The Effect of Permanent Income on Completed Schooling in Australia

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Abstract

Child poverty is a concern to any society, and the link between childhood poverty and schooling completion is one of the key factors causing cycles of intergenerational poverty in Australia. In particular, the literature suggests that it is sustained, or permanent, low income which has the most serious and long-lasting consequences on children, rather than transitory income shocks. This paper investigates the effect of permanent income during childhood on adolescent's schooling completion using the first six Waves of the HILDA Survey. The results show that whilst permanent income during adolescence is positively associated with the probability of completing Year 12 or a trade qualification, other factors including parental education and neighbourhood characteristics, have a far greater impact on adolescent's schooling preferences.

Section I: Introduction

Child poverty is a concern to any society and warrants detailed consideration. Children represent an 'investment' in the future and so society should ensure that they have a chance to meet their potential. Society also has innate feelings of protection towards children, as they have little control over their situation and limited input into decisions that shape their future. Evidence also suggests a link between childhood poverty and a child's chances of being income poor as an adult. Childhood poverty "is one of the key factors determining the link between incomes of different generations within families," (Blau 1999, p261) as it limits the chances for educational attainment and in turn, labour market success and the chance to escape poverty (Engle and Black 2008, p243; Levy and Duncan 2000, p19; Buddelmeyer and Verick 2007, p17).

The literature also suggests that the most serious and long-lasting consequences of poverty during childhood are felt by those with sustained low household income, rather than children whose household income is only temporarily low (Goodin *et al.* 1999, p159; Duncan *et al.* 1998). The objective of this paper is to assess the effect of low, permanent, household income during adolescence on completed schooling: an analysis which, in its very nature, requires longitudinal data. This is the first study to explore this issue using Australian longitudinal data.

The remainder of this paper is organised as follows. Section II reviews the theoretical models and empirical literature regarding the transmission mechanism between household income during childhood and schooling achievement. Section III introduces the data and methodology used, develops the research hypothesis and finally, translates

this into an empirical model for estimation. Section IV presents and discusses the estimation results, including marginal effects. Finally, Section V concludes with a summary of the key findings, policy implications and areas of further research.

Section II: Literature Review

Models explaining the link between income poverty of children and educational outcomes in later life can be broadly categorised under two contrasting analytical paradigms – the economic theories and the socialisation theories (Haveman, Wolfe and Spaulding 1991, p135). The former focuses on income poverty and the choice to continue with education as a question of efficiency: a family has a given amount of income and time resources to allocate between consumption and investment activities, including children's schooling. Economic models include the "human capital investment" model, the "home environment" and "outside home care" models. Alternatively, socialisation theory emphasises the potential effects of parental or other role models' behaviours and achievements on children's own aspirations and performance (Haveman, Wolfe and Spaulding 1991, p135). This theory underlies the "neighbourhood effects" model and Mayer's (1997) "good parent theories."

The human capital investment model (Becker 1981; Becker and Tomes 1979) assumes that families maximise a utility function spanning several generations constrained by family resources of both time and money. Parents must allocate their given resources between current and future consumption, which includes investment in children's schooling. The greater the value of parental resources in any generation, the larger is the potential investment in a child's human capital and therefore, future income and

consumption This means that poorer households tend to remain so throughout generations, as their budget can sustain only present consumption necessities.

'Poor' children, whose income to needs ratio is less than unity have been found to average 1.4 fewer years of schooling and be more than three times as likely to have dropped out of school, compared to non-poor children (Corcoran 2001, p143). In fact, children with real, household equivalised income (RHED income) of $35,000 across ages 0-15, are more than ten times as likely to complete high school compared to children with an average RHED income of $15,000 across the same ages (Duncan *et al.* 1998, p415). Regarding outcomes in later life, "poor children have higher poverty rates (24% versus 4%) and lower incomes ($21,514 versus $36,003) in their mid-twenties than do non-poor children," which is evidence of the existence of a poverty cycle (Corcoran 2001, p143).

Blau (1999, p268) showed that permanent changes in the household budget have a bigger impact on a family's investment and education decisions compared to transitory shocks. Using a series of fixed effects models, Blau (1999) found that a $10,000 increase in total, current RHED income increased a child's math score by 12.1% of a standard deviation and increased reading score by 13.5% of a standard deviation at age five, but these effects were more than double when based on *average* RHED income from all available childhood years. These results show that households with permanent income changes are better able to plan for long-term investments such as children's schooling, consistent with the findings of Dahl and Lochner (2005, p28).

The home environment model emphasises the physical condition of a home, the warmth of mother-child interactions and opportunities to access learning resources as prime mechanisms through which poverty can affect a child's life outcomes (Duncan and Brooks-Gunn 2000, p190). The strongest determinant of the quality of a child's home environment is parental income (Kornberger 1999, p21), meaning that children in wealthy households are advantaged from an early age as they are more likely to be surrounded by an environment conducive to learning and development. Similar to the home environment model, the quality of care a child receives outside the home also affects their schooling decisions and life outcomes. For example, children who have access to high quality, developmentally appropriate child care are likely to have, "enhanced social, emotional and in some cases, linguistic competence," (Duncn and Brooks-Gunn 2000, p190).

The 'neighbourhood' model postulates that, "individuals and families self-segregate into neighbourhoods based on their preferences for local public goods and taxation," (Jensen and Seltzer 2000, p18) as well as income constraints (Duncan and Brooks-Gunn 2000, p190), resulting in a segregation between wealthy neighbourhoods with high employment rates and educational attainment and poor ghettos characterised by fewer available jobs, lower-quality schools and fewer job networks (Jencks and Mayer 1990; Engle and Black 2008, p247). The day-to-day activities which surround children in their neighbourhood can have long-lasting consequences. For example, children in wealthier suburbs who interact with professionals and skilled tradespersons and see them travelling to and from work form a strong connection between education and meaningful employment, whereas children living in suburbs with high welfare

dependency, drop-out rates, unemployment, crime, drug use and idleness are unlikely to perceive this connection, resulting in higher school drop-out rates and fewer available job networks.

According to the results of Jensen and Seltzer (2000, pp25-6), a neighbourhood unemployment rate of only 1% implies a 64.92% chance of a student continuing his or her education beyond secondary school, compared with a probability of 52.99% if the neighbourhood unemployment rate is 5% and only 37.75% if the child's neighbourhood has an unemployment rate of 10%. Based on these results, there is the possibility of a vicious cycle if low geographical mobility means children raised in suburbs with high unemployment have restricted educational opportunities, thereby generating further negative externalities and lower incomes in future (Jensen and Seltzer 2000, p26). Duncan, Brooks-Gunn and Klebanov (1994, p309) found similarly, that having more affluent neighbours is associated with higher age-5 IQ while having more low income neighbours is associated with more externalizing problem behaviour. Engle and Black (2008, p247), however, find that community-level variables typically account for less variance in children's academic performance than family related variables.

'Role model' theories suggest that parents set an example which their children tend to follow, such that children whose parents are more highly educated, and thus, less likely to be poor, are encouraged to achieve the same outcomes (Haveman, Wolfe and Spaulding 1991, p134). This result is strongly supported by the empirical literature. Having a father who has some college education increases the probability that a child will graduate high school by 14% and having a mother with some college education

makes such an outcome a "virtual certainty," (Haveman, Wolfe and Spaulding 1991, p145). Having a father who is employed at the age of 14 also makes one less likely to be poor in adulthood (Buddelmeyer and Verick 2007, p13).

Mayer (1997) stresses the importance of unobservable parental traits, such as diligence, reliability, genetics, values and a strong work ethic as important predictors of children's educational and labour market outcomes. She acknowledges the positive effect of household income on children's living standards. However, once basic needs are met, parental income is relatively less important compared to having parents who are good role models and display traits such as diligence, motivation and a good work ethic.

Aspects of Mayer's (1997) 'good parent' theories are reflected in the 'working mother hypothesis.' This suggests that having a mother who is employed increases household income and displays strong work ethic, though it potentially reduces the amount of parent/child interactions, leading to developmental problems for children (Haveman, Wolfe and Spaulding 1991, p135). Kornberger (1999, pp14-5) states that the positive effect of maternal employment on a child's schooling are, "mainly experienced by two parent families where a working mother's second income can significantly boost family income."

The intergenerational welfare transmission model, another of the socialisation theories, suggests that welfare dependency leads to feelings of lower personal adequacy, independence and self-esteem on the part of the parent, which has harmful flow-on effects for children's own aspirations and their capacity for independent actions

(Murray 1984; Haveman, Wolfe and Spaulding 1991, p135). Furthermore, when parents use welfare heavily and work only intermittently, the stigma associated with welfare diminishes and a 'welfare culture' emerges whereby parents develop self-defeating work attitudes and poor work ethics which are again passed on to their children (Corcoran 2001, p141). Thus, children living in households which are not only poor but also welfare dependent have significantly lower labour market outcomes, including hourly wage, earnings and family income (Corcoran *et al.* 1992, p589), complete fewer years of schooling (Corcoran 2001, p147) and are significantly less likely to graduate from high school, especially when welfare dependency is experienced during adolescence (Haveman, Wolfe and Spaulding 1991, p143).

In summary, there is strong theoretical and empirical evidence suggesting a link between childhood poverty, educational achievement and one's likelihood to be poor as an adult, highlighting the importance of schooling in breaking the poverty cycle.

Section III: Data and Methodology

To study the effect of permanent, household income on schooling completion requires longitudinal data, which observes the same children through time as their household circumstances change. Two large-scale, longitudinal data sets currently exist in Australia, namely the Longitudinal Survey of Australian Children (LSAC) and the Household Income and Labour Dynamics in Australia Survey (HILDA). For the purpose of this paper, HILDA is preferred as it includes children of all ages and also contains data from a longer time period.

HILDA began in 2001 with a large, national probability sample of Australian, privately owned dwellings and each year thereafter, members of the initial sample, as well as their spouses, children and others living in the same household were re-interviewed. All sample members aged 15 years and older were administered a questionnaire each year and data for children aged younger than 15 years was collected through a household questionnaire. The choice of appropriate income measure is crucial for the analysis in this section, and for the purpose of this paper, the annual real, household equivalised disposable (RHED) income is used.

The main objective of this section is to determine the effect of permanent RHED income during adolescence on schooling completion, when controlling for other individual characteristics. For this purpose, the dependent variable of interest is whether or not the individual has completed a 'minimal level of schooling,' defined as completing Year 12 or a Trade certificate. In modern Australian society, one may postulate that completing a minimal level of schooling is essential to function as an adult, as it improves one's chances of securing employment and substantially increases one's earnings. This makes it far less likely that the individual will fall into poverty in adulthood and allows one the freedom to direct his or her own life and achievements (Sen 1997, p1959). The dependent variable in the model, therefore, is binary: either the adolescent has or has not completed a minimal level of schooling.

The empirical model of schooling completion is now developed in the context of utility maximisation theory. Firstly, assume the adolescent faces a decision between completing a minimal level of schooling (option A), and dropping out of school without

completing a minimal level (option B). The indirect utility derived from each decision is given by (Kennedy 2008, p247):

$$\begin{aligned} U_A &= \alpha_A + \beta_{1A} x_1 + \beta_{2A} x_2 + ... + \beta_{KA} x_K + \varepsilon_A \\ U_B &= \alpha_B + \beta_{1B} x_1 + \beta_{2B} x_2 + ... + \beta_{KB} x_K + \varepsilon_B \end{aligned}$$

where $x_k \quad \forall k = 1,2,...K$ represents K explanatory variables which affect the indirect utility derived from the education decision such as social, familial and individual background characteristics. The student chooses to complete a minimal level of schooling only if the indirect utility derived from deciding to complete, exceeds that derived from dropping out:

$$\begin{aligned} U_A - U_B &> 0 \\ \alpha + \beta_1 x_1 + \beta_2 x_2 + ... + \beta_K x_K + \varepsilon &> 0 \end{aligned}$$

where the simplified coefficients represent the difference in the parameters from both indirect utility functions. The function for propensity to complete a minimal level of schooling is akin to the latent variable index, whereby the adolescent chooses to complete Year 12 or a Trade Certificate if their latent index exceeds the threshold value of zero. Therefore, the probability that adolescent *i* chooses to complete a minimal level of schooling can be modelled using a probit model where the independent variables include those individual, familial and background characteristics that affect the adolescent's indirect utility from either completing or not completing a minimal level of schooling.

The sample of adolescents used in this analysis consists of those aged 17, 18 or 19 years in 2005-06, the sixth Wave of the HILDA data. This age range was chosen to ensure that the attained schooling level would be known with certainty, whilst also allowing sufficient years of household income data during adolescence to be used in the analysis.

Furthermore, the sample was purposely designed to be as large as possible in order to reduce the expected estimation problems caused by multicollinearity in the explanatory variables.

Adolescents were kept in the sample if their household, disposable income was available for all six years and was greater than zero,[1] resulting in an initial sample of 594 adolescents. However, the sample was further reduced due to missing education data in 2005-06 and to ensure permanent income during adolescence reflected only family income by excluding those adolescents living alone, with a partner or as a single parent. A minority of students who were still studying in Years 10 or 11 were then excluded from the sample as it could not be known with certainty whether these students would complete the minimal level of schooling. This left a total sample of 503 students: 160 17-year olds, 176 18-year olds and 167 19-year olds.

Based on the literature reviewed, the following independent variables were included in the model:

- *Permanent RHED income*: defined as the maximum, sustainable level of annual consumption that a person could achieve with their actual income stream over *T* years, if the agent could save and borrow at prevailing interest rates. The variable is used since the literature suggests it is permanent, rather than current, annual income which has the greatest impact on a child's schooling completion and long-term outcomes. The variable PERMINC is calculated using household, disposable

[1] Households were dropped from each annual sample if their aggregate disposable income was zero or negative, following concerns by the Melbourne Institute regarding the reliability of such income data (Headey, Warren and Harding 2006, pp42, 47; Headey and Warren 2007, p37; Heady and Warren 2008, p52).

income for each adolescent in each of the six waves after converting this into real 2005-06 dollars, equivalising using the OECD equivalence scale[2] and finally, converting the annual RHED incomes into the single, permanent RHED income using the algorithm set out by Rodgers and Rodgers (1993, p37) and summarised in Appendix 1. The mean value of PERMINC for those in the estimation sample was $29, 479 (and standard deviation of $14,104).[3]

- *Gender*: GIRL is the gender variable where the base category is male
- *Race*: represented by a binary variable INDIG, where the base category represents those who are not Aboriginal or Torres Strait Islander. In the sample, only 4% of the adolescents were Aboriginal and/or Torres Strait Islander.
- *Parent's Education*: defined as separate categorical variables for either parent. Father's highest level of education is categorised either as University education (F_UNI), Trade Certificate qualification (F_TRADE) or Other, which represents the reference category. Mother's highest level of education has only two categories: at least Year 12 completion (M_YR12), which includes mothers with a University or trade qualification, or less than Year 12 completion which is the reference category. Mother's education does not contain separate categories for tertiary qualification, as the sample sizes were too small. The data for parent's highest level of education was taken from the parent's most recent self-enumerated survey form, or the adolescent's own report of their parent's highest level of education in the case that the parent had never reported their education,. In the sample, 31% of adolescents

[2] The OECD equivalence scale appoints a weight of one to the first adult in the household, a weight of 0.5 for each extra adult and a weight of 0.3 for each child in the household aged under 15 years. Dividing the total household disposable income by the equivalence scale gives household, disposable income per adult equivalent.

[3] Two adolescents, whose permanent RHED income exceeded $110,00 were identified as outliers, though kept in the sample. Sensitivity analysis was conducted by excluding these adolescents though the results were unchanged, overall.

had fathers who held some University qualification, 36% had fathers whose highest level of education was a trade Certificate or Diploma and the remaining 33% of adolescents fell into the reference category. Regarding mother's education, 64% of adolescents had mothers whose highest level of education was at least Year 12.

- *Neighbourhood:* The ABS Socio-Economic Index for Areas was used to represent the multitude of characteristics in a student's neighbourhood which are believed to affect the decision to complete Year 12 or a trade qualification. The SEIFA Index of Advantage and Disadvantage was used and transformed from a decile index into a categorical variable. For each of the six Waves, adolescents were deemed to be living in a 'low' neighbourhood if they lived in the lowest three deciles, a 'mid' neighbourhood if they lived in the middle four deciles or a 'high' neighbourhood if they lived in one of the three most advantaged deciles. Each adolescent was categorised as living in either a very disadvantaged (LOW_AD), mid advantage/disadvantage (MID_AD) or very advantaged (HIGH_AD) neighbourhood based on that category where they lived most frequently over the six Waves. The middle category is excluded as the reference case for the purpose of the regression analysis. Approximately the same number of adolescents lived in each of the three categories of neighbourhood, with a slightly higher number of students living in middle SEIFA neighbourhoods.[4]
- *Wealth:* Real, own home equity, as measured by the HILDA survey in 2001-02 is included in the model, after converting this into real 2005-06 dollars, equivalising using the OECD equivalence scale and finally, taking the natural logarithm, to

[4] 157 adolescents were classified in LOW_AD, 183 classified in MID_AD and 163 in HIGH_AD.

create the variable LOGWEALTH.[5] The mean value of real own home equity is $87,419.[6]

The structural specification of the estimated model is given by:

$$P(MINSCHOOL_I = 1) = \Phi\begin{bmatrix} \alpha + \beta_1(LOGPERMINC) + \beta_2(GIRL) + \beta_3(INDIG) \\ + \beta_4(F\_UNI) + \beta_5(F\_TRADE) + \beta_6(M\_YR12) \\ + \beta_7(F\_UNI * GIRL) + \beta_8(F\_TRADE * GIRL) \\ + \beta_9(M\_YR12 * GIRL) + \beta_{10}(LOW\_AD) + \beta_{11}(HIGH\_AD) \\ + \beta_{12}(LOGWEALTH) \end{bmatrix}$$

A stepwise procedure is used whereby the model is successively re-estimated, each time including an additional set of variables to test the sensitivity of the estimates.

Section IV: Results

Table 1 Probit Results for Model of Minimal Schooling Completion

Dependent Variable = Completed Minimal Level of Schooling					
	Model I	Model II	Model III	Model IV	Model V
Constant	-5.9248***	-3.7239**	-1.6901	-1.7637	-1.2725
LOGPERMINC	0.6312***	0.3729**	0.1798	0.1900	0.1137
GIRL	0.3898***	0.3987***	0.4159***	0.4519**	0.5132***
INDIG	-0.8349***	-0.6919**	-0.6462**	-0.6717**	-0.5448*
F_UNI		0.6496***	0.5285***	0.5948***	0.5583***
F_TRADE		0.0934	0.0705		
M_YR12		0.3613***	0.3461***	0.3247*	0.3418*
F_UNI*GIRL				-0.2373	-0.2100
M_YR12*GIRL				0.0348	-0.0421
LOW AD/DIS			-0.3191**	-0.3283**	-0.3022**
HIGH AD/DIS			0.3064*	0.3041*	0.3058*
LOGWEALTH					0.0316**
Wald χ^2	34.73	50.83	62.95	64.96	72.65
Prob > χ^2	0.00	0.00	0.00	0.00	0.00
Log Likelihood	-271.29	-257.56	-251.58	-251.43	-248.64
Pseudo R^2	0.0629	0.1104	0.1310	0.1316	0.1412
Count R^2	74.8%	75.6%	76.3%	76.5	75.8%
N	503	503	503	503	503

Legend: * p<0.1; ** p <0.05; *** p<0.01

[5] For the 24% of the sample with negative or zero real own home equity, LOGWEALTH is assumed to be equal to zero.

[6] One adolescent, with real, equivalised, own home equity in excess of $1,400,000 was identified as an outlier. Sensitivity analysis showed that the regression results remained unchanged, overall, after excluding this adolescent.

Initially, when permanent RHED income is included, with only controls for gender and race, it appears that permanent RHED income has a positive and highly significant impact on a student's probability of completing a minimal level of schooling (Model I). The effect of permanent RHED income, however, is substantially reduced as parent's education and neighbourhood characteristics are introduced, approximately halving with the introduction of parent's education (Model II) and again when neighbourhood is included (Model III). The coefficient of permanent income continues to have its expected positive sign, but ceases to be significant at the 10% level with the inclusion of neighbourhood advantage and disadvantage.

The results of the stepwise estimation show that the explanatory power previously assumed by permanent RHED income is being absorbed partly by parental education and, to a larger extent, neighbourhood variables. The results of Model III, in particular, support the neighbourhood characteristics model and evidence the transmission from low household income to schooling achievement through neighbourhood segregation. Living in a high-income family positively affects a student's probability of completing schooling: firstly, because it allows for increased human capital investment, and secondly, because it encourages the family to live in relatively advantaged suburbs where resources and successful role models are more prevalent. The opposite effect occurs for students living in low-income households, as evidenced by the negative and significant effect of 'low' advantage and disadvantage in the neighbourhood.

In short, these results show that the positive effect of household income on a student's propensity to finish a minimal level of schooling is transmitted through a mixture of

channels. On one hand, the positive effect of household income reflects the effect of parent's education, which not only increases parent's earning and household income, but also encourages children, likewise, to complete higher education. This is supported by the human capital investment model and the 'role model' theories. On the other hand, household income acts to segregate families into different neighbourhoods and thereafter, the effect of household income on schooling is transmitted through the resources available and actions of role models in the neighbourhood, which affect the child's schooling preferences.

Regarding the other explanatory variables in the model, higher levels of parental education are positively associated with a student's probability of completing a minimal level of schooling (Model II). Students whose father has attended or completed a university qualification are significantly more likely to complete a minimal level of schooling, compared to students whose father's highest qualification is other than university or a trade Certificate. Similarly, there is a positive effect on the student's probability of completing if their father holds a trade Certificate, though this effect is not significant. Students whose mother has completed at least Year 12 are also significantly more likely to complete, relative to students whose mother has not completed at least Year 12. This effect is significant at the 1% level. Based on a restricted log likelihood statistic, the parental education variables are jointly significant at the 1% level,[7] which is consistent with the findings of Haveman, Wolfe and Spaulding (1991). The positive and significant effect of parental education remains as neighbourhood characteristics are included (Model III), implying that the estimates are

[7] $\lambda = -2(-271.29 - (-257.56)) = 27.46 \sim \chi_{(df=3,\ \alpha)}$

robust. The effect of parental education is independent of household income and neighbourhood characteristics. In short, having highly educated parents makes an adolescent more likely to prefer to complete a minimal level of schooling, even if they live in a low income household in a relatively disadvantaged neighbourhood. This result is not unusual in the face of the 'role model' hypothesis.

Based on the results from Models II and III, interaction terms were introduced for father's university education and mother's Year 12 completion, where each was interacted with student's gender. However, the reference case was expanded to include students whose father held a trade Certificate as the results showed no significant difference in schooling completion for these students. Introducing the interaction terms (Model IV), initially suggests that father's university education has a stronger effect on a son's schooling completion relative to daughter's completed schooling, whilst mother's Year 12 completion has the opposite effect. However, the mother's interaction term changes sign and becomes negative in Model V and the parameters were neither independently nor jointly significant at the 10% level in either model. Thus, the results show no significant difference in the effect of parental education on student's schooling completion, based on the student's gender.

As stated above, the relative advantage and disadvantage present in a student's neighbourhood is highly significant in predicting his or her probability of completing a minimal level of schooling (Model III). The parameters conform to their expected signs and are independently significant, at least at the 10% level in both models. In addition,

the variables are also jointly significant at the 1% level in Model III.[8] Even as additional variables are introduced in Models IV and V, the parameters remain stable and exhibit their *a priori* expected signs, demonstrating their robustness. These results strongly imply that neighbourhood resources and role models have a significant effect on a student's schooling preferences and decisions, even after controlling for permanent RHED income. The results illustrate the complexities in the transmission mechanism between household income and schooling and are consistent with the findings of Jensen and Seltzer (2000).

Real, household, equivalised wealth also has a positive and significant effect on a student's probability of completing a minimal level of schooling (Model V). It's inclusion again reduces the size of the permanent RHED income coefficient implying, as expected, that the variables are positively correlated. Wealth, like the neighbourhood variables, absorbs some of the explanatory power of household income.

Regarding the model diagnostics, presented in the lower part of Table 1, the inclusion of parental education and neighbourhood characteristics substantially improved the overall performance of the model. The pseudo R^2 statistic increased by approximately 75% when parental education was introduced (Model II) and a further 19% when neighbourhood variables were included (Model III). Note that the pseudo R^2 is not adjusted for the number of included variables. The overall count R^2 of the model also improved from approximately 74.8% for Model I to 75.6% for Model II and further increased to 76.3% for Model III. The model performance, as determined by the

[8] $\lambda = -2(-254.56 - (-251.58)) = 11.96 \sim \chi_{(df=2,\ \alpha)}$

proportion of correct predictions, improved most considerably for students who did not complete a minimal level of schooling, 'non-completers',[9] whilst the rate of correct prediction for completers remained relatively constant.[10] Thirdly, based on the restricted log likelihood statistic, both parent's education and neighbourhood variables were highly significant. The count R^2 for these models was also consistently greater than the naïve prediction (=73.8%). The log likelihood and pseudo R^2 for Model IV improved only marginally, reflecting the low individual significance of the interaction terms.

Model V is chosen as the superior model in Table 1 for the purpose of examining the marginal effects, for the following reasons. Firstly, it has the maximum log likelihood and exhibits the expected coefficient signs for those variables which had an *a priori* expected sign, based on the empirical literature. Although no adjusted R^2 statistic is available, the pseudo R^2 is substantially larger than that of the other models. The count R^2 for Model V is also relatively high (=75.8%) and compared with the other models, it correctly predicts a much larger proportion of outcomes for those students who did not complete a minimal level of schooling. Model V correctly predicts the outcome for 93.3% of the observed successes and 26.5% of the observed failures: an overall count R^2 of 75.8% which is greater than the result for the naïve prediction.

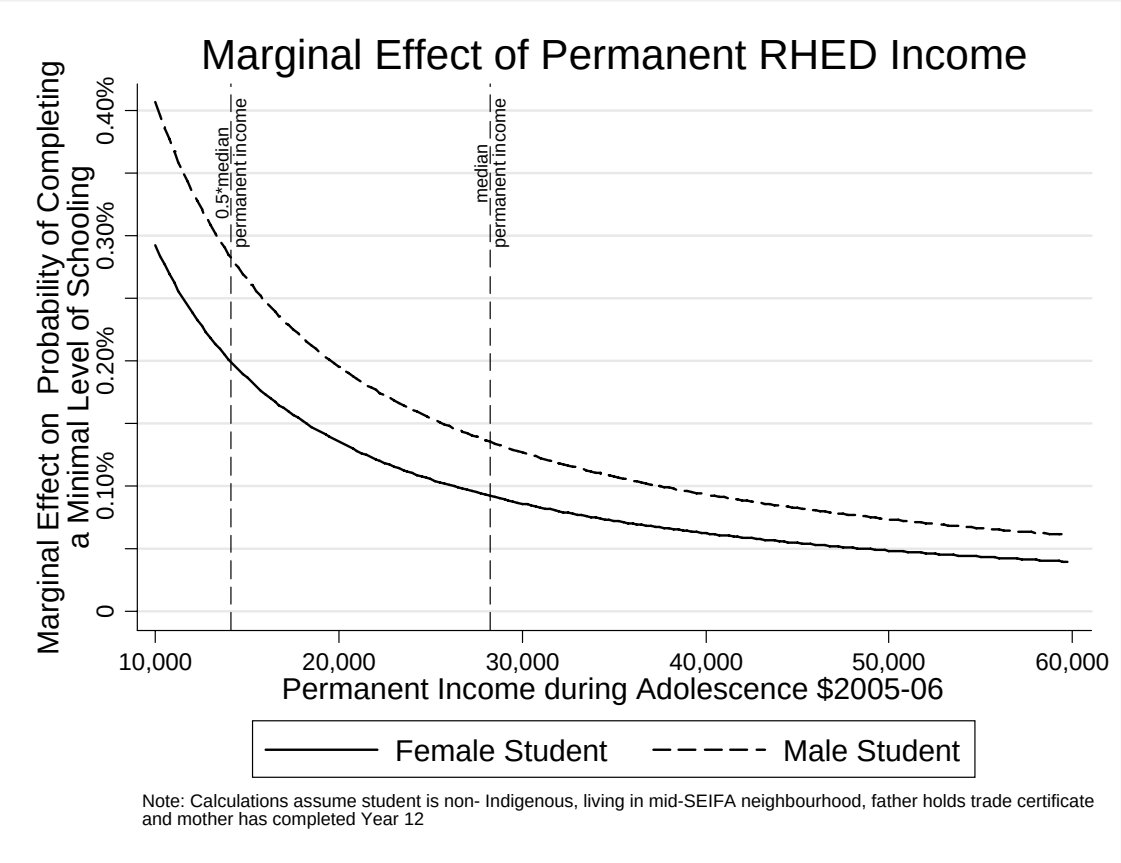
Figure 1 presents the marginal effect of permanent RHED income on a student's probability of completing a minimal level of schooling, when measured in thousands of dollars. The calculations are based on a typical student who is non-Indigenous, living in

[9] Model I correctly predicted 10.6% of non-completers, compared with 18.2% for Model II and 21.2% for Model III.

[10] Model I correctly predicted 97.6% of completers, compared with 96.0% for Models II and III.

a mid-SEIFA neighbourhood whose father holds a trade certificate and whose mother has completed Year 12, with median RHE wealth equal to $66,071.

Figure 1 Marginal Effect of $1000 Increase in Permanent Income



For a student with median permanent RHED income (=$28,222), a $1,000 increase in permanent income increases the probability of completing a minimal level of schooling by 0.10%-0.15%. The same change in permanent RHED income for a student with only half median permanent RHED income increases the probability of completing by 0.20%-0.30%. By halving the gap in permanent income between a student with half median permanent income and a student with median permanent income,[11] the probability of completing a minimal level of schooling for the poorer student increases

[11] This represents an increase in permanent, RHED income of approximately $7,000.

by approximately 1.8%. In effect, the gain in schooling achievement from increasing permanent income alone is quite small.

The marginal effect on completed schooling is far greater in the case of parental education and neighbourhood characteristics. All probabilities presented herein are estimated for a student who was non-Indigenous, with half median permanent RHED income of $14,111[12]. Parents' education is considered only at the university level for fathers, and Year 12 level for mothers. Thus, a 'well-educated' father refers to a father who has completed, or is attending, University whilst a 'well-educated' mother refers to a mother who has completed at least Year 12. Four categories of parents' education are considered: neither parent is well-educated, only one's father is well-educated, only one's mother is well-educated and lastly, both parents are well-educated.

Compared to a student where neither parent is well-educated, females are approximately 9 percentage points more likely to complete a minimal level of schooling if either their mother or father is well-educated, and 16 percentage points more likely if both parents are well-educated. The effect of parents' education is even stronger for male students, who are approximately 20 percentage points more likely to complete a minimal level of schooling if their father is well-educated and 13 percentage points more likely if their mother is well-educated. In combination, a male is student is 29 percentage points more likely to complete a minimal level of schooling if both his parents are well-educated. For both male and female students, father's education has a greater impact relative to mother's.

[12] Median real, permanent HED income for the sample of 17, 18 and 19 year-olds was $28,222 (when enumerated person longitudinal weights were applied).

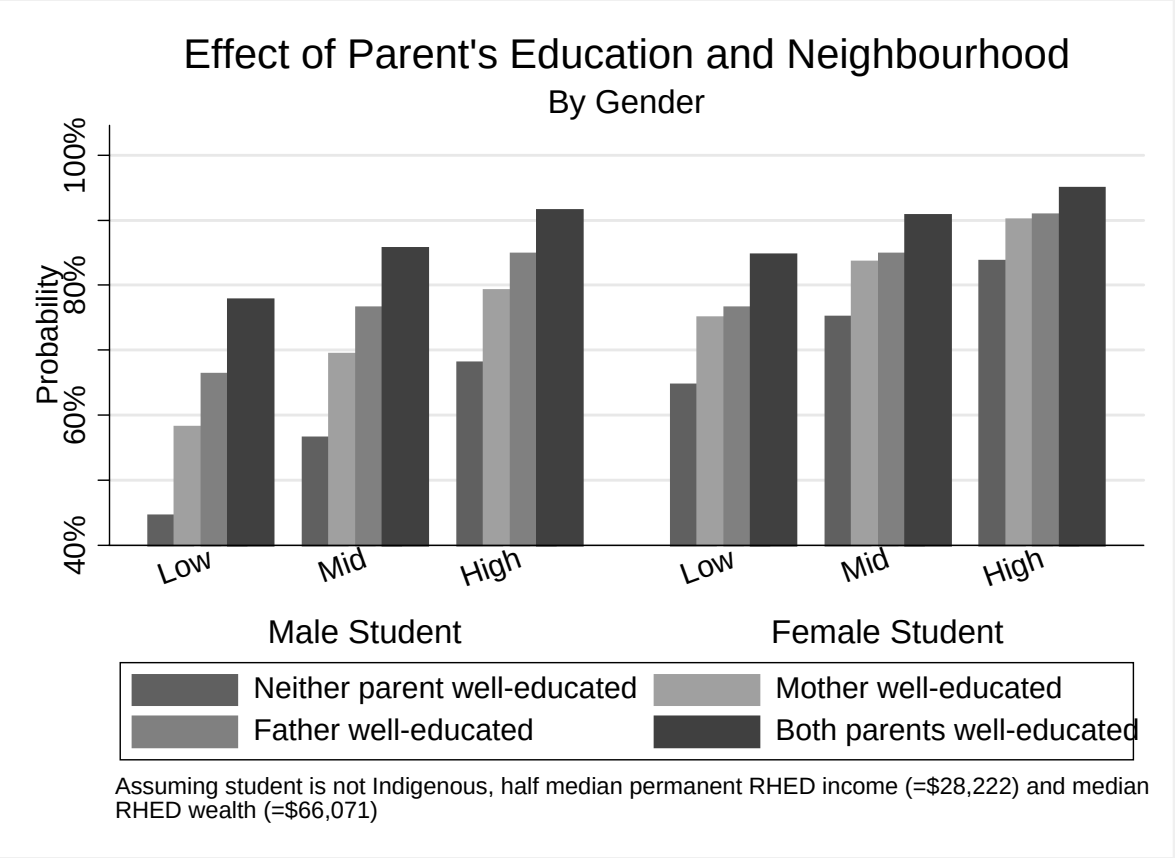
Table 2 Marginal Effect of Parents' Education and Neighbourhood by Gender

(Assuming half median income)

Parent's Education	Boy			Girl		
	SEIFA: Ad/Dis			SEIFA: Ad/Dis		
	Low	Mid	High	Low	Mid	High
Neither parent educated	44.5%	56.5%	68.1%	64.6%	75.1%	83.7%
Mother only educated	58.1%	69.4%	79.2%	75.0%	83.6%	90.0%
Father only educated	66.3%	76.5%	84.8%	76.5%	84.8%	90.9%
Both parents educated	77.7%	85.6%	91.5%	84.7%	90.8%	94.9%

Note: Estimated probabilities based on non-Indigenous student with half median permanent RHED income (=$14,111) and median RHE wealth (=$66,071)

Figure 2 Marginal Effect of Parents' Education and Neighbourhood by Gender



It is noteworthy that even for a student who is very poor, with permanent RHED income is equal to only half the median, having well-educated parents does give the student a good chance of completing a minimal level of schooling. For example, male students living in low or middle SEIFA neighbourhoods whose fathers have a university

qualification have, on average, a 71.4% chance of completing a minimal level of schooling, compared with an 80.7% probability for girls.

Controlling for the student's permanent RHED income, the probability of completing a minimal level of schooling is far higher for students living in suburbs which are relatively advantaged. Compared to males living in very disadvantaged neighbourhoods, those in mid-SEIFA neighbourhoods are approximately 10.4 percentage points more likely to complete and those living in high-SEIF neighbourhoods are 19 percentage points more likely to complete. The effect for girls is somewhat smaller with girls in mid-SEIFA neighbourhoods being 8.4 percentage points more likely to complete and those in high-SEIFA neighbourhoods being 15 percentage points more likely to complete. Comparing these probabilities highlights the importance of neighbourhood resources, even after controlling for household income.

Section V: Conclusion

The aim of this paper was to determine the manner by which income poverty during childhood is transmitted to low schooling achievement. This research is important as education is a key determinant of labour market success in adulthood, and thus plays a significant role in maintaining, or potentially breaking, the cycle of intergenerational poverty. This paper adds to the literature through the use of permanent income, to reflect the hypothesis that it is permanent, rather than transitory, changes in income which have the largest impact on children's schooling outcomes and standard of living.

The estimates from the probit model, based on a sample of approximately 500 adolescents, revealed that permanent RHED income had a positive effect on the probability of completing a minimal level of schooling. This is consistent with the human capital investment model and other 'economic' theories of the poverty-to-schooling transmission. However, the effect of permanent income is, to a considerable degree, a reflection of the effects of parental education and neighbourhood segregation. After controlling for household income and some other individual characteristics, parental education as well as the resources and role models in one's neighbourhood explain far more of the variation in adolescent's schooling outcomes, which supports the arguments suggested by the socialisation theories.

The marginal effect of permanent RHED income was low to moderate. A $1,000 increase in permanent RHED income for a student whose permanent income is half median, increases the probability of completing a minimal level of schooling by approximately 0.2% for girls and 0.3% for boys. In contrast, the marginal effects for parental education and neighbourhood advantage and disadvantage were much larger. For a student whose permanent RHED income is half median, having either a father who has attended university or a mother who has completed at least Year 12 increases the probability of completing a minimal level of schooling by approximately 9 percentage points for female students and 17 percentage points for male. If both parents have these educational qualifications, the probability of completing increases considerably, with students being approximately 29 percentage points more likely to complete. Neighbourhood characteristics also had a sizeable effect on completed schooling, with students in middle-SEIFA suburbs approximately 9 percentage points

more likely to complete than adolescnts in disadvantaged neighbourhoods. Furthermore, students living in relatively advantaged suburbs are a further 8 percentage points more likely to complete.

In conclusion, whilst higher permanent RHED income positively affects completed schooling, the relationship is far more complex. In particular, parental education and neighbourhood have much stronger effect on an adolescent's preferences for schooling, as suggested by many of the socialisation theories. In regards to Government policy, the results indicate that in order to increase educational attainment and thereby break the poverty cycle, funds should be invested in policies which encourage networking between disadvantaged students and well-educated role models who possess the qualities advocated by Mayer (1997).

Further work can be done to improve and extend the regression model. For example, parental employment, particularly mother's employment status which is considered in the 'working-mother hypothesis', could be included as an additional regressor. Also, as more Waves of HILDA data become available, a more robust estimate of permanent income during adolescence could be used to revise the estimates. Lastly, household dependence on welfare could be incorporated, in line with the intergenerational welfare transmission theory.

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Appendix 1

Given:

The interest rate on savings in each year, $rs_t \quad \forall t = 1,2,...T$

The interest rate on borrowings in each year, $rb_t \quad \forall t = 1,2,...T$

And annual income, $y_t \quad \forall t = 1,2,...T$

Permanent income, for T years, can be calculated as follows.[13]

1. Compute average income ($\bar{y}$) as the first approximation of permanent income.

$$\bar{y} = \frac{\sum_{1}^{T} y_t}{T}$$

2. Compute savings (or borrowings) in each year as:

$$s_t = y - \bar{y} \quad \forall t = 1,2,...T$$

Where $s_t > 0$ implies positive savings in year t

$s_t < 0$ implies borrowings in year t

3. Compute the balance remaining at the end of each year if the individual consumes their average income in each year.

$$b_t = s_t + d*(1+rs_{t-1})*b_{t-1} + (1-d)*(1+rb_{t-1})*b_{t-1} \quad \forall\, t = 1,2,...T$$

Where $b_0 = 0$ (initially there is nil savings, consistent with the assumption of no inter-period transfers);

$d = 1$ if $b_{t-1} > 0$; $d = 0$ otherwise.

4. Determine whether the end of year balance in year T (the end of period balance) is sufficiently close to zero ($b_T \approx 0?$). This is consistent with the assumption that the individual begins and ends the planning horizon with nil borrowing and saving, and can only transfer income between and within years. For the purpose of this paper, an end of period balance of less than \$0.10 was accepted to be sufficiently close to zero.

[13] For the purpose of this paper, the interest rate on savings each year was taken as the average of the RBA indicator interest rates on cash management accounts of balances totalling \$10,000 and \$50,000, as well as the interest rate on term deposits of 6 and 12 months (RBA F04 Retail Deposit and Investment Rates). This ranged between 3.0% and 4.1%. The interest rate on borrowing was taken as the average of the RBA indicator fixed and variable rates rates for unsecured loans and the standard credit card interest rate, which averaged between 13.5% and 14.2% (RBA F05 Indicator Lending Rates).

5. Where the individual's end of year balance in year *T* is not sufficiently close to zero, adjust the savings and borrowings in each year according to the following formula:

$$s_t = s_t - b_T / T$$

and repeat steps 3 and 4 until the end of period balance is sufficiently close to zero.

6. Permanent income (Y_t^*) is finally calculated as: $Y_t^* = y_t - s_t \quad \forall t = 1,2,...T$

7. To ensure that the permanent income is exactly the same in each year, permanent income is averaged over all *T* years: $Y^* = \frac{\sum_1^T Y_t^*}{T}$