7	5.0	0.6	4.9	0.8
Team runs efficiently	4.5	0.7	3.8	0.8	4.5	0.7	4.7	0.8	4.7	0.7	4.4	0.7	4.5	0.8
Students are supportive	4.5	0.5	4.8	1.0	4.7	0.6	4.9	0.8	5.0	0.6	4.8	0.9	5.2	0.7
Households are supportive	4.4	0.9	4.5	1.0	5.1	0.6	4.8	0.9	5.2	0.6	4.7	0.9	5.0	0.7
Teachers are supportive	4.6	0.8	4.3	0.9	4.7	0.8	4.2	1.1	5.7	0.6	4.3	0.9	5.1	0.8
Schools and local government are supportive	4.5	1.2	4.4	0.8	5.0	0.7	4.3	0.6	5.6	0.7	4.7	0.9	4.8	1.1
What we are doing is meaningful for students	4.9	0.7	4.8	0.9	4.8	0.5	4.6	0.5	4.8	0.8	5.1	0.9	4.6	1.0
We are the best Lighthouse team this year	4.4	0.9	3.8	1.2	5.1	0.6	4.8	0.9	4.1	0.9	4.0	0.8	4.2	0.7
Teaching training is quite helpful	4.2	1.1	3.5	0.9	4.1	0.9	3.8	0.9	4.0	1.5	4.6	1.1	3.8	1.1
Team building is quite helpful	4.9	0.7	4.8	0.8	4.8	0.7	4.7	0.7	4.5	0.9	4.8	0.9	4.5	1.1
Lighthouse instructional framework is supportive	3.6	1.0	3.4	1.1	4.0	0.8	4.1	0.7	3.4	1.1	3.8	0.9	4.2	1.2
Former volunteers are supportive	5.3	0.6	4.2	0.9	5.7	0.6	4.8	0.8	4.6	0.9	4.9	0.6	4.6	1.0

Note: 1 to 6 for totally disagree to totally agree. HX is a primary school, so it is not included in this study.

G3. Perceptions regarding Team Operation (Weighted by Leadership)

Weighted by Leadership	QB		QD		HQ		HS		HT		HX		HY	
	Mean	SD.	Mean	SD.	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Team members stay with each other well	4.7	0.5	4.4	1.0	5.4	0.6	5.0	0.6	5.1	0.7	4.9	0.6	5.0	0.8
Team runs efficiently	4.6	0.7	3.7	0.8	4.4	0.7	4.7	0.7	4.6	0.8	4.3	0.7	4.5	0.9
Students are supportive	4.6	0.5	4.7	1.0	4.6	0.6	4.9	0.8	4.9	0.6	4.8	1.0	5.1	0.6
Households are supportive	4.5	0.9	4.4	0.9	5.2	0.6	4.9	0.9	5.2	0.5	4.6	1.0	5.0	0.7
Teachers are supportive	4.8	0.9	4.2	0.9	4.7	0.9	4.3	1.1	5.7	0.6	4.1	0.9	5.1	0.7
Schools and local government are supportive	4.5	1.1	4.4	0.7	5.0	0.7	4.3	0.6	5.6	0.8	4.6	0.8	4.7	1.0
What we are doing is meaningful for students	5.1	0.8	4.8	0.9	4.8	0.5	4.6	0.5	4.8	0.8	5.0	0.9	4.5	1.2
We are the best Lighthouse team this year	4.5	0.9	3.7	1.3	5.1	0.6	4.8	0.9	4.0	0.9	3.9	0.8	4.3	0.7
Teaching training is quite helpful	4.3	0.9	3.4	0.9	4.0	0.8	3.8	0.9	3.7	1.5	4.7	1.1	3.7	1.1
Team building is quite helpful	5.0	0.6	4.7	0.9	4.8	0.6	4.8	0.7	4.4	0.9	4.7	0.9	4.4	1.1
Lighthouse instructional framework is supportive	3.6	0.8	3.5	1.1	3.9	0.7	4.1	0.7	3.3	1.0	3.7	0.8	4.1	1.2
Former volunteers are supportive	5.3	0.6	4.1	1.0	5.7	0.6	4.8	0.7	4.6	0.9	4.9	0.7	4.5	1.0

Note: 1 to 6 for totally disagree to totally agree. HX is a primary school, so it is not included by this study. The calculation assigns a weight of 3 to team leaders, 2 to those in charge of a class or team function, and 1 to other volunteers.