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ABSTRACT

Are Young People's Educational Outcomes Linked to their Sense of Control?*

This paper analyzes the link between young people's sense (locus) of control over their lives and their investments in education. We find that young people with a more internal locus of control have a higher probability of finishing secondary school and, conditional on completion, meeting the requirements to obtain a university entrance rank. Moreover, those with an internal locus of control who obtain a university entrance rank achieve somewhat higher rankings than do their peers who have a more external locus of control. Not surprisingly, there is a negative relationship between growing up in disadvantage and educational outcomes. However, this effect does not appear to operate indirectly by increasing the likelihood of having a more external locus of control. In particular, we find no significant relationship between family welfare history and young people's locus of control.

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1 Introduction

Human capital formation is the bedrock of modern social policy. Governments often rely on investments in health, education, or labor market skills as the primary means of assisting disadvantaged groups, raising productivity (and hence living standards), promoting economic and social development, and generally enhancing the wellbeing of the population. It is not surprising, then, that there is intense interest in understanding the process that underpins human capital formation. Increasingly, researchers' attention has turned towards the complex role that non-cognitive skills play in facilitating human capital investments generally, and educational achievement in particular (e.g. Heckman et al., 2006; Cunha and Heckman, 2007; Borghans and Weel, 2008; Leininger and Kalil, 2008).

Our objective is to contribute to this emerging literature by analyzing the link between young people's sense of control over their lives (i.e., "locus of control" or "self-efficacy") and their investments in education. Locus of control is a psychological concept capturing "a generalized attitude, belief, or expectancy regarding the nature of the causal relationship between one's own behavior and its consequences"(Rotter, 1966). Those who believe that life's outcomes are due to their own efforts have an "internal" locus (sense) of control, while those who believe that outcomes are due to external factors (e.g. luck) have an "external" locus (sense) of control (see Gatz and Karel, 1993). In short, locus of control reflects individuals' beliefs about whether there is a payoff to their own behavior and there is evidence that locus of control influences educational outcomes primarily through these beliefs rather than through overall ability (Coleman and DeLeire, 2003).

Our data come from the Youth in Focus (YIF) Project which interviews 18-year old Australians about their experiences in school, educational achievement, and future study plans. Detailed information about non-cognitive skills including personality and locus of control, family background, parental education, and parents' investments in their children's education is also collected. These survey data are then linked to almost twelve years of administrative data on the family's welfare receipt while the young person was growing up. We use these unique data to answer the following questions: How are young people's educational outcomes related to their locus of control? Does locus of control have differential effects on educational attainment and educational achievement? Finally, does growing up

in disadvantage seem to have an indirect effect on educational outcomes by reducing young people's sense of control over their lives?

In addressing these questions, we make several contributions to the existing literature. First, we consider not only educational attainment (i.e., completion of secondary school), but also relative academic achievement (i.e., university entrance rank). Economic models of skill formation recently proposed by Heckman and his co-authors suggest that non-cognitive skills (like locus of control) may affect schooling decisions (i.e. educational attainment) and cognitive skills (i.e. educational achievement or test scores) differently (Heckman et al., 2006; Cunha and Heckman, 2007). Second, we utilize an estimation strategy that allows us to combine all of the information from multiple (imperfect) indicators of young people's locus of control without requiring us to use ad hoc weights to create an overall locus of control index. In contrast, the approach often taken in the economics literature is to use weights to aggregate the multiple indicators of locus of control found in survey data into a single index and then to estimate conventional regression models. Unfortunately, these weights are necessarily ad hoc given the lack of information about the contribution that each indicator makes to predicting locus of control and estimation results can be sensitive to the weights chosen.[1] Our estimation model is flexible in allowing for differences in the response error associated with each separate locus of control indicator thus avoiding this problem. Finally, our data allow us to account for socio-economic background, specifically family welfare history, in a very detailed way. This is important in light of the ongoing debate on the effect of welfare receipt on non-cognitive skills such as self-esteem and locus of control (Elliott, 1996; Kunz and Kalil, 1999; Gottschalk, 2005) and the evidence that locus of control may be related to socio-economic status (see Wang et al., 1999). Designing sensible policies to enhance opportunities for disadvantaged students requires that we know more about the extent to which socio-economic disadvantage limits educational outcomes by diminishing non-cognitive skills.

We find that young people with a more internal locus of control have a higher probability of finishing secondary school and, conditional on completion, obtaining a university

[1] In related research, Kalil et al. (2010) use the Youth in Focus data to investigate the effect of a standardized locus of control index on employment and education transitions. In contrast, Osborne-Groves (2005) and Heckman et al. (2006) are exceptions in explicitly considering the latent nature of psycho-social characteristics (including locus of control).

entrance rank. Those with an internal locus of control who obtain a university entrance rank achieve somewhat higher rankings than do their peers who have a more external locus of control. Not surprisingly, there is a negative relationship between growing up in disadvantage and educational outcomes. However, this effect does not appear to operate indirectly by increasing the likelihood of having a more external locus of control. In particular, we find no significant relationship between family welfare history and young people's locus of control.

In Section 2, we briefly review the literature relating locus of control and educational investments. Section 3 presents details of the Youth in Focus (YIF) data and provides an overview of the Australian institutional context relevant to young people's educational outcomes. Our conceptual framework and estimation strategy are reviewed in Section 4, while our results are discussed in Section 5. Our conclusions and suggestions for future research are in Section 6.

2 Locus of Control and Investments in Education

A vast psychology literature assesses the determinants of individuals' locus of control. In their reviews of this research, Gatz and Karel (1993) and Coleman and DeLeire (2003) make the following observations. First, psychologists typically believe that locus of control forms during childhood and stabilizes during adolescence. Second, parents can influence their children's locus of control through their parenting style. Children are more likely to develop an internal locus of control if their parents encourage autonomy and consistently use a system of rewards and punishments. Third, stressful life events are related to a higher likelihood of having an external locus of control. Finally, although the empirical evidence is inconclusive, individuals' locus of control may evolve over the life-cycle as physical and mental health changes.

Previous research concludes that an internal locus of control is associated with superior academic performance (see Wang et al., 1999 for a review). A sense of personal control is thought to increase effort, motivation, and persistence in problem solving all of which are expected to improve educational outcomes (Ross and Broh, 2000). Others argue that, because those with an internal sense of control believe that success comes from hard work,

they are more likely to be aware of information that is useful for future decision-making, are more willing to take action to improve their performance, and are less likely to surrender to peer pressures (Andrisani, 1977). Coleman and DeLeire (2003) formalize many of these ideas in an explicit model of human capital accumulation in which locus of control influences adolescents' perceptions of the future returns to education. Those with an internal locus of control are assumed to believe that the marginal return to education is higher than is the case for those with an external locus of control. Consequently, they are expected to accumulate more human capital than their peers with a more external sense of control. Coleman and Deleire provide empirical evidence that U.S. adolescents with an internal locus of control do in fact anticipate higher wage returns to additional years of education. Cebi (2007), however, is not able to replicate these results using a different data set once cognitive ability is controlled. Moreover, Borghans et al. (2008) demonstrate that, in an experimental setting, those with an internal locus of control respond less to financial incentives when allocating effort to cognitive tasks. This is more consistent with those having an internal locus of control being simply more highly motivated, rather than with them being more sensitive to the marginal returns to their investment decisions.

Much less is known about the effect of socio-economic status on these relationships, in particular, the extent to which growing up in disadvantage might contribute to poorer educational outcomes by limiting adolescents' sense of control over their lives. There is evidence, for example, that welfare receipt is related to lower self-esteem (Elliott, 1996) and that increased employment results in adult welfare recipients adopting a more internal locus of control (Gottschalk, 2005). The evidence for young people growing up in welfare families is less clear, however. It also appears that the efficacy of policies designed to improve educational outcomes for disadvantage students may in the end rest on their level of non-cognitive skills. Experimental evidence, for example, indicates that U.S. welfare recipients enrolled in an adult education program are twice as likely to receive a high school diploma or GED if they feel they have control over the things that happen to them than if they do not (Leininger and Kalil, 2008). With this in mind, some remedial education programs in the U.K. are in fact designed to enhance these skills (including locus of control) in the hope of improving cognitive outcomes (see Holmlund and Silva, 2009).

3 The Youth in Focus Data

Our data come from the Youth in Focus Project (YIF). These data are unique in providing detailed information about educational attainment, educational achievement, family welfare histories, as well as individual and household characteristics for a sample of 18-year old Australians.

3.1 Estimation Sample

The YIF Project uses Australian administrative social security records to identify all young people born between October 1987 and March 1988 who ever had contact with the social security system between 1993 and 2005 (Breunig et al., 2007). The Australian social security system is nearly universal for families with children with some payments such as the Child Care Benefit having no income test at all and others, such as the Family Tax Benefit, being denied only to families in the top quintile of the income distribution. At the other extreme are welfare payments that are targeted towards low-income parents (mainly single parents) or unemployed individuals which are also subject to income, asset and/or activity tests. Young people are also in the administrative data if they receive benefits in their own right. Most, however, are in the data because a family member (usually a parent) received a payment at some point between 1993 and 2005 which depended in part on his or her relationship to the youth. Comparing the number of young adults in these administrative data to census data suggests that over 98 percent of young people born between October 1987 and March 1988 are represented in the administrative data (Breunig et al., 2007). Thus, these social security records provide high-quality, fortnightly data on the payment details for nearly the entire birth cohort. A stratified (on welfare history) random sample of young people was selected from the administrative data for interview by phone and through a self-completion questionnaire (SCQ). These data are then matched to the administrative social security data for the youth's family.[2]

[2]Following best practice (Groves et al., 2004), approach letters, incentive payments, repeated call backs, and Computer Assisted Telephone Interviewing (CATI) were all used to maximize response rates. Response rates differed somewhat across strata, however these differences stem primarily from differences in contact rates rather than refusal rates (Breunig et al., 2007). Overall, 36.1 percent of young people responded to the survey—73.1 percent of whom also completed the self-completion questionnaire. More than 96 percent of youth consented to having these survey data linked to their administrative records.

We have necessarily made a number of sample restrictions. Many of our variables of interest come from the SCQ. Consequently, out of the 4,079 youth in the YIF data, we drop 1,150 youths who did not provide SCQs or had missing information on the SCQ-related variables. We drop an additional 864 youths who did not provide information on some other variable of interest (most commonly parental education). The estimation sample consists of 2,065 youths. Appendix Table A1 presents summary statistics for the variables used in the analysis.[3]

3.2 Education, Locus of Control, and Welfare History Measures

Australian children enter Kindergarten at age five, complete a further six years of primary school, and leave secondary school after finishing 12th grade. Students who complete secondary school meeting certain minimum coursework requirements (e.g. with respect to minimum credit hours, English requirements, etc.) are eligible to obtain a percentile ranking for university entrance based on their academic performance in grades 11 and 12. Each of the six states and two territories calculates this ranking differently and a national conversion table is used to make comparisons across students educated in different jurisdictions. Potential students wishing to go to university register their preferences (in rank order) for specific degree programs with a central administrative agency. University placements offers are then made on the basis of students' entrance rankings once they are known (see Marks et al., 2001, for details). Given these institutional arrangements, we consider three measures of educational attainment: (i) an indicator of secondary school completion; (ii) an indicator for obtaining a university entrance rank; and (iii) the actual entrance ranking (measured from 30.0 – 99.9).[4]

We measure individuals' locus of control using their responses to seven separate questions from the Pearlin and Schooler, 1978 Mastery Scale about their sense of control over life's events and what happens to them.[5] Specifically, respondents are asked to indicate

[3]A corresponding parent or guardian—in 96.5 percent of cases the biological mother—was also selected from the administrative data for a separate interview. The matched parent-youth sample is substantially smaller and we therefore rely strictly upon survey and administrative data from our sample of young people.

[4]Unlike other states and territories, Queensland ranks students on a scale from 1 (highest) to 25 (lowest). Following Cardak and Ryan (2006), we transform scores for students in Queensland to be equivalent to those in other jurisdictions so that our university entrance rankings are calibrated to a common, Australia-wide scale that ranges from 30 to 99.99.

[5]The seven separate items underlying the Pearlin-Schooler scale are summarized in Table A2.

their agreement (or disagreement) with seven separate statements using a four-point response scale ranging from strongly agree to strongly disagree. We use these responses to create seven separate, ordered indicators of locus of control each of which is included separately into our estimation model (see Section 4).

Finally, we classify young people on the basis of their families' welfare histories as follows: 1) those in families with no history of welfare (non-recipients); 2) those in families that received welfare for more than six years while the youth was growing up (intensive support); and those in families receiving less than six years of support (moderate support) for the first time 3) after 1998 (age 10); 4) between 1994 and 1998 (age 6 - 10); and 5) before 1994 (age 0 - 6).[6] This categorization allows us to make comparisons between the intensity and timing of welfare receipt.

3.3 Locus of Control: Links to Education and Welfare History

Table 1 presents information about the relationship between educational outcomes on the one hand and locus of control and family welfare history on the other.[7] We find a strong relationship between the probability of secondary school completion and our indicators of young people's sense of control over their lives. Specifically, young people who (strongly) agree that (i) they cannot solve some of the problems they have; (ii) have no control over the things happening to them; (iii) feel helpless in dealing with problems; or (iv) can do little to change things in life are all significantly less likely to have finished Year 12 at the time of the survey.[8] In contrast, completion rates are substantially higher for those who (strongly) agree that (i) they can do anything they set their mind to or (ii) what

[6]We use the Australian government's guidelines to identify the specific programs to be classified as "welfare". For example, neither the Family Tax Benefit or the Child Care Benefit are considered to be welfare payments. To place these payments in context, similar benefits are provided to United States families through the tax system in the form of standard deductions for dependent children and child care rebates. The most common welfare payments are those for the unemployed (New Start Allowance) or low-income parents (Parenting Payments). Unlike the case in the U.S., Australian unemployment benefits are income-, asset-, and activity-tested, are not time-limited, and are not related to an individual's previous earnings history (Centrelink, 2007). As such they represent welfare rather than unemployment insurance.

[7]The results in Table 1 are based on seven indicator variables which take the value of one if the respondent strongly agrees or agrees with each statement and zero otherwise. Descriptive statistics for obtaining a university entrance rank are conditional on having completed secondary school, while the percentile entrance rankings are conditional upon having qualified for an entrance rank.

[8]The young people in the sample were 18 at the time of interview and most of them would have been expected to have finished secondary school. Those who have not include those who have left school without completing 12th grade and those who are still in school, but have not yet completed 12th grade perhaps because they have made slower academic progress or because they began school at a later age.

happens to them mostly depends on them. In only one case, feeling pushed around in life, is there no significant difference in the views of those who have and have not completed secondary school. Thus, there appears to be a strong relationship between locus of control and educational attainment.

[Table 1 here]

There is also evidence that locus of control is related to the propensity to obtain a university entrance rank (see Table 1). Conditional upon completing secondary school, those young people who (strongly) agree that there is little they can do to change things in their lives are significantly more likely to have failed to meet the curriculum requirements necessary to qualify for a university entrance rank (70.6 vs. 61.3 percent). Those who feel that they have little control over what happens to them are also significantly less likely to obtain a university entrance rank, while those who feel that they can do anything that they set their minds to are more likely to obtain a ranking for university. In general, young people with a more internal locus of control seem more inclined towards obtaining university entrance ranks.

There is less evidence that locus of control is related to academic achievement, i.e. actual university entrance rankings themselves. The last panel of Table 1 presents the average percentile ranking for those who (strongly) agree and (strongly) disagree with each of the locus of control statements. The difference in average percentile rankings for these two groups is generally small in magnitude (usually less than one percentage point) and statistically insignificant. At the same time, young people who think they have little control over the things that happen to them obtain entrance rankings that are on average three percentage points lower.

Taken together, the results suggest that youths with a more internal locus of control are more likely to have completed 12th grade by age 18 and more likely to obtain a university entrance rank upon completion. The strength of these relationships, nevertheless, varies considerably by the specific locus of control indicator under consideration highlighting the challenges associated with combining these indicators into a single index. Consequently, we adopt an estimation strategy which accounts for each indicator separately and avoids the necessity of imposing ad hoc restrictions on the way these indicators are combined.

Unlike previous Australian research on the effect of parental socio-economic status on the educational attainment of youth (Cardak and Ryan, 2006; Marks et al., 2000; Le and Miller, 2005), our measure of social and economic disadvantage is based on 12 years of parental welfare history and not on parental occupation at some point in the past. Fully 77.6 percent of young people with no family history of welfare receipt have completed secondary school by the time they turn 18 and, of those who graduate, 76.8 percent earn a university entrance rank with an average ranking in the 75.1 percentile. Youth growing up in the most extreme disadvantage have completion rates that are substantially lower (54.9 percent) and are much less likely to be awarded a university entrance rank upon completion (53.7 percent). There is also a large gap in achievement associated with having a family history of intensive welfare receipt (69.4 versus 75.1 percentile). Finally there is evidence that, moderate levels of socio-economic disadvantage (particularly those experienced for the first before age 6) are also associated with a lower probability of completing 12th grade and earning a ranking for university entrance. Gaps in achievement conditional upon meeting the curriculum requirements necessary for obtaining a ranking are smaller than those associated with extreme disadvantage.

4 The Econometric Model

Our primary empirical challenge is to make the best use of the multiple indicators of locus of control that are available to us. We wish to avoid adopting ad hoc weights to create a single locus of control index or, at the other extreme, using a measure-by-measure approach to analyze each indicator separately.[9] Instead, our estimation strategy allows for the possibility that responses to specific survey questions are only imperfect measures, or indicators, of a single, unobserved concept called locus of control. By simultaneously using information from multiple indicators, we also hope to improve the precision of our estimates. The estimation model for each of our three outcomes consists of two parts. The first is a behavioral (structural) model that links the specific educational outcome to individuals' latent locus of control. The second is a measurement model that relates individuals' observed, ordered

[9]The difficulty with the latter is that it treats the data as though each survey question provides information about a separate, perfectly measured concept. Dohmen et al. (2006) who adopt this approach to analyze different measures of trust.

responses to each locus of control question to their underlying latent locus of control.

4.1 Secondary School Completion

We begin by assuming that the latent propensity of completing Year 12 (y^*) is given by

$$y^* = \mathbf{X}\boldsymbol{\beta} + \gamma LC^* + \mathbf{W}\boldsymbol{\theta} + u; \tag{1}$$

where $\mathbf{X}$ represents a set of covariates, LC^* is a continuous measure capturing an individual's latent locus of control, and $\mathbf{W}$ is the set of dummy variables indicating young people's exposure to socio-economic disadvantage while growing up. Moreover, $\{\boldsymbol{\beta}, \gamma, \boldsymbol{\theta}\}$ are vectors of parameters of conformable dimensions to the matrices they multiply, and u is the error term which is independent of each element of $\mathbf{Z} = \{\mathbf{X}, LC^*, \mathbf{W}\}$. Finally, $u \sim N(0, \sigma_u^2)$. We cannot observe the propensity of completing secondary school (y^*). Instead we observe an indicator of Year 12 completion, y, which takes the values 1 (completion) and 0 (noncompletion) according to the rule $y = \mathbf{1}[y^* > 0]$. Given these assumptions, u_i/σ_u is distributed standard normal and by the symmetry of the normal distribution we can write the probability of secondary school completion as:

$$P(y = 1|\,\mathbf{Z}) = \Phi\left(\mathbf{X}\frac{\boldsymbol{\beta}}{\sigma_u} + \frac{\gamma}{\sigma_u}LC^* + \frac{\boldsymbol{\theta}}{\sigma_u}\mathbf{W}\right), \tag{2}$$

where $\Phi(\cdot)$ is the cumulative distribution function for a standard normal. Equation 2 describes the well-known probit model.[10] Unlike the standard case, however, our model includes a continuous, latent right-hand-side variable, LC^*, which captures a young person's locus of control and is assumed to be distributed $N(0, \sigma_\ell^2)$. Higher values of $LC^*$are associated with having a more internal locus of control, while lower values are associated with being more external. Equation 2 sets out the model's key behavioral relationship.

Although we do not observe LC^* directly, we can generate imperfect measures of LC^* by using information from individuals' survey responses to our seven items from the Pearlin and Schooler (1978) Mastery Scale. Specifically, let l_j^* represent the degree to which a respondent agrees with each of the seven specific items in the scale (see Table A1). We

[10]Note that without further assumptions only the ratio β_i/σ_u is identified. Consequently, it is standard to achieve identification of β_i by adopting the normalization $\sigma_u = 1$.

assume that l_j^* is related to latent locus of control (LC^*) through the following measurement model:

$$l_j^* = \alpha_j LC^* + \epsilon_j \;\; ; \;\; j = 1, 2, ..., 7. \tag{3}$$

In this set of equations, α_js are parameters to be estimated and ϵ_j captures seven separate error terms such that, conditional on LC^*, $\epsilon_j \sim N(0,1)\ \forall j$. Although we do not observe individuals' latent degree of agreement with each of the seven items in the Pearlin and Schooler scale (l_j^*), we do observe their discrete responses to each survey question (l_j). In particular, there are four possible responses to each survey question ranging from "strongly agree" to "strongly disagree". The rule linking these observed (ordered) responses to the underlying (latent) degree of agreement is:

$$l_j = \begin{cases} 1 \quad \text{if} \quad -\infty < l_j^* \leq \delta_{0j}, \\ 2 \quad \text{if} \quad \delta_{0j} < l_j^* \leq \delta_{1j}, \\ 3 \quad \text{if} \quad \delta_{1j} < l_j^* \leq \delta_{2j}, \\ 4 \quad \text{if} \quad \delta_{3j} < l_j^* < \infty; \end{cases} \tag{4}$$

where δ_{ij} are threshold parameters satisfying the restriction $\delta_{1j} < \delta_{2j} < ... < \delta_{3j}\ \forall j = 1, ..., 7$. The error terms in this system of seven ordered probits are independent of each other and the error term in the Year 12 completion equation (i.e. $E[\epsilon_j \epsilon_i] = 0\ \forall j \neq i$ and $E[\epsilon_i u] = 0$).[11]

The objective is to obtain estimates of $\boldsymbol{\beta}$, the α_js, the thresholds for each of the ordered probits (δ_{ij}s), and the main parameters of interest, γ and $\boldsymbol{\theta}$. The wording of the items in the Pearlin and Schooler locus of control scale and the possible response options imply that higher values of LC^* can be interpreted as reflecting a more internal locus of control and the extent to which the data support this interpretation is explicitly considered in Section 5.1. Given this, the literature review in section 2 leads us to expect that $\hat{\gamma} > 0$ and $\hat{\theta}_i < 0$ for all $i \in \theta$. In addition to the standard normalizations of the variance of the error terms in the probit and ordered probit equations outlined above, it is also necessary to set one of the α parameters to unity in order to identify the parameters in the model.[12]

[11] Note that by assuming $\epsilon_j \sim N(0,1)$, the model uses a common identification restriction; that is $\sigma^2_{\varepsilon_j} = 1$.

[12] This is the standard normalization adopted in the literature. An alternative normalization is to set the variance of LC^* to unity.

Moreover, the model can be seen as a system of seven ordered probits (given by the set of equations in equations 3 and 4) and a binary probit model for Year 12 completion (equation 2). The system has cross-equation restrictions on some of the parameters and a common factor with known distribution (LC^*).[13]

In summary, our estimation model allows us to test whether there is a relationship between locus of control and Year 12 completion while first, taking into account the latent nature of locus of control, and second, utilizing the information from multiple locus of control indicators. The resulting estimates can be given a causal interpretation if the identifying assumptions of the model hold. Most concerning is the assumption that u is independent of the independent variables in the model (i.e. $\mathbf{Z} = \{\mathbf{X}, LC^*, \mathbf{W}\}$) as it rules out the presence of unobserved individual-specific effects which might be correlated both with individuals' locus of control or family welfare history and their educational outcomes. Unfortunately, our cross-sectional data do not permit us to account for individual-specific effects in the estimation. Therefore, we will be cautious in interpreting our estimates as associations rather than causal effects.[14]

4.2 University Entrance Rankings

The above model can also be used to estimate the propensity for young people graduating from secondary school to have met the specific curriculum requirements necessary to qualify for a university entrance rank. This propensity is unobserved. However, we do observe each individuals' receipt of a university entrance rank (R) which is assumed to be given by the following:

$$R = 1\left[\mathbf{X_1}\boldsymbol{\beta_1} + \gamma_1 LC^* + \boldsymbol{\theta_1}\mathbf{W} + u_1 > 0\right] \tag{5}$$

[13] This and all subsequent models are estimated in aML using maximum likelihood with adaptative quadrature for the numeric maximization of the likelihood (Lillard and Panis, 2003).The aML software is freely available from http://www.applied-ml.com. However, any other software that performs maximum likelihood can also be used to estimate this model.

[14] Using data on siblings to account for unobserved family characteristics, Ku and Plotnick (2003) suggest that cross-sectional estimates of the relationship between disadvantage at home and school completion of youth are biased downwards. If this is the case in the Australian context, the results discussed above under-estimate the effect of disadvantage on the educational outcomes of young people.

where $1[\cdot]$ is the indicator function which takes the value of 1 for graduates with university entrance rankings and 0 for graduates without. As before, we are interested in the effect of LC^* —individuals' latent locus of control—on educational attainment. Consequently, the full model also includes equations 3 and 4 which capture the relationship between young people's responses to survey questions about the degree of control they have over their lives (l_j) and their latent degree of agreement with each of the seven items in the Pearlin and Schooler locus of control scale (l_j^*). The error term u_1 is assumed to be independent of all explanatory variables, distributed standard normal, and independent of the error terms in the measurement equations in equation 3.

Finally, we consider the determinants of a young person's actual (percentile) university ranking conditional on having received one. Australian states and territories calculate these rankings somewhat differently (see Section 3.2). However, each jurisdiction bases their rankings on a combination of: (i) students' academic performance in their coursework in grades 11 and 12 (normed within the state or territory through school-specific, test-based scaling factors); and (ii) students' individual results on state-wide examinations at the end of 12th grade. The resulting score reflects the student's percentile ranking within the entire cohort (see Marks et al., 2001). Entrance rankings are left-censored at 30 leading us to adopt a censored regression model that incorporates the effect of individuals' latent locus of control through the measurement model given in equations 3 and 4. Specifically,

$$RANK^* = \mathbf{X_2}\boldsymbol{\beta_2} + \gamma_2 LC^* + \boldsymbol{\theta_2}\mathbf{W} + u_2 \tag{6}$$

$$RANK = max\,(30, RANK^*) \tag{7}$$

where $RANK^*$ represents individuals' actual percentile rankings which are observed only if they are greater than the censored value of 30. In this specification u, conditional on regressors and censored value, is assumed to be normally distributed with mean zero and variance σ_u^2. The resulting estimates from the censored model are consistent (unlike OLS estimates) and directly interpretable (unlike Tobit estimates).

5 Results

5.1 Measurement Model: Are we capturing locus of control?

We being by considering whether the measurement component of the model specified in equations 3 and 4 yields estimated parameters ($\hat{\alpha}$), i.e. factor loadings, that are consistent with our interpretation of internal versus external locus of control. Locus of control has no intrinsic unit of measurement, so it is necessary to set one factor loading to be a constant in order to identify the model.[15] Therefore, we set $\hat{\alpha}_1$ to unity implying that the signs and relative magnitudes of all remaining $\hat{\alpha}_j$ can also be interpreted relative to this outcome (i.e. "I cannot solve some of my problems"). If our interpretation of the latent variable (LC*)–i.e. higher values represent a more internal locus of control–is consistent with the data, we expect that $\hat{\alpha} > 0$ for those items suggesting an internal sense of control and $\hat{\alpha} < 0$ for those items suggesting a more external sense of control.[16]

Table 2 presents the results ($\hat{\alpha}$ and heteroscedasticity-robust standard errors) of our measurement component of our model for each of the three educational outcomes under consideration. Although the measurement and behavioral components of each model are estimated jointly, for ease of interpretation Table 2 presents only the results from the measurement model. Table 2 also reports the estimated standard deviation of the latent locus of control variable.

[Table 2 here]

We find that all factor loadings are statistically significant and have signs that are consistent with our interpretation that higher (lower) values of the latent variable correspond to a more internal (external) locus of control. That is, responding that one strongly disagrees with the statement that he or she feels pushed around in life (i.e. $l_2 = 4$) is significantly related to higher levels of the latent variable (LC*) because the coefficient relating the two ($\hat{\alpha}_2$) is positive and significant. The same holds true for all items for which disagreement indicates a strong sense of personal control (i.e. l_3, l_5,and l_7). For the remaining items (i.e. l_4 and l_6) disagreement indicates a lack of personal control which is consistent with $\hat{\alpha}_4$ and

[15] Another alternative is to set the variance of LC^* to unity.

[16] Recall that higher values of the locus of control indicator variables reflect higher levels of disagreement with the underlying statement.

$\hat{\alpha}_6$ being significant and negative. Taken together, these estimated factor loadings imply that higher values of the latent variable indicate a more internal locus of control.

5.2 Secondary School Completion

Table 3 presents the marginal effect of a change in each of our explanatory variables on (i) secondary school completion; (ii) receipt of a university entrance rank; and (iii) university entrance ranking. The level of statistical significance (denoted by stars) is based upon the significance of the underlying parameter in the probit model.[17]

[Table 3 here]

We find that there is a relationship between young people's sense of control over their lives and their chances of having completed secondary school by age 18. Specifically, moving from the 25^{th} to the 75^{th} percentile of the locus of control scale is associated with an increased probability of completing secondary school of 6.1pp (see column 1). Although significant only at the 10^{th} percent level, this estimate is nonetheless economically sizeable. Its effect is almost as large as the advantage associated with living with both biological parents at age 14 (6.5pp), for example, and is larger than the relative effect of having a mother with a secondary school education (5.4pp). To put this in the context of the international literature, this result can also be expressed as a one standard deviation change in the extent to which a young person has an internal locus of control being associated with a 4.5 percentage point (pp) increase in the probability of secondary school completion.[18] This is remarkably consistent with Coleman and DeLeire (2003) who also find that a one standard deviation increase in youths' sense of control results in a 2 to 3pp increase in the probability of completing high school in the United States.

Not surprisingly, young people growing up in economic and social disadvantage have lower secondary school completion rates. In particular, youth in families with a history of welfare receipt are between 2.9 and 9.9pp less likely to have completed secondary school

[17] Results available upon request.

[18] Latent locus of control is assumed to be distributed normal with mean zero and variance σ_ℓ^2. The marginal effect of moving from one percentile of the latent locus of control scale to another is calculated by using the estimated standard deviation of latent locus of control (see Table 2). Becoming more internal by one standard deviation ($\hat{\sigma}_l = 1.020$) increases the probability of completing secondary school by 4.5 percentage points. This figure is calculated as the marginal effect (evaluated at the means of the explanatory variables) of a continuous variable in a probit model where the change is by a standard deviation, $\Phi(\overline{\mathbf{X}}\hat{\beta})\cdot\hat{\sigma}_l\cdot\hat{\gamma}$.

by age 18 than are their peers in families with no welfare history. Exposure to prolonged disadvantage (i.e. more than six years) while growing up appears to be particularly detrimental and young people in this situation have secondary school completion rates that are 9.9pp lower. The effect of shorter periods of disadvantage (i.e. less than six years) appears to be related to the age at which young people first experienced welfare receipt. Exposure to disadvantage when aged 6 - 10 years old (i.e. just at the start of primary school) is linked to a 8.0pp lower probability of completing secondary school by age 18. Earlier (i.e. before school age) or later (i.e. late primary) exposure is associated with an economically sizeable, but much smaller and statistically insignificant, gap in the chances of completing 12th grade.

An individual's demographic characteristics and family background are also significantly related to the chances of having completed secondary school by age 18. Consistent with the literature (see d'Addio, 2007 for a review), higher parental education is associated with higher secondary school completion rates. Young people have an 8.8pp higher likelihood of finishing secondary school if their fathers' have university degrees (as opposed to leaving school before completing 12th grade) and a 3.6pp (5.4pp) higher probability of graduation if their mothers have university degrees (completed 12th grade). Moreover, young people who lived with both parents at age 14 are more likely to have completed secondary school by age 18 (5.4pp), although we find no evidence of a significant relationship between parental investment in their children's education as measured by reading at night or helping with homework and completion rates once everything else is controlled. Young people with at least one foreign-born parent from a non-English-speaking country have a much higher probability of completing secondary school (12pp), though young people with an English-speaking background immigrant parent graduate at the same rate as those youth with Australian-born parents. These differences are consistent with previous research (see, for example, Larum and Beggs, 1989) and most likely stem from the highly-skilled nature of immigration to Australia, particularly that from Asian countries. Indigenous youth are 17pp less likely to have completed secondary school by age 18, while young men are less likely (12pp) to graduate than are young women.

Finally, young people who start school at younger ages will be more likely to have completed secondary school by age 18. In two Australian jurisdictions (Queensland, and Western Australia) the cutoff date for beginning school is January 1, the midpoint of the period October – March in which our sample is being born. The entire birth cohort is eligible to begin school in the same year in other jurisdictions. Consequently, we expect the effect of an early (vs. late) birth on completion rates to be larger in Queensland and Western Australia than elsewhere because the cutoff date for starting school will bind for some families with younger children forcing them to delay the start of school until the next year. We account for this through interaction terms between (i) being born in Queensland or Western Australia and (ii) being born between October and December 1987 (early born). We find results that are consistent with these differences in school starting ages. Not surprisingly, young people who were born early in the period (October to December 1987) are 16.7pp more likely to complete secondary school by age 18 than are young people who are born late (January - March 1988). More importantly, this marginal effect of an early birth is 3.6pp higher in Queensland and Western Australia than in the rest of Australia.

5.3 University Entrance Rank Receipt

We turn now to consider the determinants of having met the curriculum requirements necessary to be awarded a university entrance rank upon completion of secondary school. The marginal effect of a change in each explanatory variable on the probability of a graduate receiving an entrance rank is reported in column 2 of Table 3.

Having an internal locus of control is associated with a higher likelihood that graduates have qualified for a ranking for university entrance. A one standard deviation increase in the degree to which one has an internal locus of control is associated with a 2.9pp increase in the probability of obtaining a university entrance rank. Thus, moving from the 25^{th} to the 75^{th} percentile of the locus of control distribution is related to a 7.1pp increase in the probability of obtaining an entrance ranking at graduation. The magnitude of this effect is relatively large and is roughly equivalent to that of having immigrant parents from a non-English-speaking country or (in the opposite direction) having a family history of moderate welfare receipt starting at age 6-10.

A family's experiences with the welfare system is closely related to the likelihood that its 18-year old children receive a university entrance rank upon graduation from secondary school. The most disadvantaged young people (i.e., those experiencing six years or more of parental welfare receipt) are 19.8pp less likely to receive a ranking. Moderate (i.e. less than six years) disadvantage is also related to the receipt of entrance rankings with disadvantage early in life mattering most. Specifically, those graduates first exposed to disadvantage in their preschool ages (0 - 6) experience the largest gap in the receipt of a ranking (9.9pp), followed by those experiencing moderate disadvantage for the first time between the ages of 6 and 10 (7.8 pp). Young people exposed to the welfare system for the first time in adolescence (10 - 16 years old) are also less likely to obtain a ranking (3.7pp), although this relationship is not statistically significant.

The probability of meeting the curriculum requirements necessary to obtain a university entrance ranking is also related to an individual's demographic characteristics and family background (see Table 3). Male (2.8pp) and indigenous (17.5pp) youth, for example, are less likely to obtain a university entrance rank upon graduation from secondary school than are their female and non-indigenous peers. While young people who lived with both parents at age 14 are more likely to complete secondary school (see Section 5.2), conditional upon completion they are no more likely to obtain a ranking for university entrance. However, youths whose parents read to them before they went to bed as a child have a significantly higher probability of obtaining a university entrance rank (5.8pp) suggesting that they have additional skills or aspirations that make university study more likely. The relationship between parents helping adolescents with their homework and achieving a university entrance rank (5.3pp) is, somewhat surprisingly, significantly negative almost exactly canceling the benefits of reading at night. This negative relationship is consistent with the possibility that young people struggling in school might be more likely to get help from their parents. Parental education–both of mothers and fathers–is closely linked to youth people's propensity to obtain a ranking for university entrance. In particular, young people are significantly more likely to obtain a university entrance ranking if their fathers completed secondary school or if their mothers have degrees. Finally, young people with immigrant parents from non-English-speaking backgrounds are not only more likely to complete sec-

ondary school (11.8pp), but are also more likely to obtain a ranking for university entrance when they do (4.6pp).

5.4 Percentile University Entrance Rankings

Australian universities offer admission to specific programs to applicants in rank order. Thus, while obtaining a university entrance rank is necessary for university study, it is not sufficient. It is the percentile ranking itself that determines to which university and to which degree program a student will be admitted. Programs in law or medicine, for example, are very competitive and typically require entrance rankings in the 99th percentile, while in first-tier universities almost all programs require rankings in the top quartile for admission. Students with rankings toward the bottom of the scale are usually not offered any placement at all. These institutional arrangements imply that the options open to students can be strongly influenced by relatively small changes in their university entrance rankings.

We use a censored regression model in combination with our measurement model to estimate the relationship between students sense of control over their lives and their university entrance rankings (see Section 4.3).[19] These results are conditional upon young people having completed 12th grade and having obtained a university entrance ranking (see Table 3).

We find that moving from the 25th to the 75th percentile of the locus of control ranking is associated with an increase in students' university entrance rankings of 1.31 percentiles (see column 3). Alternatively, a one standard deviation change in the extent to which one is internal is associated with an increase of less than one (0.95) percentiles in ones university ranking. Thus, the effect of locus of control on students' percentile rankings is relatively small in comparison to its effect on the probability of completing secondary school or, conditional on graduation, receiving a ranking at all.

Young people growing up in the most socio-economically disadvantaged households obtain, on average, university entrance rankings that are 4.3 percentiles lower than their peers in families with no exposure to the welfare system. Intermediate exposure to disadvantage (i.e. less than six years), however is not statistically related to a student's percentile ranking conditional on receiving one. To the extent that intermediate levels of disadvantage

[19] Rankings are censored at 30 below (n=17) and 99.99 (n=4) above.

affect students' educational outcomes, the effect appears to operate through graduation rates and curriculum requirements, not through the academic performance of graduates meeting those requirements.

At the same time, family background seems particularly relevant for understanding performance. Young people achieve significantly higher rankings if their parent's were involved in their education either by reading to them at night (3.3 percentiles) or by helping them with homework (3.4 percentiles) when they were younger. Parental education is also linked to better performance, with young people achieving higher rankings if their mothers (4.9 percentiles) and fathers (3.7 percentiles) completed secondary school than if they did not. Finally, having an immigrant parent from a non-English-speaking country is associated with an increased ranking of 2.8 percentiles.

Interestingly, students' demographic characteristics are statistically unrelated to their entrance rankings conditional on achieving one. There is a gender gap of 3.8 percentiles in the rankings of young women relative to young men and a gap of 7.3 percentiles for indigenous youth relative to their non-indigenous peers. This latter gap is significant is not statistically significant at conventional levels which most likely reflects imprecision of our estimates given the very small number of indigenous students in our sample.

5.5 Sensitivity Analysis

The above evidence strongly suggests that young people's educational attainment and achievement are linked to the sense of control they have over their lives. Here we consider the sensitivity of our results to: first, the conditioning on specific subsamples and second, the use of our measurement model.

Section 5.2 provides estimates of the effect of locus of control on secondary school completion rates for the entire sample of 18-year-olds. The relationship between locus of control and the receipt of a university entrance rank (Section 5.3), however, is estimated only for secondary school graduates. Similarly, we estimate the determinants of percentile university rankings only for those graduates who receive one (Section 5.4). This focus on specific subsamples is useful in isolating the impact of locus of control on specific educational outcomes. However, estimation conditional on prior educational outcomes may underesti-

mate the overall effect of locus of control because there is likely to be non-random sample selection due to incidental truncation. Specifically, we do not observe whether or not an individual would receive a university entrance if he or she has not completed secondary school. Moreover, individuals who have not completed secondary school are likely to have characteristics that make them less likely to meet the requirements to receive a university entrance rank. Consequently, our estimates represent an underestimate of the effect of locus of control on the receipt of an entrance score across the entire population of students. A similar problem pertains to estimates in the model of the percentile ranking itself.

Given the complexity of the model, it is not possible to incorporate a selection equation to account for this truncation problem.[20] We can, however, gauge the extent to which we are underestimating the effect of locus of control by using information about institutional differences in school starting ages (i.e. interactions on early versus late births and living in Queensland or Western Australia) as instruments in the model of entrance rank receipt.[21] As expect, this resulted in a larger association between an individual' locus of control and his or her chances of receiving a university entrance rank. Specifically, moving from the 25^{th} to the 75^{th} percentile of the locus of control distribution is associated with an increase of 7.6pp in the probability of obtaining an entrance ranking when we use instruments to account for incidental truncation in comparison to 7.1pp when we do not (see Table 3). This difference of 6.6 percent suggests that we are not grossly underestimating the effect of locus of control by conditioning on secondary school completion. Unfortunately, we do not have plausible instruments for identifying the probability of receiving an entrance rank separately to the percentile ranking itself making it impossible to test the sensitivity of the estimated relationship between locus of control and percentile entrance rankings. Consequently, our results should be regarded as a conservative estimate of the total effect.

Finally, we consider our results would change if we had adopted the standard approach in the literature and used ad hoc weights to created a single locus of control index rather than using our measurement model to simultaneously use the information from multiple indicators of latent locus of control. We investigate this by using standard probit models to

[20] The maximization algorithm failed to converge in this extended model most likely because the likelihood function did not have sufficient curvature for us to identify the global maximum.

[21] These institutional arrangements affect school starting ages, but have no obvious relationship to the receipt of a university entrance rank conditional on graduating from secondary school. Hence they meet the necessary exclusion restriction.

estimate the effect of a standardized index of locus of control which weights each indicator equally on (i) secondary school completion and (ii) the receipt of a university entrance rank.[22] A censored regression is used to estimate the effect of this locus of control index on (iii) percentile rankings themselves.

The use of an index based on equal weights results in an estimated marginal effect of moving from the 25th to the 75th percentile of the locus of control index on secondary school completion of 0.057. In comparison, the estimated marginal effect when we take advantage of the measurement model is 0.061 (see Table 3). The use of an ad hoc index in this case slightly understates the estimated relationship between a young person's sense of control and the probability that he or she completes secondary school. The estimated marginal effect of locus of control on the probability of obtaining a university entrance ranking is also understated when we use an equal-weight index (0.063 versus 0.071), while the estimated marginal effect of locus of control on individuals' percentile rankings is virtually the same (1.34 versus 1.31).

5.6 Is Locus of Control Linked to Disadvantage?

Previous researchers have argued that welfare receipt can influence recipients' non-cognitive skills such as self-esteem (Elliott, 1996) and locus of control (Gottschalk, 2005). We know very little, however, about the effect of a family's welfare history on the non-cognitive skills, in particular locus of control, of its young adult members. The concern is that growing up in disadvantage may play an indirect role in limiting educational attainment and achievement by reducing adolescents' sense of control over their lives.

We investigated this issue using a model in which (latent) locus of control is regressed on our measures of socio-economic disadvantage both with and without controls for demographic characteristics (gender and indigenous status) and family background (parental education, immigrant parents, and parental investment in education). As before, we use responses to each of the seven items in the Pearlin and Schooler (1978) Mastery Scale to generate imperfect indicators of individuals' latent locus of control. These indicators are incorporated separately into a model which is similar to the one estimated in Sections 5.2

[22] We created this index by rescaling items in the Pearlin and Schooler (1978) scale so that higher values on each item reflect a more internal locus of control, summing individual responses to these seven items, and then standardizing the result to have a mean of zero and a variance of one.

- 5.4. In this case, however, locus of control is the dependent rather than independent variable. Results (coefficients) for our measures of family welfare history are presented in Table 4.

We find that when we do not control for demographic and other family background characteristics having a family history of intensive welfare receipt (i.e. more than six years) while growing up is significantly related to having a more external locus of control. Having a family history of moderate welfare receipt, irrespective of when it occurs, however, is not significantly related to young people's sense of control over their lives. Once we control for demographic and family background characteristics the estimated coefficient on intensive welfare receipt falls (in absolute terms) from -0.150 to -0.116 standard deviations and becomes statistically insignificant. Thus, there is little evidence that young people growing up in extreme disadvantage have a more external locus of control once other factors are taken into account. Consequently, it is unlikely that disadvantage has an indirect effect on youths' educational outcomes by leading them to feel less in control of their lives.

6 Conclusions

Human capital investment is often at the core of public policies designed to assist individuals—in particular the young, disadvantaged, or socially-excluded—in becoming more self-reliant. It is not surprising, then, that researchers' attention has increasingly turned towards investigating the complex role that non-cognitive skills like locus of control play in human capital formation. In particular, we would like to understand why some individuals invest more than others in ensuring good outcomes for themselves and whether believing that life's events are outside one's control leads to a lack of human capital investment.

This paper makes an important contribution to these efforts by analyzing the relationship between young people's educational outcomes and their sense of control over their lives. Our estimation model advances the literature by allowing for differences in the response error associated with each separate locus of control indicator thus avoiding the need to create a single index through the use of ad hoc weights. Moreover, our data are unique in allowing us to account for the effects of socio-economic disadvantage in a very detailed way.

Our results clearly indicate that having an internal locus of control is associated with more positive educational outcomes. In particular, we find that young people with a more internal locus of control are more likely to finish secondary school and to meet the necessary requirements to be assigned a university entrance rank upon graduation. Those with an internal locus of control who obtain a university entrance rank achieve somewhat higher rankings than do their peers who have a more external locus of control. At the same time, we find that socio-economic disadvantage is associated with large gaps in the educational attainment and academic achievement of young people. This disparity in the educational outcomes of youths growing up in disadvantage does not appear to be the result of an indirect effect of disadvantage on the development of a more external locus of control however. There is no significant relationship between family welfare history and young people's locus of control once other factors are taken into account.

These results are important in furthering our understanding of the relationship between young people's educational outcomes and their sense of control over their lives. At the same time, they leave a number of important issues unresolved. In particular, it is important that we know more about whether or not the association between locus of control and educational outcomes represents a causal effect and, if so, the mechanism through which it operates. Unfortunately, our data do not allow us to account for individual-specific heterogeneity in our estimation and we, therefore, have been cautious in interpreting our results as associations rather than causal effects. Experimental evidence, however, suggests that at least some of what we are measuring is likely to be causal (Leininger and Kalil, 2008). Moreover, the mechanisms through which locus of control affect human capital investments are not well understood. Making progress in this area is often hampered by the complex relationship between various non-cognitive skills. There is often a very close link between an individual's locus of control and dimensions of his or her personality for example, while Ross and Broh (2000) argue that the apparent benefits of high self-esteem for academic achievement are in fact the result of having an internal locus of control. These linkages often make it difficult to isolate the effects of locus of control per se. Finally, we need to understand what these results imply for policy development. Can we design policy interventions to promote adolescents' sense of control over their lives? Thus far, there is little

evidence that academic achievement can be improved by programs which specifically target adolescents' non-cognitive skills (see Holmlund and Silva, 2009, for a review). Psychologists argue, however, that parenting style may contribute to adolescents' sense of control (see McClun and Merrel, 1998) opening up the possibility for policy makers to target parenting skills directly. Most importantly, how can we close the gaps associated with socio-economic disadvantage? Answering this question is critical because the relative lack of educational attainment and academic achievement among young people growing up in disadvantage will almost certainly result in further gaps in their labor market opportunities, health status, and overall wellbeing over the course of their lives.

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Table 1: **Educational Attainment and Achievement by Locus of Control and Socio-Economic Disadvantage.**

Variables		*Secondary School Completion*		*Obtained University Entrance Rank*		*University Entrance Rank*	
		Mean	*Std. Dev.*	*Mean*	*Std. Dev.*	*Mean*	*Std. Dev.*
Locus of Control							
I cannot solve some of my problems	Agree	0.624***	(0.485)	0.682	(0.466)	74.9	(18.0)
	Disagree	0.708***	(0.455)	0.696	(0.460)	73.6	(17.2)
I feel being pushed around in life	Agree	0.676	(0.468)	0.673	(0.469)	73.5	(16.7)
	Disagree	0.699	(0.459)	0.707	(0.455)	74.0	(17.7)
I have no control over things happenning to me	Agree	0.612***	(0.488)	0.642*	(0.480)	71.2**	(17.0)
	Disagree	0.705***	(0.456)	0.701*	(0.458)	74.2**	(17.3)
I can do anything I set my mind to	Agree	0.701***	(0.458)	0.700*	(0.458)	73.8	(17.1)
	Disagree	0.602***	(0.490)	0.626*	(0.485)	73.4	(19.9)
I feel helpless in dealing with my problems	Agree	0.629***	(0.483)	0.672	(0.470)	73.3	(16.9)
	Disagree	0.719***	(0.449)	0.702	(0.458)	74.0	(17.5)
What happens to me mostly depends on me	Agree	0.696**	(0.460)	0.696	(0.460)	73.8	(17.4)
	Disagree	0.621**	(0.486)	0.650	(0.479)	74.4	(16.8)
There is little I can do to change things in my life	Agree	0.591***	(0.492)	0.613***	(0.488)	72.2	(17.5)
	Disagree	0.710***	(0.454)	0.706***	(0.456)	74.0	(17.3)
Socio-economic background[(b)]							
Youth unexposed to disadvantage		0.776	(0.417)	0.768	(0.422)	75.1	(17.1)
Youth exposed to six or more years of disadvantage		0.549***	(0.498)	0.537***	(0.499)	69.4***	(18.4)
Youth exposed to disadvantage when aged 10+ years		0.686***	(0.464)	0.684***	(0.465)	71.6***	(18.1)
Youth exposed to disadvantage when aged 6-10 years		0.684***	(0.465)	0.658***	(0.475)	72.9*	(16.8)
Youth exposed to disadvantage when aged less than 6 years		0.640***	(0.481)	0.628***	(0.484)	72.7	(16.8)

Notes: Standard errors in parentheses. ***, ** and * denotes that the difference is statistically different from 0 at the 1%, 5% and 10% level.
[(a)] Description of index ...*strongly agree* or *agree* with the statement in the question, and value zero if they *disagree* or *strongly disagree*.
[(b)] The diference in means tests compare all groups against those with no history of income support.
Source: Authors' calculations using data from the Youth in Focus data wave 1.

Table 2: **Measurement Model Results: The Estimated Effect of Locus of Control Indicators on Latent Locus of Control.**

Measurement Model's Variables[(a)]	*Secondary School Completion*	*Obtained University Entrance Rank*	*University Entrance Rank*
I cannot solve some of my problems (α_1)	1.00[(b)]	1.00[(b)]	1.00[(b)]
I feel being pushed around in life ($\hat{\alpha_2}$)	.903	.903	.899
	(.065)	(.059)	(.091)
I have no control over things happenning to me ($\hat{\alpha_3}$)	1.150	1.153	1.238
	(.091)	(.077)	(.139)
I can do anything I set my mind to ($\hat{\alpha_4}$)	−.576	−.578	−.651
	(.047)	(.043)	(.073)
I feel helpless in dealing with my problems ($\hat{\alpha_5}$)	1.107	1.107	1.206
	(.079)	(.071)	(.119)
What happens to me mostly depends on me ($\hat{\alpha_6}$)	−.403	−.406	−.346
	(.044)	(.035)	(.059)
There is little I can do to change things in my life ($\hat{\alpha_7}$)	.671	.674	.664
	(.052)	(.046)	(.071)
$\hat{\sigma}_\ell$ [(c)]	1.020	1.015	0.985
	(.053)	(.049)	(.070)

Notes: Heteroscedasticity-robust Standard errors in parentheses.
[(a)] The locus of control variables take four values: 1 if *strongly agree*, 2 if *agree*, 3 if *disagree*, and 4 if *strongly disagree*. The interpretation of the locus of control latent variable, therefore, corresponds to higher values (positive) for internals and low values (negative) for externals.
[(b)] Set to 1.
[(c)] Estimated standard deviation for the latent locus of control, LC^*. $LC^* \sim N(0, \sigma_\ell^2)$. All parameters in the models, including the ones reported in this table, are estimated jointly by maximum likelihood.

Table 3: **The Determinants of Youths' Educational Outcomes (Probit Marginal Effects).**

Dependent Variable:	*Probit Model:* Secondary School Completion	*Probit Model:* Obtained University Entrance Rank	*Censored Regression:* University Entrance Rank
Locus of Control (higher values for *internals*)[(a)]	.061*	.071**	1.31*
Exposure to disadvantage when growing up			
Youth exposed to six or more years of disadvantage	−.099***	−.164***	−4.29***
Youth exposed to disadvantage when aged 10+ years	−.029	−.027	−.96
Youth exposed to disadvantage when aged 6-10 years	−.080***	−.078***	−1.24
Youth exposed to disadvantage when aged less than 6 years	−.050	−.099***	−1.68
Other characteristics			
Living with both parent at 14 years old	.065***	−.012	−.66
Male	−.120***	−.028**	−3.79***
Indigenous	−.170**	−.175**	−7.30
Parents read at night when young	.016	.058**	3.30**
Parents helped with homework	−.024	−.053**	3.34**
Father has a degree	.088***	.021	1.11
Mother has a degree	.036*	.058**	1.10
Mother completed Year 12	.054**	.003	4.93***
Father completed Year 12	.025	.081***	3.70***
Either parent is immigrant–non-English speking background	.118***	.046**	2.77**
Either parent is immigrant –English speaking background	−.019	−.042	1.74
Early born (Oct.-Dec. 1988) in Queensland or Western Australia	.036**		
Early born (Oct.-Dec. 1988) in other states	.167***		
Observations	2065	1506	1105

Notes: ***, **, and * denote significance at 1%, 5%, and 10% of the underlying coefficient (Results available upon request).
[(a)] The marginal change is from someone with a locus of control at the 25^{th} percentile to someone who has a locus of control at the 75^{th} of the scale. A one standard deviation change (i) increases the probability of Year 12 completion by 4.5 percentage points and (ii) the probability of obtaining an university entrance rank by 5.3 percentage points. It also increases the university entrance rank by 0.93 percentiles.

Table 4: **The Effect of Socio-Economic Disadvantage on Youths' Locus of Control.**

Dependent Variable: Latent Locus of Control	*Model With No Controls*	*Model With Controls*
Disadvantage Variable	*Coefficient*	*Coefficient*
In terms of Standard Deviations of the Dependent Variable:		
Youth exposed to six or more years of disadvantage	$-.147^{**}$	$-.116$
Youth exposed to disadvantage when aged 10+ years	$-.079$	$-.039$
Youth exposed to disadvantage when aged 6-10 years	.028	.056
Youth exposed to disadvantage when aged less than 6 years	$-.010$	.031
Observations	2065	2065

Note: The figures come from a model in which latent Locus of Control is regressed on disadvantage variables. Regressors include gender, parental education, parent's non-pecuniary, indigenous indicator, parental immigration status. ***, **, and * denote significance at 1%, 5%, and 10% of the underlying coefficient.

Table A1: **Variable Definition and Sample Descriptive Statistics.**

Variable definition	*Mean*	*Std.Dev.*	*Min.*	*Max*	*Obs.*
=1 if individual had completed Year 12 at interview, =0 otherwise	.717	(.451)	0	1	3723
University entrance score, 0 for those who did not take it	50.348	(33.938)	0	99.98	2294
I cannot solve some of my problems	3.044	(.753)	1	4	2705
I feel being pushed around in life	2.751	(.811)	1	4	2702
I have no control over things happenning to me	3.131	(.709)	1	4	2699
I can do anything I set my mind to	1.756	(.657)	1	4	2696
I feel helpless in dealing with my problems	2.834	(.781)	1	4	2698
What happens to me mostly depends on me	1.636	(.644)	1	4	2702
There is little I can do to change things in my life	3.125	(.703)	1	4	2701
Youth unexposed to disadvantage	.252	(.434)	0	1	3723
Youth exposed to six or more years of disadvantage	.365	(.482)	0	1	3723
Youth exposed to disadvantage when aged 10+ years	.127	(.333)	0	1	3723
Stratum D	.102	(.302)	0	1	3723
Stratum F	.054	(.226)	0	1	3723
Youth exposed to disadvantage when aged less than 6 years	.100	(.300)	0	1	3723
Regional dummy variables					
ACT	.013	(.115)	0	1	3723
VIC	.250	(.433)	0	1	3723
WA	.103	(.305)	0	1	3723
NT	.003	(.057)	0	1	3723
QLD	.218	(.413)	0	1	3723
SA	.078	(.269)	0	1	3723
TAS	.026	(.159)	0	1	3723
Characteristics					
=1 if youth is male, 0 otherwise	.468	(.499)	0	1	3723
=1 if youth is indigenous, 0 otherwise	.040	(.197)	0	1	3714
=1 if parent read to youth at night, 0 otherwise	.471	(.499)	0	1	2715
=1 if parent helped youth with homework, 0 otherwise	.554	(.497)	0	1	2717
=1 if youth lived with both parents at age 14, 0 otherwise	.664	(.472)	0	1	3711
=1 if youth's father had a degree when the youth was aged 14, 0 otherwise	.539	(.499)	0	1	3188
=1 if youth's mother had a degree when the youth was aged 14, 0 otherwise	.471	(.499)	0	1	3133
=1 if youth's mother was a high school graduate when youth was 14, 0 otherwise	.469	(.499)	0	1	3446
=1 if youth's father was a high school graduate when youth was 14, 0 otherwise	.409	(.492)	0	1	3446
=1 if either parent is immigrant from non-English-speaking country, 0 otherwise	.246	(.430)	0	1	3723
=1 if either parent is immigrant from English-speaking country, 0 otherwise	.164	(.370)	0	1	3723

Source: Author's calculations based on data from Youth in Focus (YIF) data, wave 1.

Table A2: **Items in the Pearlin-Schooler Scale.**

How strongly you agree or disagree with the following statements? (1) Strongly disagree; (2) Disagree; (3) Agree; and (4) Strongly agree	
Item 1	I cannot solve some of my problems
Item 2	I feel being pushed around in life
Item 3	I have no control over things happenning to me
Item 4	I can do anything I set my mind to
Item 5	I feel helpless in dealing with my problems
Item 6	What happens to me mostly depends on me
Item 7	There is little I can do to change things in my life

Source: Author's calculations based on data from Youth in Focus (YIF) data, wave 1.