

The Role of Non-cognitive Traits in Higher Education Achievement among Economically Disadvantaged Taiwanese Youths*

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ABSTRACT

Despite the profound impact of poverty on individual development, empirical research on this issue has been scanty in Taiwan. Youths from economically disadvantaged families tend to have lower academic achievement than their peers from middle-class families. Yet recent studies have shown that positive non-cognitive traits often mediate and moderate the negative developmental outcomes among poor children. This study aims to use both the 7th and 9th grade samples (N=3,544) from the Taiwan Youth Project to examine how non-cognitive traits (using both subjective and objective measures) affect the higher education outcomes of youths who experienced economic hardship in adolescence. The results show that for both the younger and older cohorts, positive personality traits are positively associated with higher odds of entering a top university. However, limited evidence is found for the protective effects of personality. For the younger cohort, among youths who were exposed to late economic disadvantage, scoring high on the subjective positive self-image measure has a marginal effect on raising the likelihood of entering a good university. For the older cohort, being more conscientious has a marginal positive effect on increasing the likelihood of attending a top university for those who were exposed to chronic economic hardship, when compared to their peers who never experienced economic disadvantage. The implications of these findings and the impact of the 2000 educational reforms for the high school entrance

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requirements are discussed.

Key Words: poverty, economic disadvantage, youth development, non-cognitive traits, personality, resilience, educational achievement

I. Introduction

Exposure to poverty is a major life adversity that has long-term impact on various developmental outcomes. The multifaceted unfavorable consequences of growing up in families with economic hardship have been widely documented (Brooks-Gunn and Duncan, 1997). Children who are raised in economically stressed families are more likely to have poor physical health and lower cognitive and academic attainments. They are also more prone to have emotional or behavioral problems. Poor children are also more at risk of having out-of-wedlock births as teens or becoming economically inactive as young adults (Brooks-Gunn and Duncan, 1997). Studies have shown that the timing and length of exposure to poverty also matters. Poverty experienced during the first five years of life has lasting detrimental effect on cognitive ability and later outcomes (Duncan et al., 1998; Guo, 1998); whereas the impact of adolescent poverty appears to be limited to educational and occupational opportunities observed in late adolescence and early adulthood (Guo, 1998; Hauser and Sweeney, 1997). The long-term impact of poverty on an array of unfavorable developmental outcomes has also been documented in various studies (Duncan et al., 1994; Duncan et al., 1998; Guo, 1998; Teachman et al., 1997). Research indicates that longer exposure to poverty leads to more negative physical and cognitive outcomes, particularly when economic hardship is observed in early childhood years (Guo, 1998; Korenman and Miller, 1997; Teachman et al., 1997).

Past studies on the negative impact of economic hardship on child development in Taiwan have mostly been qualitative interviews conducted with small, convenient samples (黃聖紘, 2005; 黃雅伶, 2008). Empirical studies that examine the impact of family economic disadvantage on child development have relied on regional, cross-sectional data (林士翔, 2003; 李俊豪, 2010; 王育敏、邱靖惠, 2009; 蔡順良, 1985). The only two studies that analyzed large samples are cross-sectional in nature (李俊豪, 2010; 王育敏、邱靖惠, 2009), which limit the possibility of causal inference. Despite the critical influence of poverty on later life outcomes, studies that utilize longitudinal, large-sample survey data have been surprisingly non-existent in Taiwan. Furthermore, no study to the author's knowledge has attempted to examine the crucial role of non-cognitive traits in moderating the negative impact of family economic hardship on college

enrollment. The current study aims to utilize the Taiwan Youth Project (TYP) data to study how exposure to economic stress in adolescence affects the likelihood of entering a top-tier university and a graduate program among two recent cohorts of youths born in the mid to late 1980s. Furthermore, the importance of non-cognitive traits, such as a positive self-image, conscientiousness, and agreeableness, will be investigated as potential moderating factors that lead to resilient adaptation for economically disadvantaged youths.

II. Conceptual Framework: Risk and Resilience

This study adopts the developmental perspective of risk and resilience as the guiding framework. The core thesis of the risk and resilience perspective emphasizes the protective mechanisms that lead to favorable adaptations despite adversity experienced early in an individual's life course (Masten and Powell, 2003). The presence of risk refers to circumstances such as child neglect or abuse, parental mental illness, economic hardship, parental divorce, or experiences of war. Individuals are considered resilient when they achieve favorable developmental outcomes or sustain competence despite facing challenges that bring detrimental consequences to their lives.

In the risk and resilience literature, resilience resides in the social context as much as within the individual (Rutter, 1993). Masten and Garmezy point out three broad sources of resilience: (1) family cohesiveness, warmth and lack of discord; (2) the availability of an external support system that enhances a child's coping ability; (3) personality characteristics such as autonomy, self-esteem, and a positive social orientation. These factors have been found to be associated with more beneficial outcomes for children exposed to adversity (Masten and Garmezy, 1985).

Research on resilience has its theoretical basis built upon Bowlby's attachment theory and Erikson's trust and mistrust emphasis (Luthar, 2006). Early family relationships, in particular, affect the formation of resilient long-term developmental trajectories. An intimate and caring relationship with caretakers during the early years is the fundamental mediator of successful human development and promotes resilient adaptations among children exposed to adverse conditions (Shonkoff and Phillips eds., 2000).

Having positive peer relationships can also be a source of resilience for youths. As pointed out by Havighurst, establishing mature relationships with peers of both sexes is a key developmental task during adolescence (Havighurst, 1972). Interpersonal interactions in adolescence shape the development of identity and prepare young people for other developmental tasks in early adulthood. Research

shows that peer acceptance and perceived social support ameliorate the impact of negative and stressful life events (Luthar, 2006; Werner, 1990).

As for personality traits, longitudinal research on competent children and youths who experienced high-risk conditions (e.g., poverty and parental divorce) has reported their common characteristics: good problem-solving and communication skills, a positive self-concept, a sense of self-efficacy, flexible coping strategies, good intellectual functioning and a reflective (not impulsive) cognitive style (Cicchetti et al., 1993; Fergusson and Horwood, 2003; Masten and Coatsworth, 1998; Seifer et al., 1992; Werner, 1990; Werner and Smith, 1989). These psychosocial attributes contribute to a positive sense of self and a competent adaptation to environmental and experiential challenges. Indeed, past research has shown that temperamental and personality traits are critical to the rise from adversity among individuals who were exposed to various risk contexts. For example, resilient youths who were exposed to parental mental problems are reported to adopt a compassionate but detached approach to their parents, and develop a sense of mastery and self-esteem from the pursuit of hobbies with peers and friends (Anthony, 1987). Youths who coped successfully with chronic poverty and family discord were also reported to be more responsible and achievement-oriented than their troubled counterparts (Werner and Smith, 1992). Finally, self-esteem and ego-control were reported to promote more competent functioning and resilient outcomes among maltreated children (Cicchetti et al., 1993).

While this study recognizes the importance of all three factors (i.e., family cohesiveness, support system, and personality traits) in promoting resilience, the analyses that follow will focus on exploring the role of personality characteristics (or non-cognitive traits) in moderating the negative impact of family economic disadvantage in adolescence on later achievements in higher education: the likelihood of entering a top-tier university and an advanced graduate program. Both subjective and objective measures of non-cognitive traits will be analyzed to evaluate their protective effects on altering the life chances of disadvantaged youths.

III. Prior Research

A. Exposure to Poverty and Educational Attainment

The life stage in which poverty is experienced affects children's cognitive ability and academic achievement. While poverty experienced in adolescence has critical effects on achievement, early childhood poverty is more detrimental to the development of cognitive ability (Guo, 1998). Using the National Longitudinal Study of Youth 1979 data (NLSY79), Guo (1998) finds that chronic poverty expe-

rienced in childhood affects children's performance on both the Memory for Digit Span Assessment and the Peabody Picture Vocabulary Test-Revised, which are designed to evaluate academic *ability*. In contrast, poverty experienced in early adolescence significantly reduces the scores on three versions of the Peabody Individual Achievement Tests, which measure academic *achievement*. He concludes that longer exposure to poverty does not necessarily lead to poorer outcomes, but rather, it is the life stage when poverty is experienced that matters (Guo, 1998).

Similar findings that stress the critical influence of early childhood poverty on completed years of schooling have also been reported with data from the Panel Study of Income Dynamics (PSID). Duncan and colleagues show that family income averaged from birth to age 5 exerts a larger impact on completed education than does income measured at later life stages (either between ages 5 and 10 or between ages 11 and 15). Another noteworthy finding in this study is that at the higher end of the socioeconomic spectrum, the results suggest that high parental income during adolescence facilitates entry into a college (Duncan et al., 1998).

Finally, another study that analyzes the Wisconsin Longitudinal Study (WLS) data also reports the role of adolescent exposure to poverty in educational attainment. The findings reveal that the influences of poverty experienced during teen years are limited to educational and occupational opportunities observed in late adolescence and early adulthood (Hauser and Sweeney, 1997). The long-term impact of poverty, while not readily observable in this study, is likely to operate through indirect effects of lowered educational and occupational attainment caused by experiences of economic impoverishment in adolescence.

B. Non-cognitive Traits and Educational Attainment

As discussed earlier, developmental psychology studies have found that competent youths who demonstrate effective, healthy coping with stressful life experiences tend to possess personality dispositions that enable them to stay resilient. These traits are correlated with better socioeconomic achievement (Almlund et al., 2011; Heckman and Rubinstein, 2001; Heckman et al., 2006; Mueser, 1979). As early as in the 1970s, both sociological and economic research has pointed out the critical role of non-cognitive skills in the social stratification processes.¹ In his pioneering work in 1979, Mueser argues that personality traits like industriousness, perseverance, and leadership are traits that are positively rewarded in schools and in the labor market. The positive effects of these traits are comparable to those of

1 Non-cognitive traits are often called 'personality traits' in psychological literature. Both terms will be used interchangeably in the following text.

other characteristics, such as IQ, completed years of schooling, and parental socioeconomic status, that predict favorable labor market outcomes (Mueser, 1979). Most important of all, even though academic capacity and non-cognitive skills are positively correlated, both separately predict higher occupational attainment and earnings years later. Later studies also find that cognitive and non-cognitive traits are conceptually distinct characteristics and tend to have non-negligible impact on various developmental outcomes (Almlund et al., 2011; Heckman and Rubinstein, 2001; Lundborg et al., 2010).

A recent study by Heckman and colleagues also shows that non-cognitive traits have significant influence on educational outcomes, occupational choices, wages, and an array of social behaviors (Heckman et al., 2006). Using the NLSY79 data, they discover that those with higher non-cognitive ability (measured by the average of the Rosenberg Self-Esteem Scale and Rotter Internal-External Locus of Control Scale) are much more likely to graduate from 4-year colleges, to be white-collar employees, to have higher wages, and to be single with no child at age 18, whereas those with lower non-cognitive ability are more likely to be daily smokers by age 18, to use marijuana, and to engage in other illegal activities (Heckman et al., 2006; Masten and Garmezy, 1985).

Using the National Educational Longitudinal Study (NELS) data, Jacob (2002) shows that young women from low-income and minority communities are 25 percent more likely to enroll in post-secondary education than their male counterparts. The author concludes that nearly 90 percent of the gender gap in higher education can be attributed to women's greater non-cognitive skills. Furthermore, the magnitude of the effect of non-cognitive skill on college attendance is comparable to those of cognitive ability and socioeconomic status (Jacob, 2002).

There is also empirical evidence for the moderating effects of personality disposition on reversing adversity encountered in life. Among disadvantaged school-age children, the expression of positive temperament, such as an internal locus of control, higher self-esteem and self-efficacy, is found to be associated with more adaptive outcomes like better school performance and emotional or behavioral functioning (Rutter, 1993).

Taken together, past studies using U.S. data have repeatedly shown that family economic hardship during adolescence has important effects on academic achievement and that positive personality traits bring about resilience among disadvantaged youths. Empirical research that investigates these issues using large-scale panel data barely exists in Taiwan. This study aims to fill the gap by analyzing a longitudinal dataset that includes two recent cohorts of youths residing in Northern Taiwan (i.e., Taipei City, Taipei County, and Yilan County) who were in seventh and

ninth grades in the year 2000. Their higher education outcomes in their early twenties will be examined. Three important research questions will be investigated: (1) How does exposure to economic disadvantage affect tertiary educational outcomes in adulthood? (2) How are non-cognitive traits associated with higher education attainment in early adulthood? (3) Are disadvantaged youths with more positive personality dispositions more likely to have better tertiary educational outcomes? The next sections present the research design of this study and the analytical models used to explore these empirical questions.

IV. Research Design

A. Data

The data used for this study come from the Taiwan Youth Project (TYP), a longitudinal data collection effort initiated in 2000 by a group of family researchers from the Institute of Sociology at Academia Sinica. With the life course perspective as a theoretical framework, this project aims to study how family and school processes shape the developmental experiences and outcomes of two recent cohorts of Taiwanese adolescents. In addition to the student sample, teachers and parents were also interviewed to collect information on adolescents' school and family environment in various waves.

A stratified, random sampling method was used to select adolescents enrolled in seventh and ninth grades² who reside in Northern Taiwan (i.e., Taipei City, Taipei County, and Yilan County) to participate in this study. The average ages of the younger and older cohorts are about 13 and 15. The study sampled two cohorts of adolescents because the seventh graders are the first cohort of junior high school students who entered high school without taking the Joint High School Entrance Exam (JHSEE, 高中聯考). They had multiple channels to enter high school and had to take the Basic Scholastic Exam (BSE, 基本學力測驗), while the older ninth-grade cohort had to take the JHSEE. A total of 40 schools (81 seventh grade classes and 81 ninth grade classes) were chosen to be included in this study, resulting in a student sample of 5,542 youths in the first wave. Both groups of seventh and ninth graders (referred to as G7 and G9 cohorts hereafter) were followed annually till 2008/2009. A total of 9 waves of data have been collected for the G7 cohort and 8 waves for the G9 cohort.

2 On some occasions, the seventh and ninth graders will be referred to as the younger and older cohorts respectively in later parts of this study.

B. Sample

The two analytical samples used for this study were selected separately for the younger and the older cohorts. For the G7 cohort, respondents who participated in the first, second, and third waves as well as any of the seventh, eighth, or ninth waves of the survey were included.³ For the G9 cohort, respondents who participated in the first and fourth waves as well as any of the fifth, sixth, seventh, or eighth waves of the survey were included.⁴ These selection criteria result in an analytical sample of 1,662 adolescents for the G7 cohort and another sample of 1,882 adolescents for the G9 cohort.

C. Variables and Measurements

(A) Outcome Variable

A dichotomous variable measuring whether a respondent entered a top-tier university was created by using reports gathered from waves 7 through 9 for the G7 cohort and from waves 5 through 8 for the G9 cohort. The variable of “top-tier university” was defined as enrollment in one of the national universities or a public or private medical school in Taiwan.⁵ A detailed list of these schools is presented in Appendix 1. For the older G9 cohort, another dichotomous variable was also created to measure whether a respondent advanced to a graduate program. No such

3 The first and third waves of data were required for gathering family income information at two time points. The second wave of data was used because 98 new respondents entered the study from Wave 2 onward. Waves 7 to 9 were used to collect information on college entrance.

4 The first and fourth waves of data were required for gathering family income information at two time points. Waves 5 to 8 were used to collect information on college entrance and enrollment in a graduate program.

5 A more refined measure of college selectivity is not used because of two reasons. First of all, about 13% of youths entered one of the “top-tier universities” in the current definition (about 220 students). If a more restricted definition is used to pick out those who attended the more prestigious public universities, the size of the sample that meets this definition will shrink further. Given that these respondents will be further grouped into four family economic statuses (early, late, chronic, and never in disadvantage), applying a stricter definition of “top-tier university” will cause the problem of not being able to detect any significant effect of family economic status on higher education outcome due to a lack of statistical power. Secondly, there are no objective or published rankings of universities in Taiwan. To further group private colleges/universities into tier 2 vs. tier 3 schools will inevitably require arbitrary judgment on the author’s part. The current definition of top-tier vs. other universities, though not perfect, is less problematic since it only includes national universities and medical schools. They are considered objectively strong schools by most people.

variable was created for the G7 cohort because they were too young to experience such an event by Wave 9.

(B) Independent Variables and Covariates

Family Economic Status is the key independent variable for this study, which is a categorical variable measuring the length of exposure to economic disadvantage. A direct measure of “poverty” is not used in this study, given that the official poverty line defined by the Social Assistance Law (社會救助法) has long been criticized for causing a vast underestimate of the prevalence of poverty in Taiwan (蔡明璋, 1996; 孫健忠, 2002). Hence, this study adopts an alternative variable to measure relative economic disadvantage (i.e., the bottom 1/3 of the sample distribution) that takes into account household sizes. The measurement of family economic status is constructed in several steps. First, parental reports of family income were grouped by number of family members residing in the same household (i.e., ≤ 3 , 4, 5, 6, and 7+ people). In cases where parental reports on family income were missing, adolescents’ reports were used to impute the missing cases. When family income was still missing after imputation from youth reports, a multiple imputation procedure was used. About 4.8% and 9.2% of the income reports were missing in the G7 and G9 samples respectively. Within each household-size category, those with a family income level at or below the 35th percentile of distribution were coded as experiencing economic disadvantage in that wave (refer to Appendix 2 for household-size-specific cutoff income levels). Due to clustering of income reports around the cutoff levels, respondents whose family incomes fall at percentiles slightly higher than 35% might also be defined as facing “economic disadvantage” in a given wave.

This measurement of family economic status was constructed for Waves 1 and 3 (at ages 13 and 15) for the G7 cohort, and for Waves 1 and 4 (at ages 15 and 18) for the G9 cohort. Three dummy variables indicating the exposure to family economic disadvantage for both cohorts were created: early economic disadvantage, late economic disadvantage, and chronic economic disadvantage. “Never experienced economic disadvantage” is the reference group. For the G7 cohort, the first category refers to those who experienced economic hardship at age 13 (W1) but not at age 15 (W3). The second category refers to those who encountered economic disadvantage at age 15 only but not at age 13. Those in the last category were living in low income families at both ages 13 and 15. The reference category is those who never lived in poor families at both ages. The same variable is constructed for the G9 cohort, except that the second wave of information comes from Wave 4, because no parental reports of family income were collected in Wave 3 for this cohort.

Other covariates used in this study include: sex, maternal education, family

structure, sibship size, school adjustment, family warmth, and relative class ranking in eleventh grade (for G7 cohort only). All these variables come from the wave 1 data, except for the relative class ranking, which was collected at Wave 5 for the G7 sample. Reports on *maternal education* are collapsed into less than high school, high school graduates, junior college, and college and above. *Family structure* has two categories: two-biological-parent family and other family (i.e., step-parent family, single-parent family, and other forms of family). *Sibship size* is a categorical variable that includes zero, one, two, and three or more siblings. *School adjustment* is measured by summing 9 items together: (1) I feel closer to my family members than to other people; (2) everyone in my family is very close to each other; (3) when making decisions, we discuss them with each other in my family; (4) my family enjoys spending leisure time together; (5) when there is a family activity, everyone in the family participates in it; (6) we like to do things together in my family; (7) my family are nice to each other's friends; (8) when I feel frustrated, I can always count on my family for comfort and encouragement; (9) When I need help or advice, I can rely on my family. The Cronbach alpha for this scale is 0.78 for the G7 sample and 0.76 for the G9 cohort. *Family warmth* is measured by adding 4 items together: (1) My classmates always give me a hand when I need help; (2) I always give my classmates a hand when they need help; (3) students in my class are very close and nice to each other—just like a family; (4) compared to other classes, students in my class share more mutual trust. The Cronbach alpha for this scale is 0.87 for the G7 sample and 0.88 for the G9 cohort. These variables have been found to be predictive of educational outcomes (Astone and McLanahan, 1991; Downey, 1995), so they are included in the analytical models as covariates. Finally, relative class ranking is measured by dividing reported class ranking by class size. This variable is included as a covariate because secondary school achievement can potentially mediate the effect of family economic status in junior high school on college attainment.

(C) Moderators

Non-cognitive (Personality) Traits are measured using subjective and objective reports in Wave 1. A detailed list of items used to create the following scales is shown in Appendix 3. There are two subjective variables of non-cognitive traits: *positive self-image* and *conscientiousness*. Adolescents were asked to rate themselves in certain personality traits. Factor analyses were first used to extract the underlying factor patterns. Two scales of positive self-image and conscientiousness were created by summing items that load on the same factor. The Cronbach's alpha for positive self-image is 0.73 for the seventh graders and 0.77 for the ninth graders. The Cronbach's alpha for self-rated conscientiousness is 0.63 for the seventh graders and 0.61 for the ninth graders. Objective measurements of non-cognitive

traits are constructed by using teacher reports on adolescent respondents' *agreeableness*. Having a higher score on this scale indicates a youth is more agreeable. The Cronbach's alpha for objective agreeableness is 0.91 for both cohorts.

D. Missing Data

Missing data were handled with multiple imputation (Rubin, 2004), a procedure that utilizes a Monte Carlo technique to replace missing values with several simulated versions. Five imputed datasets were generated using the procedures of MI Impute in Stata. Each of the simulated complete datasets was analyzed using the MI Estimate procedure, and the results were combined using Rubin's rules to produce estimates and confidence intervals that incorporate missing data uncertainty. Both descriptive statistics and the output for regression models in this study are based on the combined outputs from the five imputed datasets.

E. Analytical Strategies

To start out, descriptive statistics are presented to show the characteristics of the two analytical samples. Nested logistic regression models are then presented to show how exposure to economic disadvantage affects the likelihood of entry into a top-tier university. In addition, the influence of non-cognitive traits and their potential moderating effects on the association between family economic status and entrance into a top university were also explored for both the seventh- and the ninth-grade cohorts. Finally, an additional set of analyses predicting entrance into a graduate program was also conducted for the ninth-grade cohort, as they were old enough to make such a transition by the last wave of the survey.

V. Results

A. Descriptive Statistics

Table 1 shows that about 13% of the G7 cohort entered one of the top-tier universities in Taiwan. For the G9 cohort, about 14% entered such universities and about 10% proceeded to more advanced graduate education. As for family economic status, about 17% and 16% of the G7 and G9 samples experienced "early economic disadvantage" when they were interviewed at ages 13 (G7) or 15 (G9). About 13–14% of the respondents were exposed to "late economic disadvantage" at ages 15 (G7) or 18 (G9). Slightly less than a quarter of both cohorts lived in families with "chronic economic disadvantage" in both waves of survey. About 47–48% of all respondents were never economically stressed during adolescence. Both G7 and G9 samples are about evenly split between male and female adolescents. About half of

**Table 1: Descriptive statistics for the 7th- and 9th-grade cohort samples
(multiply imputed data)**

Variable	G7 (N=1662)		G9 (N=1882)	
	Mean	S.D.	Mean	S.D.
Dependent Variables				
Entry into a top-tier university	13.27%		13.66%	
Entry into a graduate program			9.72%	
Independent Variables				
Family Economic Status				
Early economic disadvantage	17.11%		15.69%	
Late economic disadvantage	12.95%		14.17%	
Chronic economic disadvantage	23.12%		22.27%	
Never experienced economic disadvantage	46.82%		47.87%	
Sex				
Male	50.48%		51.86%	
Female	49.52%		48.14%	
Mother's Education				
Less than high school	46.22%		49.90%	
High school	38.76%		34.08%	
Junior college	6.31%		7.15%	
College and above	8.71%		8.86%	
Family Structure				
Two-biological-parent family	88.60%		88.87%	
Step/single-parent family and other	11.40%		11.13%	
Siblings				
Zero	8.48%		9.86%	
One	43.62%		42.11%	
Two	37.36%		36.20%	
Three or more	10.53%		11.83%	
School Adjustment	11.55	2.32	11.59	2.25
Family Warmth	27.76	5.35	26.48	5.19
Self-rated Positive Self-image	14.77	3.26	14.31	3.13
Self-rated Conscientiousness	7.10	1.38	7.62	1.32
Teacher-rated Agreeableness	28.98	5.57	29.36	5.69
Relative class ranking in 11th grade (in percentile)	0.56	0.33	—	—

both samples have a mother who received less than high school education. Another third of them have a mother with a high school degree. The rest of the sample comes from families where the mother received a tertiary education. Roughly 90% of both cohort samples grew up in two-parent families. As for sibship structure, about 9–10% of the respondents are an only-child. Nearly 80% of them have one or two siblings and another 11–12% of them live in a bigger family of three children and more. Finally, the mean scores on school adjustment, family warmth, and three non-cognitive traits are similar between the two samples. The mean relative class ranking for the G7 sample is 0.56.

B. Entry into a Top-tier University

The first set of analyses (Table 2) shows the impact of family economic status on the likelihood of attending a top-tier university for both G7 and G9 cohorts. As shown in model 1, for the younger G7 cohort, exposure to family economic hardship at age 13 (early economic disadvantage) has the strongest effect on lowering the likelihood of attending a top-tier university, compared to the other two family economic statuses. All things being equal, living in a low income family at age 13 lowers the likelihood of entering a top university by 51%, whereas when such a disadvantage was experienced at age 15 the likelihood is lowered by 48%. Finally, a youth who faced family economic problems at both ages 13 and 15 (chronic economic disadvantage) is 43% less likely to enter a good university, when compared to those who never lived in low income conditions in both time periods. Maternal education exerts a strong influence on a youth's educational achievement. Respondents who have a mother with more than junior college education are about four times more likely (OR=4.20 for junior college; OR=3.76 for college and above) to enter a higher-ranked university in Taiwan, when compared to those who have a mother with less than high school education. Both family structure and sibship size do not have significant impact on achievement in tertiary education.

In model 2, school adjustment, family warmth, and three different measures of subjective and objective non-cognitive traits are added into the baseline model. Those who experienced early or chronic economic disadvantage are still less likely to enter a top university. The odds ratios show that scoring higher on both school adjustment (OR=1.15, $p < .01$) and family warmth (OR=1.04, $p < .05$) is linked to a higher likelihood of entering a top university. In addition, having a positive self-image (OR=1.06, $p < .05$) and being conscientious (OR=1.10, $p < .10$) also raise the chances of entering a top university, while being rated by teacher as agreeable (OR=1.15, $p < .001$) also increases the likelihood. When actual scores on these three scales are applied, the coefficients indicate that a standard deviation increase

Table 2: Odds ratios of logistic regression models predicting entry into top-tier colleges for both 7th- and 9th-grade cohorts (multiply imputed data)

	7 th Grade		
	model 1	model 2	model 3
Family Economic Status (reference: Never experienced economic disadvantage)			
Early economic disadvantage (poverty at age 13, but not age 15)	0.49**	0.59*	0.76
Late economic disadvantage (poverty at age 15, but not age 13)	0.52*	0.58 [†]	0.05
Chronic economic disadvantage (poverty at both ages 13 & 15)	0.57*	0.59*	0.12
Male	1.14	1.59**	1.60**
Maternal Education (reference: Less than high school)			
High school	1.51*	1.52 [†]	1.58*
Junior college	4.20***	4.47***	4.77***
College and above	3.76***	3.65***	3.80***
Family Structure (reference: Other family)			
Two-biological-parent family	1.42	1.10	1.13
Siblings (reference: Zero)			
One	1.27	1.38	1.39
Two	0.89	1.00	1.00
Three or more	0.60	0.60	0.60
School Adjustment		1.15**	1.15**
Family Warmth		1.04*	1.04*
Self-rated Positive Self-image		1.06*	1.06 [†]
Self-rated Conscientiousness		1.10 [†]	1.07
Teacher-rated Agreeableness		1.15***	1.15***
Relative class ranking in 11th grade (in percentile)		0.25***	0.26***
Family Economic Status × Self-rated Positive Self-image (ref.: Never experienced EconDisadv × Self-rated positive self-image)			
Early EconDisadv × Self-rated positive self-image			0.94
Late EconDisadv × Self-rated positive self-image			1.20 [†]
Chronic EconDisadv × Self-rated positive self-image			0.96
Family Economic Status × Self-rated Conscientiousness (ref.: Never experienced EconDisadv × Self-rated conscientiousness)			
Early EconDisadv × Self-rated conscientiousness			0.95
Late EconDisadv × Self-rated conscientiousness			1.05
Chronic EconDisadv × Self-rated conscientiousness			1.24
Family Economic Status × Teacher-rated Agreeableness (ref.: Never experienced EconDisadv × Teacher-rated agreeableness)			
Early EconDisadv × Teacher-rated agreeableness			1.04
Late EconDisadv × Teacher-rated agreeableness			0.98
Chronic EconDisadv × Teacher-rated agreeableness			1.02
<i>N</i>	1662	1662	1662

[†]p < .10; *p < .05; **p < .01; ***p < .001

Note: The ages to which each family economic status dummy refers are:

Early economic disadvantage—at age 13, but not age 15 (G7) or at age 15, but not age 18 (G9)

Late economic disadvantage—at age 15, but not age 13 (G7) or at age 18, but not age 15 (G9)

Chronic economic disadvantage—at both ages 13 & 15 (G7) or at ages 15 & 18 (G9)

	9 th Grade		
	model 4	model 5	model 6
	0.44**	0.48**	0.27
	0.58*	0.62 [†]	7.56
	0.62*	0.69 [†]	0.05
	1.09	1.20	1.20
	1.29	1.25	1.28
	2.67***	2.45**	2.50**
	4.11***	3.89***	3.97***
	1.85*	1.73 [†]	1.76 [†]
	1.32	1.33	1.26
	1.20	1.18	1.12
	0.86	0.89	0.85
		1.06 [†]	1.06
		1.00	1.00
		1.11***	1.12***
		1.05	1.03
		1.10***	1.10***
		—	—
			0.91
			1.05
			0.96
			1.17
			0.75
			1.31 [†]
			1.03
			0.96
			1.03
	1882	1882	1882

in scores on positive self-image, conscientiousness, and objective agreeableness is associated with 21%, 14%, and 110% higher likelihood of entering a top university respectively. Finally, relative class ranking in 11th grade also has a positive effect on the likelihood of entering a top university (i.e., a lower value on relative ranking indicates better academic achievement in a given class). In model 3, the moderating effects of non-cognitive traits are examined. The results show that for youths who were exposed to late economic disadvantage, scoring high on the subjective positive self-image measure has a marginal effect on raising the likelihood of entering a good university (OR = 1.20, $p < .10$).

In the next three models, identical analyses were conducted for the G9 cohort. A similar effect of family economic status was shown in model 4. Exposure to economic hardship at age 15 (early economic disadvantage), at age 18 (late economic disadvantage), and at both ages 15 and 18 (chronic economic disadvantage) for the G9 respondents decreases the likelihood of entering a top-tier university by 56%, 42%, and 38% respectively, when compared to their counterparts who never spent any time in low income conditions. Respondents who have better educated mothers are about 2.5 to almost 4 times more likely to enter a top-tier university than those whose mothers did not complete high school. For the G9 cohort, living with both biological parents also matters for academic achievement. Youths who have grown up with both parents are nearly two times more likely to be enrolled in a top university than their counterparts living in other family arrangements (OR = 1.85, $p < .05$). There is no statistical significant effect found for sibship status.

The additional variables added in Model 5 show that only early economic disadvantage is still predictive of a lowered likelihood of entering a top-tier university. School adjustment has a marginally significant positive effect on entering a good university, but no effect was reported for family warmth. Quite similar to the findings presented for the G7 cohort, having a positive self-image (OR = 1.11, $p < .001$) increases the likelihood of attending a higher-ranked university, whereas

scoring high on teacher-rated agreeableness ($OR=1.10$, $p<.001$) also increases the likelihood. When actual scores on these two scales are applied, the coefficients indicate that a standard deviation increase in ratings on positive self-image and objective agreeableness is associated with 38% and 44% higher likelihood of entering a top university respectively. The moderating effects of personality traits are shown in model 6. For youths who experienced low family income in both mid- and late-adolescence, a higher score on self-rated conscientiousness ($OR=1.31$, $p<.10$) has a marginal effect on increasing the likelihood of attending a top-tier university, when compared to those who never experienced economic disadvantage at home.

C. Entry into a Graduate Program: The G9 Cohort Sample

For the G9 cohort, the next set of analyses presented in Table 3 shows the factors that are associated with entry into a graduate program. In the baseline model, early ($OR=0.57$, $p<.10$) and chronic exposure ($OR=0.62$, $p<.05$) to economic disadvantage lowers the likelihood of entering a graduate school by about 40%, when compared to those who never had such an experience. Maternal education again exerts a positive effect—having a better educated mother increases the chances of enrollment in a graduate school by about twofold. Higher family warmth ($OR=1.03$, $p<.10$) is associated with an increased likelihood of entering a good university. Teacher-rated agreeableness ($OR=1.11$, $p<.001$) also has a significant effect on increasing the chances of proceeding to advanced graduate education. The last model shows the moderating effect of non-cognitive traits on receiving graduate education. None of the interaction terms examined attain statistical significance in the analysis.

Finally, to examine whether the timing of exposure to economic strain matters, models with chronic economic disadvantage as the reference group were fitted, as shown in Table 4. The differences between early vs. late economic disadvantage vs. chronic economic disadvantage are not statistically significant in all three models presented. The key difference is between never experienced economic disadvantage versus chronic economic disadvantage. Youths who have never lived in economically stressed families are about 70% more likely to enroll in a good university for the G7 cohort ($OR=1.70$, $p<.05$), and only a marginally significant effect of never in economic disadvantage is found for the G9 cohort ($OR=1.45$, $p<.10$).

Table 3: Odds ratios of logistic regression models predicting entry into graduate school for the 9th-grade cohort (N=1882, multiply imputed data)

	model 1	model 2	model 3
Family Economic Status (reference: Never experienced economic disadvantage)			
Early economic disadvantage (poverty at age 13, but not age 15)	0.57 [†]	0.64	0.38
Late economic disadvantage (poverty at age 15, but not age 13)	0.81	0.91	5.80
Chronic economic disadvantage (poverty at both ages 13 & 15)	0.62*	0.67	0.04
Male	1.48*	1.75**	1.77**
Maternal Education (reference: Less than high school)			
High school	1.28	1.23	1.25
Junior college	2.24**	1.95*	1.96*
College and above	1.92*	1.57	1.60
Family Structure (reference: Other family)			
Two-biological-parent family	1.62	1.44	1.46
Siblings (reference: Zero)			
One	0.93	0.87	0.82
Two	0.76	0.70	0.67
Three or more	0.75	0.72	0.69
School Adjustment		1.05	1.06
Family Warmth		1.03 [†]	1.03 [†]
Self-rated Positive Self-image		1.02	1.02
Self-rated Conscientiousness		0.99	1.00
Teacher-rated Agreeableness		1.11***	1.10***
Family Economic Status × Self-rated Positive Self-image (ref.: Never experienced EconDisadv × Self-rated positive self-image)			
Early EconDisadv × Self-rated positive self-image			0.95
Late EconDisadv × Self-rated positive self-image			1.02
Chronic EconDisadv × Self-rated positive self-image			1.00
Family Economic Status × Self-rated Conscientiousness (ref.: Never experienced EconDisadv × Self-rated conscientiousness)			
Early EconDisadv × Self-rated conscientiousness			1.05
Late EconDisadv × Self-rated conscientiousness			0.69
Chronic EconDisadv × Self-rated conscientiousness			1.22
Family Economic Status × Teacher-rated Agreeableness (ref.: Never experienced EconDisadv × Teacher-rated agreeableness)			
Early EconDisadv × Teacher-rated agreeableness			1.03
Late EconDisadv × Teacher-rated agreeableness			1.02
Chronic EconDisadv × Teacher-rated agreeableness			1.04
<i>N</i>	1882	1882	1882

[†]p < .10; *p < .05; **p < .01; ***p < .001

Table 4: Odds ratios of logistic regression models predicting higher education outcomes for both cohorts, with “chronic economic disadvantage” as the reference family economic status (multiply imputed data)

	Top College		Graduate Program
	7 th Grade	9 th Grade	9 th Grade
Family Economic Status			
(reference: Chronic economic disadvantage)			
Early economic disadvantage	1.01	0.70	0.97
Late economic disadvantage	0.99	0.90	1.37
Never experienced economic disadvantage	1.70*	1.45 [†]	1.50
Male	1.59**	1.20	1.75**
Maternal Education			
(reference: Less than high school)			
High school	1.52 [†]	1.25	1.23
Junior college	4.47***	2.45**	1.95*
College and above	3.65***	3.89***	1.57
Family Structure (reference: Other family)			
Two-biological-parent family	1.10	1.73 [†]	1.44
Siblings (reference: Zero)			
One	1.38	1.33	0.87
Two	1.01	1.18	0.70
Three or more	0.61	0.89	0.72
School Adjustment	1.15**	1.06 [†]	1.05
Family Warmth	1.04 [†]	0.99	1.03 [†]
Self-rated Positive Self-image	1.06*	1.11***	1.02
Self-rated Conscientiousness	1.10 [†]	1.05	0.99
Teacher-rated Agreeableness	1.15***	1.10***	1.11***
Relative class ranking in 11th grade	0.25**	—	—
<i>N</i>	1662	1882	1882

[†]p < .10; *p < .05; **p < .01; ***p < .001

Note: The ages to which each family economic status dummy refers are:

Early economic disadvantage—at age 13, but not age 15 (G7) or at age 15, but not age 18 (G9)

Late economic disadvantage—at age 15, but not age 13 (G7) or at age 18, but not age 15 (G9)

VI. Conclusions and Discussion

Empirical research on the consequences of family economic disadvantage is greatly lacking in Taiwan. This study aims to investigate the impact of family economic hardship on higher education outcomes and to explore the critical role of non-cognitive traits in reversing the life chances of disadvantaged youths. To start out, the prevalence of exposure to economic disadvantage is examined. Roughly 40% of the G7 and G9 respondents are categorized as living in families with relatively low income (bottom one third in the sample distribution) at Wave 1. Achievement in higher education is a particularly salient developmental indicator in young adulthood, as it is critical for later occupational attainment and earning capacity.

The regression analyses show that for both G7 and G9 cohorts, family economic status during adolescence does matter for the odds of entering a higher-ranked university in Taiwan. Prolonged exposure to economic hardship in mid- and late-adolescence for the G9 cohort also lowers the likelihood of entering a graduate program in early adulthood. Both subjective and objective non-cognitive traits are associated with more favorable outcomes in tertiary education. Finally, limited evidence was found for the protective role of positive non-cognitive traits. A marginally significant moderating effect is observed for having a positive self-image for the G7 youths who were exposed to late economic disadvantage and for being conscientious for the G9 youths who experienced chronic economic disadvantage.

These findings show that within the same cohort of youths (G7 or G9), family economic disadvantage experienced earlier in adolescence is particularly harmful for higher education attainment in early adulthood, which is independent of the influences from maternal education, socio-demographic traits, and other individual characteristics covariates. The results reported here resonate with prior U.S. studies that reveal the significant influence of adolescent poverty experience on academic achievement (Duncan et al., 1998; Guo, 1998; Hauser and Sweeney, 1997). In particular, we focus on the odds of entering a higher-ranked university rather than just any university in Taiwan, since college admission rates have become so much higher over the past decade. The mediating process is very likely through earlier entry into lower-ranked high schools that tend not to emphasize and invest in students' scholastic performance and educational advancement as much as the more academic-oriented high schools.

For the influence of personality, youths who self-rated as having more positive self-image and those who were rated by teachers as more agreeable are significantly more likely to enter a top university for both cohort samples. Teens who hold a more

positive attitude toward themselves are more efficacious in navigating through challenges and adversities encountered in their lives. Agreeable youths tend to have better adjustment to challenges and broader social relationships that also benefit their overall development. The findings correspond to prior research findings that positive personality traits are rewarded in the educational process (Jacob, 2002; Luthar, 1999). Further analyses that investigate the moderating (protective) role of non-cognitive traits only yield very limited positive effects. A positive self-image seems to be protective for those G7 youths who experienced late economic disadvantage, and being more conscientious also increases the likelihood of entering a top university for G9 youths who experienced chronic economic disadvantage. Both effects only attain marginal statistical significance.

There are two plausible explanations for why so little protective evidence was found for non-cognitive traits. On the one hand, it is possible that non-cognitive traits are more influential in an earlier stage of the educational stratification process, such as the entrance to high schools, and that they exert very little protective effect on poor youths' college attainment in the Taiwanese context. On the other hand, the cell sizes for disadvantaged youths who experienced the outcome events (i.e., entered a top-tier university or a graduate program) in the interaction terms shown in Table 2 are small. Among the few hundreds of youths who attended a top-tier university, only about 25 to 36 youths in the chronic economic disadvantage group from either the G7 or the G9 cohort entered a top-tier college or a graduate program. Cell sizes for those in early or late economic disadvantage groups are even smaller (averaging about 20 youths entering a top university per cohort and family economic status), which could be an important factor behind why a very limited personality moderating effect was detected for youths across the models. It is very likely that larger cell sizes would reveal stronger statistically significant interaction effects in these models.

The persistent effect of most family economic statuses on tertiary educational outcomes reported in Tables 2 and 3 corresponds to past findings of how family economic conditions in adolescence affect achievements (Guo, 1998; Hauser and Sweeney, 1997). In fact, this study started out by investigating only the impact of Wave 1 family economic condition on the likelihood of entering a good university. This cross-sectional family economic well-being measure yielded a less consistent effect than the current specifications. The current family economic measure that combines family income information from two waves show a stronger and more nuanced effect on higher education outcomes.

Comparing the analytical results between the G7 and G9 cohorts in Table 2, the maternal educational gradient in youth achievement is stronger among the G7

than the G9 cohort. While youths with college-educated mothers in both cohorts are about 4 times more likely than their peers with mothers who did not graduate from high schools to enter a higher-ranked university, youths from the G7 cohort whose mothers completed high school and junior college education have much higher chances of enrolling in a top-tier university than those with mothers who have no high school degrees, when compared to the maternal education gradient observed among the G9 counterparts. Moreover, in Table 4, the figures again show that youths from relatively well-off families (who never experienced economic disadvantage) are much more likely than their chronically disadvantaged peers to have better higher education outcomes in the G7 cohort than in the G9 cohort. The expansion of the achievement gap in higher education between social classes observed between the two cohorts could be the unintended consequences of the major educational reforms implemented in 2001.

The cohort of G7 youths is the first group of junior high school students who did not have to take the joint entrance exam to enter a high school. The results here suggest that the educational reform, while aiming to open up multiple channels to high school education and to reduce exam stress levels among junior high school students, may have caused more unequal educational outcomes across the socioeconomic spectrum than the old system does. A possible explanation is that in the old system when high school entrance exams were required, students from a lower socioeconomic background who outperformed their peers tended to enter one of the top high schools, which have better educational resources and emphasize academic excellence. In turn, economically disadvantaged students who got into these top high schools had better chances to enter a higher-ranked university in the future. It is likely that the multi-channel education policy has not opened up more opportunities for the disadvantaged students from the G7 cohort to enter those academic-oriented high schools, which has resulted in an expanding social gap in secondary schooling opportunities. Such a gap can persist to further reduce the likelihood of an upwardly mobile path to top universities among the disadvantaged youths. Based on the current state of education research in Taiwan, this study is the first to reveal the consequences of the 2001 educational reform. More empirical research using large, nationally representative samples is needed to confirm the emergence of a widened socioeconomic gap in educational attainment.

There are some limitations of the current study. First of all, there are no retrospective family income reports for a respondent's pre-adolescent years. It is thus not possible to incorporate a long-term income measure to examine whether the disadvantaged economic conditions at home have roots dating back to earlier years. The information available to this study can only show the effect of how family

economic difficulties in early and mid-adolescence (or mid- and late-adolescence for the G9 cohort) affect the likelihood of advancement in higher education. Second, an objective measure of conscientiousness is not available in this study. It is very likely that an objective measure may have different direct and moderating effects on higher education outcomes. Future longitudinal surveys should include questions that measure this personality disposition in the questionnaire, as it is an important trait for determining educational and occupational attainments (Higgins et al., 2007).

To the author's knowledge, this study is the first to utilize multi-wave panel data to investigate the long-term impact of disadvantaged family economic status on subsequent academic outcomes in Taiwan. The findings reveal that exposure to low-income conditions during adolescence affects attainment in higher education among two recent cohorts of Taiwanese youths. Results also demonstrate that positive personality traits raise the likelihood of entering a top university, although limited evidence is found for the protective role of positive non-cognitive traits in altering life chances for economically disadvantaged youths in the Taiwanese context. Surveys with a larger youth sample size are needed before a conclusive argument can be made regarding the moderating role of non-cognitive traits in the educational stratification process in Taiwan. Future studies should seek to investigate whether family economic hardship also causes unfavorable outcomes in other domains of life, such as psychological well-being, occupational outcomes and marriage prospects. As the future workforce in Taiwan is shrinking due to a prolonged demographic crisis of low fertility, the findings reported here have important policy implications. That is, minimizing educational inequalities between social classes ensures that our society will be able to optimize the productivity generated by these smaller cohorts of young adults for the years to come.

Appendix 1. Definitions of top-tier universities

Schools that are categorized as top-tier universities:

National Taiwan University, National Cheng Chi University, National Tsin Hua University, National Taiwan Normal University, National Cheng Kung University, National Chung-hsin University, National Chiao Tung University, National Central University, National Sun Yat-Sen University, National Taiwan Ocean University, National Chung Cheng University, National Kaohsiung Normal University, National Chang Hua Normal University, National Yang Ming University, National Taipei University, National Chia Yi University, National Kaohsiung University, National Tung Hua University, National Chi Nan University, National Taiwan University of Science and Technology, Chang Gung University, Kaohsiung Medical University, Taipei Medical University, Chung Shan Medical University, and China Medical University.

**Appendix 2. Cutoff family income levels for defining
“economic disadvantage” status**

	Household Size				
	2~3	4	5	6	7 or more
35 Percentile Monthly Family Income (in thousands, NT dollars)					
G7					
Wave 1	35	50	40	40	40
Wave 3	30	45	40	40	35
G9					
Wave 1	40	46	45	40	40
Wave 4	40	45	45	40	40

Appendix 3.

Items used to construct various personality trait scales

From the student questionnaire

Self-rated Positive Self-image (Cronbach's $\alpha=0.73/0.77$ for G7/G9)

Do you agree with the following description about your personality traits?
(items reverse coded for scale construction)

- ◆ I cannot solve some of my own problems.
- ◆ I cannot control what happens to me.
- ◆ I feel helpless about having to deal with various issues in my life.
- ◆ I don't have much to be proud of.
- ◆ Sometimes I feel I am useless.
- ◆ Sometimes I feel I am a person of no merits.

Self-rated Conscientiousness (Cronbach's $\alpha=0.63/0.61$ for G7/G9)

Please read the following descriptions about personal attitudes and characteristics and answer whether each one of them applies to you? (items reverse coded for scale construction)

- ◆ Sometimes I give up doing something because I have no confidence in myself.
- ◆ Sometimes I pretend to be sick to avoid facing certain things.
- ◆ Sometimes I take advantage of others.
- ◆ Sometimes I prefer retaliation rather than forgiveness.
- ◆ Sometimes I am jealous of others' good fortune.

From the teacher questionnaire

Teacher-rated Agreeableness (Cronbach's $\alpha=0.91/0.91$ for G7/G9)

Do you think the following traits describe this student as a person?

- ◆ He/she is a responsible person.
- ◆ He/she is friendly to people.
- ◆ He/she likes to help people.
- ◆ He/she is very involved in class affairs.
- ◆ He/she has qualities of being a good leader.
- ◆ He/she is optimistic.
- ◆ He/she is confident.
- ◆ He/she is humorous.
- ◆ He/she has a sense of justice.
- ◆ He/she is proactive and strives for perfection.

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人格特質對高等教育成就之影響： 臺灣經濟弱勢青少年的發展

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摘 要

儘管貧窮與經濟弱勢對個人發展有長遠的影響，臺灣在相關議題上累積的實證研究仍相當有限。文獻普遍顯示經濟弱勢青少年的教育成就較中產階級家庭青少年為低。然而，近年有關人類發展與社會不平等的研究顯示，正面人格特質對教育成就具正向影響，甚至可帶來「扭轉命運」的保護效果。本文運用臺灣青少年成長歷程研究資料庫國一與國三兩組樣本約三千五百人，試圖檢驗一個實證問題：人格特質如何影響高等教育成就，以及其是否真具有復原力效應可扭轉經濟弱勢青少年的高等教育成就？分析結果顯示：正面人格特質確實可提高進入國立大學的機會，但其對經濟弱勢青少年的復原力效應則較有限。文末一併探討民國八十九年高中多元入學方案對加深教育不平等之可能影響。

關鍵字：貧窮、經濟弱勢、青少年發展、非認知特質、人格特質、復原力、教育成就