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Non-cognitive Traits and Educational Achievement among Taiwanese Youths in Poverty

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This study aims to use the both the 7th and 9th grade samples from the Taiwan Youth Project dataset to examine how non-cognitive traits might serve as sources of resilience for youths who experienced economic hardship during adolescence. Both subjective and objective measures of personality traits will be examined to see whether they moderate the impact of family poverty status on the likelihood of entry into a top-tiered university and a graduate program. The results show that for the younger cohort, those who were exposed to longer family poverty in adolescence, having a more conscientious personality raises the likelihood of entering a top university. For the older cohort, the resilient effect of personality in altering the chances of entering a good university mainly matters when poverty was experienced during mid-adolescence. Finally, for the older cohort of youths, those who were exposed to poverty in mid and late adolescence, self-rated conscientiousness and objective measures of agreeableness and conscientiousness significantly increases the likelihood of entering a graduate school, when compared to their peers who never experienced poverty.

Introduction

Exposure to poverty has been reported as one major life adversity that has long-term impact on various developmental outcomes. The multifaceted unfavorable consequences of children growing up in families with economic hardships have been widely documented (Brooks-Gunn and Duncan 1997). Children who are raised in families with substandard economic well-being are more likely to have poor physical health, lower cognitive and academic attainment, and more prone to have emotional or behavioral problems. In addition, poor children are also more at risk of having out-of –wedlock births as teens or to be economically inactive as young adults (Brooks-Gunn and Duncan 1997). The timing and length of exposure to poverty also matters. Poverty experienced during the first five years of life has lasting detrimental effect on later outcomes and cognitive ability (Duncan, Yeung, Brooks-Gunn, and Smith 1998; Guo 1998); whereas the impact of adolescent poverty appear to be limited to educational and occupational opportunities observed in late adolescence and early adulthood (Guo 1998; Hauser and Sweeney 1995). The long-term impact of poverty on an array of unfavorable developmental outcomes have been documented in various studies (Duncan, Brooks-Gunn, and Klebanov 1994; Duncan, Yeung, Brooks-Gunn, and Smith 1998; Guo 1998; Teachman, Paasch, Day, and Carver 1997). Research has in general found that longer exposure to poverty leads to more negative physical and cognitive outcomes, particularly when economic hardships are observed in early childhood years (Guo 1998; Korenman and Miller 1997; Teachman, Paasch, Day, and Carver 1997).

Past studies about the negative impact of poverty on child development in Taiwan has mostly been qualitative interviews conducted to very limited convenient samples. Empirical studies that examine the impact of poverty on child development have relied on regional, cross-sectional small samples. Poverty studies that utilize longitudinal, large-sample survey data have been surprisingly non-existent. Furthermore, no study to the author's knowledge has attempted to examine the crucial role of non-cognitive traits in moderating the

detrimental impact of poverty on college enrollment. The current study aims to utilize the Taiwan Youth Project (TYP) to study how exposure to poverty in adolescence affects the likelihood of entering a top-tiered university and graduate school in Taiwan among two recent cohorts of youths born in the mid- to late-1970s. Furthermore, the importance of non-cognitive traits, such as self-image, conscientiousness and agreeableness, will be investigated as possible moderating factors that lead to resilient adaptation for youths who experience economic hardships at home.

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 factors that lead to favorable adaptations despite adversity experienced early in an individual's life course (Masten and Powell 2003). The presence of risk usually 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 these challenges that often bring enduring and detrimental to their lives.

In the risk and resilience literature, research has shown that resilience resides both in the social context as much as within the individual (Rutter 1993). Masten and Garmezy clearly pointed out three broad sources of resilience: (1) family cohesiveness, warmth and lack of discord; (2) the availability of 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 adverse circumstances (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 long-term resilient developmental trajectories. Intimate and caring relationships formed with caretakers during the early years are the fundamental mediators of successful human development and promote resilient adaptations among children exposed to adverse circumstances (Shonkoff and Phillips 2000). In particular, having a supportive and responsive mother contributes to resilient adaptation in the face of stressful life events (Ge, Lorenz, Conger, Elder, and Simons 1994), and it has a long-lasting influence on later life adjustments by benefiting youth in interpersonal skills and interactions with peers (Furman, Simon, Shaffer, and Bouchey 2002).

Having a positive peer relationship can be a source of resilience during adolescence. 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. Prior works showed that peer acceptance and perceived social support ameliorate the impact of negative and stressful life events (Luthar 2006; Werner 2000). In particular, a close relationship with friends and friends' parents from stable families help at-risk youths gain a constructive perspective on their own life circumstances (Werner and Smith 1989). Although not a substitute for a good relationship with parents or major caregivers, these social relationships can enrich and improve resilient children's life.

As for personality traits, longitudinal research on competent children and youths who experienced high-risk conditions (e.g., poverty and parental divorce) have found that they tend to possess some common characteristics, such as good problem-solving and communication skills, a positive self-concept, a sense of self-efficacy, flexible coping strategies, and a reflective (not impulsive) cognitive style (Seifer, Sameroff, Baldwin, and Baldwin 1992; Werner 1990; Werner and Smith 1989). A study also showed that resilient youths who are exposed to parental mental problems 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). Individuals 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).

This study focuses on the role of non-cognitive traits (i.e., personality characteristics) in moderating the negative impact brought by exposure to poverty in adolescence on later opportunities in higher education: entry into a top-tiered university and an advanced graduate program. Both subjective and objective measures of non-cognitive traits will be used in the analytical models to evaluate the potential protective effects exerted by positive personality dispositions on altering the life chances of youths who experienced poverty.

Prior Research

Exposure to Poverty and Educational Attainment

Both timing and duration can harm the intellectual development of children by affecting their cognitive ability and academic achievement. While poverty experienced in adolescence is critical for achievement, early childhood poverty is more detrimental to the development of cognitive ability (Guo 1998). Using the National Longitudinal Study of Youth 1979 data, Guo (1998) found that cumulated, chronic poverty experienced 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 are designed to measure academic *achievement*. Longer exposure to poverty does not necessarily lead to poorer outcomes, 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 in another study. Using the data from

the Panel Study of Income Dynamics, Duncan and colleagues have shown that family income averaged from birth to age 5 exerts the largest 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 indicates that at the higher end of the socioeconomic spectrum, the results suggest that entry into college is facilitated if parental income during adolescence is high (Duncan, Yeung, Brooks-Gunn, and Smith 1998).

The role of adolescent exposure to poverty in educational attainment is also reported in a study that analyzed the Wisconsin Longitudinal Study (WLS) data. 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 1995). 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.

Taken together, past studies using U.S. data have repeatedly shown that family economic hardships during adolescence have important effect on academic achievement. Empirical research on the impact of poverty on developmental outcomes using large scale, longitudinal data is so far non-existent 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 7^{th} and 9^{th} grades in 2000.

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 also rewarded in the educational context and job market and are correlated with better socioeconomic achievements in various studies.

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 argued that personality traits like industriousness, perseverance, and leadership are traits that are positively rewarded in schools and in the labor market. The positive effect of these traits are comparable to other characteristics that predict positive labor market outcomes, such as IQ, completed years of schooling, and parental socioeconomic status (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 found that cognitive and non-cognitive traits are conceptually distinct characteristics and tend to have non-negligible and significant impact on various developmental outcomes (Almlund, Duckworth, Heckman, and Kautz 2011; Heckman and Rubinstein 2001; Lundborg, Nystedt, and Rooth 2010).

A recent study by Heckman and colleagues also showed that non-cognitive traits have significant influence on educational outcomes, occupational choices, wages, and an array of social behaviors (Heckman, Stixrud, and Urzua 2006). Using the NLSY79 survey sample, they found 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 employers, 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 smoker by age 18, to use marijuana, to be incarcerated, and to engage in other illegal activities (Heckman, Stixrud, and Urzua 2006; Masten and Garmezy 1985).

Given the literature reviewed above, this study aims to use a large, longitudinal dataset in Taiwan to explore three important research questions: (1) How does exposure to poverty affect the likelihood of tertiary educational outcomes in adulthood? (2) How are

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

non-cognitive traits associated with tertiary educational outcomes 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 investigate these empirical questions.

Research Design

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, Academia Sinica, in Taipei, Taiwan. With the life course perspective as a theoretical framework, this project aims to study the impact of family and school processes on shaping the developmental experiences and outcomes of two recent cohorts of Taiwanese adolescents. Hence, in addition to the student sample, teachers and parents were also interviewed to collect information on adolescents' school and family environment.

A stratified, random sampling method was used to select adolescents enrolled in 7th and 9th grades[2] 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 were the very first cohort of junior high school students who do not need to take the joint entrance exam to enter a high school, while passing the exam is the only channel for the older ninth graders to receive high school education. 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. Both groups of 7th and 9th graders (refer to as G7 and G9 cohorts hereafter) have been followed annually till 2008/2009. As of 2011, a total of 9 waves of data have been

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

collected for the G7 cohort and 8 waves for the G9 cohort.

Sample

The two analytical samples used for this study are defined separately for the younger versus 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 wave of survey are included. For the G9 cohort, respondents who participated in the first and forth waves as well as any of the fifth, sixth, seventh, or eighth wave of survey are included. 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.

Variables and Measurements

I. Outcome Variable

A dichotomous variable measuring whether a respondent entered a top-tiered university was created by using reports gathered from waves 7 through 9 for (Astone and McLanahan 1991) the G7 cohort and from waves 5 through 8 for the G9 cohort. The category of "top-tiered university" is defined by enrollment in one of the national universities, medical schools, and some of the higher-ranked private universities in Taiwan. A detailed list of these schools is presented in the Appendix 1.

II. Independent Variables and Covariates

Poverty Status: The key independent variable for this study is a categorical variable measuring the length of exposure to poverty. The measurement of poverty status is constructed in several steps. First, parental report of family income is divided by number of family members residing in the same household. In cases where parental reports on family income are missing, adolescents' reports are used to impute the missing cases. Then, this per capita income is matched with the per capita minimum cost of living defined in the Social

Aid Law (Article IV for low-income family)[3]. If the calculated per capita income falls below the "poverty line" defined in the Social Aid Law, the respondent is coded as living in poverty.

This measurement of poverty is constructed for Waves 1 and 3 (roughly ages 13 and 15) for the G7 cohort and for Waves 1 and 4 (roughly ages 15 and 18) for the G9 cohort. Three dummy variables indicating the exposure to poverty for both cohorts were created: early poverty, later poverty, chronic poverty, and never in poverty. The first category refers to those who were in poverty at age 13 but not at age 15. The second category refers to those who were not in poverty at age 13 but live in poverty at age 15. Those in the last category were living in poverty at both ages 13 and 15. The reference category is those who were never in poverty at both ages. The same variable construction procedure is repeated for the G9 cohort, except the second wave of information come from wave 4 (when the G9 respondents were age 18) rather than wave 3.

Other covariates used in this study include: sex, maternal education, family structure, and sibship size. 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, three and more siblings. These variables have been found to be predictive of educational outcomes (Astone and McLanahan 1991; Downey 1995), so they included in the analytical models as covariates.

III. Moderators

<u>Non-cognitive (Personality) Traits:</u>

[3] The per capita minimum cost of living is different for those living in Taipei city versus those living in the rest of Taiwan. For example, the poverty line is NT$11,625 for Taipei city residents and NT$7,598 for residents in other parts of Taiwan in 2000. This difference is taken into account when the poverty variables are constructed. The per capita minimum cost of living is adjusted annually to reflect inflation from year to year. The different cutoff lines for defining poverty is taken into account when measuring poverty in different waves between the two cohort samples.

The measurements of non-cognitive traits in this study come from subjective and objective reports. A detailed list of items used to create the following scales is shown in Appendix 2. There are two subjective variables of non-cognitive traits: conscientiousness and negative self-image. Adolescents were asked to rate themselves in certain aspects of personality traits. These items are summed to create two scales of negative self-image and conscientiousness. The Cronbach's α for negative self-image are 0.73 for the 7th-graders and 0.77 for 9th-graders. As for the Cronbach's α for self-rated conscientiousness are 0.53 for the 7th-graders and 0.61 for the 9th-graders.

Objective measurements of non-cognitive traits are constructed by using parental and teacher reports on adolescent respondents' personality traits. A scale for agreeableness is created by adding parental ratings on these items (as shown in Appendix 2). Having a higher score on this scale indicates an adolescent has a more agreeable personality. The Cronbach's α for this scale is 0.81 for the 7th-graders and 0.91 for the 9th-graders. Another scale for conscientiousness is constructed by using teacher's reports (refer to items listed in Appendix 2). Having a higher score on this scale indicates a youth is more conscientious. The Cronbach's α for these two scales is 0.91for both samples.

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 poverty affects the likelihood of entrance into top-tiered universities. In addition, the influence of non-cognitive traits and their potential moderating effect on the association between poverty status and entrance into top universities will also be explored for both the seventh grade and ninth grade cohorts. Finally, an additional set of analyses predicting entrance into graduate school is also conducted for the 9th-grade cohort, for they are old enough to make such a transition by the last wave of survey.

Results

Descriptive Statistics

Table 1 shows that about 12% of the G7 cohort entered into one of the top-tiered colleges defined in Appendix 1. For the G9 cohort, about 14% entered such colleges and about 10% proceeded to more advanced education in graduate schools. As for poverty status, about 10-11% of both G7 and G9 samples lived in poverty while they were interviewed at ages 13 or 15 (early poverty). About 14-17% of these respondents were only exposed to poverty later at ages 15 or 18 (late poverty). About a fifth to a quarter of both cohorts lived in poverty in both waves of survey. Roughly 40% of all respondents were never exposed to poverty. Table 2 shows the missing data pattern. The highest missing cases are found for the variable "parent-rated agreeableness" for both cohorts of samples (roughly 13% for G7 and 15% for G9). Poverty status is also missing on about 13% of the G9 sample, because many of them lack parental reports on family income in the W4 data. Income reports from the adolescent respondents were not available in that wave of survey, so missing cases cannot be imputed with adolescents' reports of family income.

Seventh-Grade Cohort Sample

The first set of analyses (Table 3) show the impact of poverty status on the likelihood of attending a top-tiered university for the G7 cohort. As presented in Model 1, exposure to poverty at age 13 (early poverty) has the strongest effect on lowering the likelihood of attending a top-tiered university, compared to the other two poverty statuses. All things being equal, living in poverty at age 13 lowers then likelihood of entering a top university by 53%, whereas poverty experienced at both ages 13 and 15 (chronic poverty) decreases the likelihood of entering a good university by 40%, when compared to those who never live in poverty in both time periods. Exposure to poverty when a youth is older (at age15) does not significantly lower the chances of attending a good university. Maternal education exerts a strong influence on a youth's educational achievement. Respondents who have a mother with

more than junior college education are more than four to five times more likely 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 the first three models of Table 3, four different measures of subjective/objective non-cognitive traits are added into the baseline model. The odds ratios show that having a positive self-image raises the chances of entering a top university (OR=1.08, p<.05), while having an agreeable (parent report) (OR=1.04, p<.10) and a conscientious (teacher report) (OR=1.17, p<.001) personality increase the chances. There is no significant effect found for the self-rated conscientiousness. In the last three models, the moderating effects of non-cognitive traits are examined. The results showed that for youths who are exposed to chronic poverty in early adolescence, having a higher score on self-rated conscientiousness is associated with higher likelihood of entering into a top-tiered university (OR=1.53, p<.05). Similar effect is also found for teacher-rated conscientiousness (OR=1.07, p<.10), showing that positive non-cognitive traits have the potential to reverse the detrimental impact of poverty on academic achievement for the G7 cohort sample.

Ninth-Grade Cohort Sample

In Table 4, identical models as presented in Table 3 were fitted for the G9 cohort. Similar effect of poverty status was shown in the first model. Exposure to poverty at age 15 (early poverty) and at both ages 15 and 18 (chronic poverty) for the G9 respondents decrease the likelihood of entering a top-tiered university by 44%, when compared to their counterparts who never spent any time in poverty. Exposure to poverty in late adolescence (age 18) does not significantly affect the chances of attending a good university. Respondents who have better educated mothers are about three to four times more likely to enter a top-tiered university than those with mothers without a high school degree. For the G9 cohort, living with both biological parents also matters for academic achievement. Youths who grow 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<.10). There is no statistical significance found for birth order.

The impact of non-cognitive traits is analyzed in the first three models. Quite similar to the findings presented in Table 3, having a positive self-image increases the likelihood of attending a higher-ranked university (OR=1.11, p<.001), whereas having an agreeable (OR=1.13, p<.001) and a conscientious (OR=1.11, p<.001) personality increase the likelihood. Again, there is no significant effect found for the self-rated conscientiousness. The moderating effects of personality traits are shown in the last three models. Both self-rated conscientiousness (OR=1.42, p<.10) and parent-rated agreeableness (OR=1.28, p<.10) increase the likelihood of attending a top-tiered university when a youth is exposed to poverty in mid-adolescence, relative to never experienced poverty.

The next set of analyses presented in Table 5 show the factors that are associated with entry into a graduate school. Holding everything constant, exposure to poverty at both ages 15 and 18 lowers the likelihood of entering graduate school by about 34% (OR=0.66, p<.10), when compared to those who never experienced poverty. As reported earlier, having a better educated mother increases the chances of enrollment in a graduate school by more than two times. As for the non-cognitive traits, both parent-rated agreeableness (OR=1.14, p<.001) and teacher-rated conscientiousness (OR=1.11, p<.001) has a significant effect on increasing the chances of proceeding to advanced graduate education.

The next three models show the moderating effect of non-cognitive traits on receiving graduate education. Those who have more positive self-image and are exposed to poverty at both ages 15 and 18 are more likely than others to enter a graduate program (OR=1.10, p<.10). Both parent-rated agreeableness and teacher-rated conscientiousness for youths who lived in poverty from mid- to late adolescence show significant interaction effects as well. Youths who experienced prolonged poverty but are more agreeable (OR=1.14, p<.10) and

more conscientious (OR=1.13, p<.05) are significantly more likely to enter graduate school than their peers without these positive personality dispositions.

Conclusions and Discussions

This study aims to explore the critical role of non-cognitive traits in reversing the life chances of youths who are exposed to poverty during adolescence. To start out, the prevalence of poverty is examined. The descriptive statistics show that about 32-37% of the G7 and G9 sample are categorized as living in poverty at Wave 1 (ages 13 and 15 respectively). The poverty prevalence rates here are markedly higher than the government statistics. Thus, the number of extended family members (not including grandparents from both sides) that are reported as household members was further analyzed. The existence of these relatives is likely to lower the per capita family income (while potentially having their own earnings) and increase the risk of a family being categorized as impoverished. The analyses (not shown) show that only about 16-21% of families in both G7 and G9 samples have reported any extended family members. Further analyses show that excluding these relatives does not make a big difference in per capita family income and the number of youths who are categorized as living in poverty. It only raises the percentage of teens never lived in poverty by 1.5-3% for both G7 and G9 cohorts. The prevalence of poverty rates demonstrates the significance of investigating the impact of family economic well-being on youth's developmental outcomes, particularly educational attainment.

The regression analyses show that for both G7 and G9 cohorts, poverty status during adolescence does matter for the entry into a top-tiered university in Taiwan. Exposure to poverty in mid- and late-adolescence for the G9 cohort also lowers the likelihood of entering a graduate program in early adulthood. The majority of the non-cognitive traits (i.e., positive self-image, agreeableness, and conscientiousness) are associated with higher attainment in tertiary education. Finally, a moderating effect is observed for chronic poverty and

conscientiousness (both subjective and objective measures) among the G7 sample. For the G9 sample, only self-rated conscientiousness and parent-rated agreeableness have moderating effect on raising the likelihood of entering a good university for youths who were exposed to poverty in mid-adolescence (age 15; early poverty). Youths in the G9 sample who have more positive self-image and score higher on parent-rated agreeableness and teacher-rated conscientiousness are more likely to enter a graduate school than their peers who also experienced family economic hardships during mid- and late adolescence (ages 15 and 18; chronic poverty).

These findings show that within the same cohort of youths (G7 or G9), both poverty experienced earlier in adolescence and longer exposure to poverty lead to lower educational attainment in early adulthood, which is independent of influences from maternal education and other sociodemographic controls. The results reported here resonate with prior U.S. studies that reveal the significant influence of adolescent poverty experience on academic achievement (Duncan, Yeung, Brooks-Gunn, and Smith 1998; Guo 1998; Hauser and Sweeney 1995). In particular, we focus on the odds of entering higher-ranked university rather than just any university in Taiwan. 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 academic high schools.

In addition, youths who feel better about themselves and who demonstrate an agreeable and conscientious disposition are significantly more likely to have better educational outcomes. These positive traits reverse the impact of poverty experience on the likelihood of entering a top-tiered university and a graduate program. These findings correspond to prior research findings that positive personality traits are rewarded in the educational process and that non-cognitive skills can be a source of resilience to promote competent adaptation among youths who experienced adversity.

Comparing the analytical results between Tables 3 and 4, youths from the G7 cohort

whose mothers completed high school and junior college education have much lower chances of enrolling in a higher-ranked university than their G9 counterparts. The cohort of G7 youths is the very first group of junior high school students who no longer need 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 stress levels among junior high school students, may have caused more unequal educational outcomes across the socioeconomic spectrum than the old system does.

The persistent effect of chronic poverty on tertiary educational outcomes reported in Tables 3 to 5 correspond to past findings of how longer-term poverty is more strongly associated with subsequent unfavorable outcomes than poverty experienced only in a certain age (Teachman, Paasch, Day, and Carver 1997). In fact, this study started out by investigating the impact of a single-wave poverty measure on the likelihood of entering a good university. This cross-sectional poverty measure yielded less consistent poverty effect than the current specification. When information on family income is pooled from two waves to construct the current poverty status measure, stronger and more consistent income effect on educational outcome emerged and so are the moderating effect of personality traits.

There are some limitations of the current study. First of all, there is no retrospective reports on the economic well-being of respondents when they were younger, which makes the investigation of childhood poverty unfeasible. It is not possible to further explore whether the adolescent poverty effect found here has already been rooted in childhood poverty or it has its own independent effect on educational achievement. Given that long-term exposure to poverty in childhood curtails cognitive ability, it is not possible for the current study to explore whether such effect can be observed in these adolescents. Second, there are no consistent items for measuring self-rated versus teacher-rated conscientiousness in this study. Thus, the significant effect found for these two scales may represent somewhat different characteristics of the adolescent respondent, though both measure positive personality traits.

In sum, this study reveals how exposure to poverty during adolescence affects attainment in higher education in two recent cohorts of Taiwanese youths and the critical role of positive non-cognitive traits in altering life chances for disadvantaged youths. Future studies should seek to investigate whether adolescent poverty also causes unfavorable outcomes in other domains of life, such as psychological well-being, occupational outcomes and marriage prospects, etc.

Table 1: Descriptive Statistics for the 7th- and 9th-grade Cohort Samples

	G7 (N=1662)		G9 (N=1882)	
Variable	Mean(Range)	SD	Mean(Range)	SD
Dependent Variable				
Entry into a top-tiered university	12.21%		13.66%	
Entry into a graduate school			9.72%	
Independent Variable				
Poverty Status				
Early Poverty	10.41%		11.16%	
Late Poverty	17.09%		13.82%	
Chronic Poverty	26.41%		20.72%	
Never in Poverty	40.37%		40.97%	
Sex				
Male	50.48%		51.86%	
Female	49.52%		48.14%	
Mother's Education				
Less than high school	46.81%		50.00%	
High School	38.03%		33.74%	
Junior College	6.62%		7.28%	
College and above	8.36%		8.82%	
Family Structure				
Two-biological-parent Family	88.51%		88.58%	
Step/single-parent Family and Other	11.49%		11.11%	
Sibling				
Zero	8.48%		9.88%	
One	43.62%		42.14%	
Two	37.36%		36.18%	
Three and above	10.53%		11.80%	
Self-rated Positive Self-Image	14.76(6~24)	3.26	14.31(6~24)	3.13
Self-rated Conscientiousness	7.10(5~10)	1.38	7.62(5~10)	1.32
Parent-rated Agreeableness	27.17(9~32)	4.03	27.84(8~32)	3.76
Teacher-rated Conscientiousness	28.98(10~40)	5.57	29.35(10~40)	5.69

Table 2: Patterns of missing values for the G7 and G9 cohort samples

	G7 (N=1662)		G9 (N=1882)	
Variable	Missing Vaule	% of N	Missing Vaule	% of N
Dependent Variable				
Entry into a top-tiered university	194	11.67	1	0.05
Entry into a graduate school			0	0.00
Independent Variable				
Poverty Status	95	5.72	251	13.34
Sex	0	0.00	0	0.00
Mother's Education	3	0.18	3	0.16
Family Structure	0	0.00	6	0.32
Sibling	0	0.00	0	0.00
Self-rated Positive Self-Image	16	0.96	18	0.96
Self-rated Conscientiousness	1	0.06	8	0.43
Parent-rated Agreeableness	214	12.88	286	15.20
Teacher-rated Conscientiousness	22	1.32	23	1.22

Table 3: Odds Ratios of Logistic Regression Models Predicting Entry into Top-tiered Colleges for the 7th-grade Cohort (N=1662)

	Entry into top-tiered college					
	model1	model2	model3	model4	model5	model6
Poverty Status (reference: Never in Poverty)						
Early Poverty (poverty at age 13, but not age 15)	0.47*	0.41*	0.47*	0.02	0.01	0.59
Late Poverty (poverty at age 15, but not age 13)	0.88	0.79	0.92	0.06	0.16	0.22
Chronic Poverty (poverty at both ages 13 & 15)	0.60*	0.52*	0.55*	0.09	3.39	0.07
Male	1.26	1.33	1.72**	1.27	1.36+	1.84**
Maternal Education (reference: less than high school)						
High School	1.61*	1.61*	1.69*	1.59*	1.67*	1.81*
Junior College	5.03***	4.98***	6.25***	5.06***	5.23***	6.49***
College and above	4.13***	4.35***	5.02***	4.15***	4.35***	5.14***
Family Structure (reference: Other family)						
Two-biological-parent Family	1.62	1.62	1.37	1.57	1.58	1.41
Sibling (reference: Zero)						
One	1.08	1.10	1.19	1.05	1.06	1.13
Two	0.85	0.89	0.97	0.82	0.84	0.98
Three and above	0.63	0.59	0.68	0.62	0.59	0.64
Self-rated Positive Self-Image	1.08**			1.08*	1.07*	1.06+
Self-rated Conscientiousness	1.07			0.94	1.07	1.09
Parent-rated Agreeableness		1.04+			1.03	1.01
Teacher-rated Conscientiousness			1.17***			1.15***
Poverty Status × Self-rated Positive Self-Image						
(reference: Never in Poverty × Self-rated Positive Self-						
Early poverty × Self-rated Positive Self-Image				1.06		
Late poverty × Self-rated Positive Self-Image				1.08		
Chronic poverty × Self-rated Positive Self-Image				0.92		
Poverty Status × Self-rated of Conscientiousness						
(reference: Never in Poverty × Self-rated						
Early poverty × Self-rated Conscientiousness				1.38		
Late poverty × Self-rated Conscientiousness				1.23		
Chronic poverty × Self-rated Conscientiousness				1.53*		
Poverty Status × Parent-rated Agreeableness						
(reference: Never in Poverty × Parent-rated						
Early poverty × Parent-rated Agreeableness					1.13	
Late poverty × Parent-rated Agreeableness					1.06	
Chronic poverty × Parent-rated Agreeableness					0.94	
Poverty Status × Teacher-rated Conscientiousness						
(reference: Never in Poverty × Teacher-rated						
Early poverty × Teacher-rated Conscientiousness						0.99
Late poverty × Teacher-rated Conscientiousness						1.04
Chronic poverty × Teacher-rated Conscientiousness						1.07+

+ p<.10 ; * p<.05 ; ** p<.01 ; *** p<.001

Table 4: Odds Ratios of Logistic Regression Models Predicting Entry into Top-tiered Colleges for the 9th-grade Cohort (N=1882)

	Entry into top-tiered college					
	model1	model2	model3	model4	model5	model6
Poverty Status (reference: Never in Poverty)						
Early Poverty (poverty at age 15, but not age 18)	0.56*	0.50*	0.54*	0.01+	0.00+	2.55
Late Poverty (poverty at age 18, but not age 15)	0.89	0.86	0.91	0.44	2.67	2.00
Chronic Poverty (poverty at both ages 15 & 18)	0.56*	0.56*	0.53*	0.20	0.59	0.16
Male	1.07	1.24	1.35+	1.08	1.18	1.44*
Maternal Education (reference: less than high school)						
High School	1.30	1.32	1.29	1.29	1.27	1.22
Junior College	2.82***	2.66***	2.55***	2.80***	2.58**	2.36**
College and above	4.32***	4.44***	3.59***	4.41***	4.58***	3.84***
Family Structure (reference: Other family)						
Two-biological-parent Family	1.85+	2.23*	1.71+	1.82+	2.17*	2.11+
Sibling (reference: Zero)						
One	1.28	1.22	1.19	1.26	1.24	1.17
Two	1.24	1.29	1.15	1.22	1.29	1.21
Three and above	1.04	1.13	0.96	1.04	1.07	1.02
Self-rated Positive Self-Image	1.11***			1.09**	1.10***	1.09**
Self-rated Conscientiousness	1.06			1.01	1.08	1.09
Parent-rated Agreeableness		1.13***			1.12**	1.11***
Teacher-rated Conscientiousness			1.11***			1.10***
Poverty Status × Self-rated Positive Self-Image						
(reference: Never in Poverty × Self-rated Positive Self-						
Early poverty × Self-rated Positive Self-Image				1.12		
Late poverty × Self-rated Positive Self-Image				1.05		
Chronic poverty × Self-rated Positive Self-Image				0.98		
Poverty Status × Self-rated of Conscientiousness						
(reference: Never in Poverty × Self-rated						
Early poverty × Self-rated Conscientiousness				1.42+		
Late poverty × Self-rated Conscientiousness				0.99		
Chronic poverty × Self-rated Conscientiousness				1.18		
Poverty Status × Parent-rated Agreeableness						
(reference: Never in Poverty × Parent-rated						
Early poverty × Parent-rated Agreeableness					1.28+	
Late poverty × Parent-rated Agreeableness					0.96	
Chronic poverty × Parent-rated Agreeableness					1.00	
Poverty Status × Teacher-rated Conscientiousness						
(reference: Never in Poverty × Teacher-rated						
Early poverty × Teacher-rated Conscientiousness						0.95
Late poverty × Teacher-rated Conscientiousness						0.98
Chronic poverty × Teacher-rated Conscientiousness						1.04

+ p<.10 ; * p<.05 ; ** p<.01 ; *** p<.001

Table 5: Odds Ratios of Logistic Regression Models Predicting Entry into Graduate School for the 9th-grade Cohort (N=1882)

	Entry into graduate school					
	model1	model2	model3	model4	model5	model6
Poverty Status (reference: Never in Poverty)						
Early Poverty (poverty at age 15, but not age 18)	0.69	0.72	0.70	0.57	0.38	0.54
Late Poverty (poverty at age 18, but not age 15)	1.17	1.14	1.21	1.02	0.09	1.59
Chronic Poverty (poverty at both ages 15 & 18)	0.66+	0.65+	0.67+	0.10	0.01	0.02*
Male	1.40+	1.51*	1.74**	1.40+	1.46*	1.82**
Maternal Education (reference: less than high school)						
High School	1.25	1.41	1.20	1.25	1.40	1.32
Junior College	2.59**	2.37**	2.24**	2.57**	2.40**	2.17*
College and above	2.18**	2.24**	1.70+	2.20**	2.29**	1.81+
Family Structure (reference: Other family)						
Two-biological-parent Family	1.85+	1.75	1.74	1.83+	1.71	1.70
Sibling (reference: Zero)						
One	0.98	0.83	0.92	0.99	0.81	0.75
Two	0.81	0.65	0.74	0.82	0.64	0.58
Three and above	0.82	0.65	0.72	0.82	0.64	0.54
Self-rated Positive Self-Image	1.04			1.01	1.05	1.03
Self-rated Conscientiousness	0.98			1.00	1.01	1.01
Parent-rated Agreeableness		1.14***			1.11**	1.12***
Teacher-rated Conscientiousness			1.11***			1.08***
Poverty Status × Self-rated Positive Self-Image						
(reference: Never in Poverty × Self-rated Positive Self-						
Early poverty × Self-rated Positive Self-Image				1.05		
Late poverty × Self-rated Positive Self-Image				1.06		
Chronic poverty × Self-rated Positive Self-Image				1.10+		
Poverty Status × Self-rated of Conscientiousness						
(reference: Never in Poverty × Self-rated						
Early poverty × Self-rated Conscientiousness				0.93		
Late poverty × Self-rated Conscientiousness				0.91		
Chronic poverty × Self-rated Conscientiousness				1.07		
Poverty Status × Parent-rated Agreeableness						
(reference: Never in Poverty × Parent-rated						
Early poverty × Parent-rated Agreeableness					1.02	
Late poverty × Parent-rated Agreeableness					1.09	
Chronic poverty × Parent-rated Agreeableness					1.14+	
Poverty Status × Teacher-rated Conscientiousness						
(reference: Never in Poverty × Teacher-rated						
Early poverty × Teacher-rated Conscientiousness						1.01
Late poverty × Teacher-rated Conscientiousness						0.99
Chronic poverty × Teacher-rated Conscientiousness						1.12*

+ p<.10 ; * p<.05 ; ** p<.01 ; *** p<.001

Appendix 1. Definitions of Top-tiered Universities

Schools that are categorized as top-tiered 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. Items used to construct various personality trait scales

From the student questionnaire

Self-rated Positive Self-image (Cronbach's α=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 happened 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 have a person of no merits.

Self-rated Conscientiousness (Cronbach's α=0.53/0.61 for G7/G9)

Please read the following descriptions about personal attitudes and characteristics and answer whether each one of them apply 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 advantages of others.
- Sometimes I prefer retaliation rather than forgiveness.
- Sometimes I am jealous of others' good fortune.

From the parent questionnaire

Parent-rated Agreeableness (Cronbach's α=0.81/0.91 for G7/G9)

Does your child have these behaviors? (items reverse coded for scale construction)

- He/she likes to attract others attention.
- He/she has a bad temper.
- He/she likes to argue with people.
- He/she likes to express opposing views that are different from others.
- He/she likes to dominate over others and intimidate others.
- He/she likes to brag about him/herself.
- He/she likes to make fun of others.
- He/she is unpopular and is isolated by others.

From the teacher questionnaire

Teacher-rated Conscientiousness (Cronbach's α=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 enthusiastic about classroom affairs.
- He/she has qualities of being a good leader.
- He/she is optimistic.
- He/she is confident.
- He/she is a humorous.
- He/she has a sense of justice.
- He/she is proactive and strives for perfection.

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