

The outcomes of early school leaving for disadvantaged students: the role of non-cognitive skills

Barbara Hanel, Domenico Tabasso and Rezida Zakirova
Melbourne Institute of Applied Economic and Social Research

Acknowledgements

This paper uses unit record data from the Longitudinal Survey of Australian Youth (LSAY). The LSAY project is managed by the National Centre for Vocational Education Research (NCVER). This research was commissioned by the Australian Government Department of Education, Employment and Workplace Relations (DEEWR) under the Social Policy Research Services Agreement (2010–12) with the Melbourne Institute of Applied Economic and Social Research. The views expressed in this report are those of the authors alone and do not represent those of DEEWR or NCVER.

December 2012

Table of Contents

Acknowledgements	1
Executive summary.....	3
1. Introduction.....	6
2. Literature Review.....	8
3. Data	10
3.1 Non-cognitive skills	11
3.2 Disadvantaged groups: definitions and descriptive statistics.....	19
3.3 Personality traits of disadvantaged individuals.....	22
3.4 Post-school activities for early school leavers.	24
4. Methodology	27
5. Empirical results	29
5.1 Probability of early school leaving and personality traits.....	29
5.2 Disadvantage and post-school choices: a matching approach	32
5.3 Disadvantage and post-school choices: the role of personality traits	34
6. Discussion and policy implications	36
Appendix A: Propensity Score Matching	39
Appendix B: Additional Tables	41
Appendix C: Personality traits in LSAY and in HILDA	46
References	47

Executive summary

This report addresses two main research questions:

- 1) What is the role of non-cognitive skills in the decision of dropping out of school? And in particular, is there any distinction in the way personality traits relate to early school leaving of disadvantaged and non-disadvantaged students?
- 2) How do the patterns of activities after school differ between disadvantaged and non-disadvantaged early school leavers, once we control for personality traits and other observable characteristics?

Differently from previous studies that have focused on the issue of early school leaving, in this report we emphasise the role of personality traits in the determination of the studied outcomes. The study is based on data from the Longitudinal Survey of Australian Youth (LSAY) 1995. Although more recent versions of the LSAY data exist, the 1995 cohort is the only one that contains information on respondents' non-cognitive abilities. In particular, in the third wave of the survey respondents were asked to rank themselves with respect to eight adjectives: agreeable, hard working, open to new experiences, intellectual, popular, outgoing, confident and calm. Following the literature in the area of non-cognitive skills we interpret the answers to these questions as proxies for personality traits and employ them as explanatory variables in a series of empirical tests aimed at addressing our two research questions. The empirical analysis distinguishes between respondents that experience some forms of disadvantage and those that do not. In particular, we indicate as disadvantaged those respondents that belong to one or more of the following categories: Aboriginals or Torres Strait Islanders, individuals that report any form of disability, individuals that do not live with both parents, respondents whose parents' occupation lies in the lowest quartile of the ANU3 occupational status scale (as reported in wave 2), individuals that report living in a household lacking basic assets.

We employ different statistical tools in performing our analysis. We first propose a wide set of descriptive statistics providing a first illustration of the links among the studied variables. The analysis of the relation between personality traits and likelihood of early school leaving across different groups of respondents is based on probability regressions ("probit" models). We then employ two different methodologies ("propensity score matching" and "multinomial logit" regressions) for studying how personality traits influence the post-school activity choices of disadvantaged and non-disadvantaged early school leavers.

Key results

The probability analysis we conducted indicates that a link can effectively be detected between the probability of dropping-out of school and some of the non-cognitive skills outlined in the LSAY data. For some personality traits, this relation does not vary even if a large number of other control variables are included in the analysis. For students that experience some forms of disadvantage early school leaving is linked to conscientiousness, emotional stability and extroversion. For conscientiousness our results appear quite surprising and are possibly explained by the way the related question is posed in the survey. The probability of dropping out of school is estimated to be higher for students that declare to be “very hard working”. A possible interpretation of this result (which is also found with respect to non-disadvantaged students) is that respondents interpret the wording “hard working” as indicative of the willingness to work and not to study. Calmer and more agreeable disadvantaged respondents show a higher propensity to complete high school, and so do less extrovert students. The results for non-disadvantaged respondents are quite similar. The only relevant difference pertains to the trait “openness to new experiences”. Non-disadvantaged students that declare to be more open to new experiences and/or less intellectual are more likely to quit education before obtaining a high school degree.

The investigation on the determinants of post-school activities for early school leavers indicates that personality traits do not play an important role in the shaping of the employment or education trajectories during the first year out of school. The descriptive statistics show that disadvantaged early school leavers have a higher probability of remaining inactive comparing to non-disadvantaged respondents. Our empirical analysis indicates that these differences cannot be explained by controlling for different levels of personality traits. More generally the differences in the post-school activities cannot be explained by the observable characteristics included in our analysis and seem to be driven by the disadvantage status *per se* more than by any other observable factor.

Policy implications

The outlined results can be interpreted with respect to their policy implications. The estimated link between personality traits and likelihood of early school leaving, in particular, bear interesting consequences. Our results indicate that disadvantaged students that declare to be particularly extrovert and hard working display a higher likelihood of quitting school prematurely. This finding suggests that students displaying certain traits may find permanency

in the formal education system particularly hard. The rate of early school leaving is especially high among disadvantaged students. A policy intervention designed to take personality traits into account may prove particularly effective in improving school retention rates. The design of school curricula with the aim of accommodating students' characteristics, such as their extroversion or their propensity for hard work, may improve students' satisfaction levels by contributing to the full use of their abilities.

Given the similarities in the results we estimate for disadvantaged and non-disadvantaged students, any policy aimed at facilitating the disadvantaged students' performance and their retention into formal education would be likely to affect the completion rates of the whole student population.

The results indicate that non-cognitive skills do not significantly influence the choice of post-school activities for early school leavers, independently of the disadvantaged status of the studied individuals. Furthermore, the differences in this type of choice between disadvantaged and non-disadvantaged students, with the former being more likely to select into inactivity, does not appear to be linked to any observable characteristics of the respondents. In this respect, an improvement in the enrolment rates in education and employment activities of disadvantaged individuals should be more effectively achieved by tackling the source of the disadvantage and not by acting on the personality trait dimensions.

The fact that personality traits seem to drive the decision to leave school, but not the decision what to do afterwards further emphasize the importance of keeping students in school in the first place. If the decision to leave school early were an optimal choice for some students according to their personality, it would be expected that the same mechanism that drives the decision to leave school would also drive the decision about what activities to engage in after leaving school. The results do not confirm the existence of such a link and hence it appears unlikely that the decision to leave school early is the result of a rational choice based on a student's innate characteristics such as personality. Policy interventions to prevent such deleterious decisions are thus all the more needed.

1. Introduction

Education represents one of the pivotal elements for determining the success of individual life paths as well as the establishment of prosperous economic systems. Economists have widely analysed the role of education attainments in explaining individual outcomes, such as the process of skill accumulation of young individuals, their working careers, their wage trajectories. At an aggregate level, much emphasis has been put on the relation between educational outcomes and growth rates across different countries. In this respect, the phenomenon of early school leaving is indicative of a double failure. At an individual level, the decision to drop out of school may seriously hinder the chances of achieving decent living standards. Similarly, high rates of early school leaving at a country level may have repercussions on the long-run performance of the economy as they can translate into lower global productivity rates and human capital levels.

Economists have investigated the issue of school drop-out from both an individual and a country-level perspective. The decline in growth rates that affected Western economies as a result of the 2009 Global Financial Crises has led policy makers to consider the need for improving school completion rates as a measure to foster economic recovery.¹ Similarly, several studies focused on the individual motivations behind the choice of leaving school before obtaining a qualification and the socio-economic consequences of these decisions.² School characteristics, peer effects, personal motivations and economic conditions are among the factors that are commonly used to explain early school leaving.

In this report we analyse two aspects connected with the decision of dropping out of school and its consequences. First of all, we investigate the role of non-cognitive skills in shaping the decision to leave school before obtaining a qualification (Heckman and Rubinstein, 2001). We assess whether a clear empirical relation can be established between the likelihood of leaving school before completion and personal traits, such as self confidence, agreeableness and openness to new experiences.

The second contribution of this report consists in the analysis of the activities that early school leavers engage in the first year after having left formal education. In this respect we address the following research questions: How do the patterns of activities after school differ between disadvantaged and non-disadvantaged early school leavers, once we control for personality traits and other observable characteristics? Throughout the report and in particular

¹ See European Commission (2011).

² See, among others, Rumberger (1987), Lamb (1994), Rumberger and Lamb (2003).

in the second part of our empirical investigation we focus our attention on individuals that experience some form of social disadvantage. Students with disabilities or individuals that experience some form of social deprivation are examples of disadvantaged individuals whose choice of leaving school can be driven by short-run needs and at the same time be extremely detrimental in the longer run. Therefore, we will try to assess the extent to which experiencing a certain form of disadvantage may affect the choice of post-school activity for early school leavers.

Our study will rely on data from the Longitudinal Survey of Australian Youth. The use of Australian data is particularly relevant in an international perspective. Recent data from the Australian Bureau of Statistics (ABS), in fact, show that in 2011 the apparent retention rate for Year 12 students is equal to 79.3% (ABS, 2012).³ This figure indicates that the percentage of early school leavers in Australia is higher than the average percentage of early school leavers in the Organisation for Economic Cooperation and Development (OECD) countries (20%) and in the countries of the European Union (17%) (OECD, 2010).⁴ Moreover, the ABS statistics show that the dropout rate among Australian students decreased by only one percentage point since 1993. The Australian Government has recently implemented a number of reforms in the attempt to reduce the number of early school leavers and increase the chances of re-engagement in education and training for students that have left school prematurely. In the National Partnership Agreement on Youth Attainment and Transitions of July 2009,⁵ the Government and the States indicated a target of 90% attainment of at least Year 12 or equivalent qualification old by 2015. Furthermore, the Agreement stated that: “young people aged 15-19 years will have an entitlement to an education or training place for any government-subsidised qualification, subject to admission requirements and course availability; and that young people aged 20-24 will have an entitlement to an education or training place for any government-subsidised qualification which would result in the individual attaining a higher qualification, subject to admission requirements and course availability”.⁶ Previous studies have investigated the determinants of early school leaving and the possibility to re-engage in education in relation to features of the educational system, for

³ The apparent retention rate is calculated by dividing the number of full-time students in Year 12 by the number of full-time students in the base year and converting the figure into a percentage. The base year is Year 7 in New South Wales, Victoria, Tasmania and the Australian Capital Territory and Year 8 in Queensland, South Australia, Western Australia and the Northern Territory.

⁴ Following the OECD official statistics, we define European Union as the EU19 group. See OECD (2010).

⁵ COAG (2009).

⁶ *Ibid.*

examples the role of VET courses. In addition, some student characteristics like their literacy and numeracy skills have been explored as possible determinants of early school leaving. Our goal is to contribute to this literature by introducing in the analysis a new set of factors that can affect the decision of leaving school before reaching a qualification. By investigating the role of personality skills and social dimensions such as physical or social disadvantages we aim at obtaining a clearer and more complete picture of the motivations behind this type of decisions.

2. Literature Review

The economic literature has so far said relatively little regarding the reasons behind the drop out decision and the activities that Early School Leavers (ESLs) might perform after having left school and before re-engaging.⁷ Recent contributions have focused on patterns of re-engagement in education and on different labour market outcomes between individuals that did or did not complete their high school education. With respect to the first topic, it is worth mentioning two recent Melbourne Institute-DEEWR reports (Black *et al.*, 2009 and Black *et al.*, 2011). The results indicate that although 70% of early school leavers re-engage in education within 18 months after dropping out of school, most of them do not go back to school but continue their education through VET institutions. The issue of return to education of early school leavers has also been analysed in a relatively small number of international contributions. Rumberger and Lamb (2003) consider the return to study of early school leavers from the U.S and Australia in their first two years after leaving high school. Similarly, Macleod and Lambe (2006) examine a sample of individuals who had recently left school and consider their rates of return to study over a six year period (using the British Household Panel Survey). However, both of these studies conduct only descriptive analyses into this issue. Hill and Jepsen (2007) offer a more rigorous analysis of re-engagement in education, and examine the factors which affect the probability that early school leavers in the U.S obtain a post-school qualification.

The topic of career outcomes of early school leavers in Australia has been recently investigated by Ryan (2011). The report, based on the Longitudinal Survey of Australian Youth (LSAY) data, highlights how completion of senior secondary schooling provides the best labour market outcomes.

⁷With respect to other countries, see Micklewright, Pearson, and Smith (1990), Oreopoulos (2003), Traag and van der Velden (2008) and Kalb and Maani (2007).

The literature on non-cognitive skills represents one of the fast growing areas in applied microeconomics. The theoretical and empirical analysis of the relation between personality traits and economic outcomes, extensively summarised in the contributions by Borghans *et al.* (2008), Almlund *et al.* (2011) and Becker *et al.* (2012), provided the basis for a wide number of studies on non-cognitive skills and different aspects of economic performances. The well-known articles by Cunha and Heckman (2007) and Cunha *et al.* (2010) indicate that for both cognitive and non-cognitive skills, the ability gaps among individuals open up at early ages. Early interventions are then particularly effective in guaranteeing high economic returns for disadvantaged children.⁸ Furthermore, the effects of these forms of interventions are reinforced if followed by later investments at later ages. This is not a surprising result and in fact much of the literature, starting with the work of Heckman and Rubinstein (2001) and Jacob (2002) focused on the investigation of non-cognitive skills and education outcomes of children and adolescents. In this respect, a recent paper by Bertrand and Pan (2011) showed how non-cognitive returns to parental inputs vary heavily by gender. Boys, in particular, appear more responsive than girls to parental inputs during the first years of their school period. Barón and Cobb-Clark (2011) use data from the Australian survey “Youth in Focus” (YIF) to analyse the relationship between one personality trait (locus of control) and the investment in education on a sample of 2,065 18 year old individuals. Their results indicate a strong (but not very robust) link between a more internal locus of control and the chances to successfully complete school. At the same time coming from a disadvantaged socio-economic status leads to an increase in the likelihood of early-school leaving. Interestingly, they find very little evidence of external locus of control being driven by a disadvantaged background. The paper of Barón and Cobb-Clark is strictly related to a contribution of Kalil *et al.* (2010) that employs the same data (YIF) and establishes that internal/external locus of control is correlated with a number of factors such as parental socio-economic status, maternal locus of control, parental involvement in respondent’s childhood and particular life events experienced during childhood or adolescence. Their results confirm the link between having an internal locus of control and the likelihood of completing secondary education and also indicate that for disadvantaged youths a more internal locus of control implies higher chances of getting a job.

⁸ While other contributions confirmed the malleability of personality traits at early ages (see, for example, Kalil *et al.*, 2010, with respect to locus of control), Cobb-Clark and Schurer (2011) proved the stability of the “Big Five” for working-age adults.

The projection of non-cognitive abilities on labour market outcomes represents another strand of research which has attracted relevant attention in recent years. Heckman *et al.* (2006), for example, employ a wide range of econometric specifications to prove that schooling, work experience and choice of occupation are decisions which are strongly influenced by non-cognitive and cognitive skills. Similarly, Osborne and Groves (2005) using data from the US and UK finds that personality traits such as locus of control, aggression and withdrawal are important variables in the determination of white women's wage. A very recent working paper has further analysed the relation between personality and job market outcomes, introducing a causal dimension in the analysis: Fletcher (2012) uses data from the US National Longitudinal Study of Adolescent Health to establish a causal link between non-cognitive skills and employment status and earnings. With respect to the Australian context, Cobb-Clark and Tan (2011) use the information on non-cognitive abilities available in the Household, Income and Labour Dynamics in Australia (HILDA) survey to analyse the different occupational attainments of men and women and the disparities in wages. Their findings suggest that “on balance, women's non-cognitive skills give them a slight wage advantage”.⁹

Our analysis will follow some of the contributions briefly mentioned above in terms of the employed methodology and with respect to the aims of the investigation. In particular, the studies of Kalil *et al.* (2010) and of Barón and Cobb-Clark (2011) represent the main reference points for our study. In the conclusive section of the report, we will discuss our findings in relation to the results of these two studies and we will assess their implications with respect to other contributions which link personality skills and education outcomes.

3. Data

The empirical analysis proposed in this report will be based on data from the Longitudinal Survey of Australian Youth (LSAY) 1995. Although more recent versions of the LSAY data exist, the 1995 cohort is the only one that contains information on respondents' non-cognitive abilities. The 1995 LSAY cohort contains data on 13,613 students which were first interviewed in 1995 while attending Year 9. The respondents were then interviewed once a year every year until 2006. The attrition rate (the share of respondents that dropped out of the

⁹ Cobb-Clark and Tan (2011), p. 2.

survey before its end) was particularly high between the first and the second wave of the survey: around 28% of initial respondents did not answer any question in 1996. A small percentage of these students were re-interviewed in wave 3, along with those respondents that did not attrite, so that around 10,300 respondents answered the 1997 questionnaire (see table B1 in Appendix B). As the non-cognitive skills questions are only asked in wave 3, the 1997 respondents constitute our initial sample. Table 1 reports some basic statistics on the school completion rates of our respondents, by gender.

Table 1
Completion rates by gender

	Completed Year 12	Early school leavers	Unknown completion status	Total
All Individuals	6,742	2,540	1,025	10,307
%	65.41	24.64	9.94	100
Males	3,000	1,486	515	5,001
%	59.99	29.71	10.30	100
Females	3,742	1,054	510	5,306
%	70.52	19.86	9.61	100

Source: LSAY Data 1995 cohort. Non-weighted figures.

The presence of an “Unknown completion status” category is due to students dropping out of the survey before the completion of Year 12 (which for the majority of them should occur in 1998). As the completion status of the respondents is crucial for our analysis we drop any student belonging to the “Unknown completion status” category from our sample. From the table, it is immediately evident that males show a much higher propensity to drop-out of school before completion while the attrition rates are very similar across the two genders.

3.1 Non-cognitive skills

The LSAY data include variables covering the entire spectrum of the most commonly investigated personality traits, the so called “Big Five”. They are: Openness to Experience (also called Intellect or Culture), Conscientiousness, Extraversion, Agreeableness and

Neuroticism (also called Emotional Stability). Table 2, which is based on Table 1.1 from Almlund *et al.* (2011) provides a brief definition of each of these traits.

The five traits can be used to categorize 30 more narrowly defined traits (“facets”). The link between the facets and the traits is critical for the implementation of our analysis. The LSAY questions on personality, in fact, can be directly linked to some of these facets. Table 3, which is taken from Borghans *et al.* (2008) shows the facets associated with each of the personality traits presented in Table 2.¹⁰

Table 2
Definition of personality traits

Trait	Definition
1. Openness to Experience	The tendency to be open to new aesthetic, cultural or intellectual experiences.
2. Conscientiousness	The tendency to be organized, responsible and hard working.
3. Extroversion	An orientation of one's interests and energies toward the outer world of people and things rather than the inner world of subjective experience; characterized by positive affect and sociability.
4. Agreeableness	The tendency to act in a cooperative, unselfish manner.
5. Neuroticism	Neuroticism is a chronic level of emotional instability and proneness to psychological distress. Emotional stability is predictability and consistency in emotional reactions, with absence of rapid mood changes.

Source: Almlund *et al.* (2011), pag. 11. Traits definitions come from the American Psychological Association Dictionary (2007).

¹⁰ See also Heckman (2011), p. 5.

Table 3
Personality traits and their facets

Trait	Facets
1. Openness to Experience	Fantasy, Aesthetic, Feelings, Actions, Ideas, Values.
2. Conscientiousness	Competence, Order, Dutifulness, Achievement striving, Self-discipline, Deliberation
3. Extroversion	Warmth, Gregariousness, Assertiveness, Activity, Excitement seeking, Positive emotions.
4. Agreeableness	Trust, Straight-forwardness, Altruism, Compliance, Modesty, Tender-mindedness.
5. Neuroticism	Anxiety, Angry hostility, Depression, Self-consciousness, Impulsiveness, Vulnerability

Source: Borghans *et al.* (2008), pag. 982.

The 1995 LSAY survey includes the following question about personal characteristics:

“I am now going to ask you some questions about your general attitudes. Firstly, some questions about how you would describe yourself.

How <<adjective>> would you say you are? ”

The adjectives are:

- 1) Agreeable;
- 2) Hard working;
- 3) Open to new experiences;
- 4) Intellectual;
- 5) Popular;
- 6) Outgoing;
- 7) Confident
- 8) Calm.

For each of these terms the respondent can choose among four numeric values corresponding to “Very”, “Fairly”, “Not Really”, “Not at All” (the residual category “Unsure” is also included in the set of possible answers). These variables can be related to the five dimensions of personality widely employed to measure non-cognitive skills (Schmitt *et al.*, 2007). In particular, the first adjective would describe agreeableness, the second conscientiousness, the third and the fourth openness to experiences, adjectives 5 and 6 would measure extroversion

and the last two would be employed in measuring emotional stability (neuroticism).¹¹ Table 4 reports the frequencies and the percentages of each of the answers to these questions by sex of the respondents.¹² Evidently, for each of the proposed adjectives the answers tend to cluster in the first two values. For all questions, less than 10% of the respondents give “Not really” or “Not at all” as an answer. The only partial exception relates to the questions on Emotional Stability. In this case, the percentage of individuals that report a negative answer is around 14%, slightly higher than in all other cases. There are some slight differences in the answers across genders. When asked about their openness to new experiences, males show a more conservative attitude than girls, with only 37% of them answering “Very”, versus 46.5 % of women. We do not find the same difference with respect to the adjective “Intellectual”, which is the second aspect used to characterize the trait “Openness to new experiences”. The answers for the adjective “Outgoing” are generally more toward “Very” and “Fairly” for women than for men, while we find exactly the opposite pattern with respect to the Emotional Stability aspects. For both “Confident” and “Calm”, in fact, there is a higher percentage of males that report “Very”, while more women than men indicate a negative answer (“Not really” or “Not at all”).

¹¹ Cobb-Clark and Tan, p. 12.

¹² See Appendix B for a comparison between the distribution of the answers on personality traits in the LSAY and those reported in HILDA data.

Table 4
Personality traits: Individual Answers

Trait	Agreeableness		Conscientiousness		Openness to Experience				Extraversion				Neuroticism (Emotional stability)			
Adjective	Agreeable		Hard working		Open to new experiences		Intellectual		Popular		Outgoing		Confident		Calm	
	<i>Freq.</i>	<i>%</i>	<i>Freq.</i>	<i>%</i>	<i>Freq.</i>	<i>%</i>	<i>Freq.</i>	<i>%</i>	<i>Freq.</i>	<i>%</i>	<i>Freq.</i>	<i>%</i>	<i>Freq.</i>	<i>%</i>	<i>Freq.</i>	<i>%</i>
<i>All Individuals</i>																
Very	1,971	19.23	4,080	39.70	4,308	41.95	1,247	12.26	1,036	10.18	3,942	38.37	2,802	27.25	2,641	25.74
Fairly	8,027	78.30	5,255	51.14	5,435	52.92	7,825	76.90	8,164	80.22	5,342	52.00	6,233	60.61	6,189	60.32
Not really	243	2.37	890	8.66	498	4.85	1,044	10.26	927	9.11	945	9.20	1,188	11.55	1,312	12.79
Not at all	11	0.11	51	0.50	29	0.28	59	0.58	50	0.49	44	0.43	61	0.59	118	1.15
<i>Males</i>																
Very	871	17.52	1,953	39.19	1,845	37.08	576	11.70	528	10.69	1,713	34.43	1,513	30.33	1,393	27.97
Fairly	3,974	79.94	2,495	50.07	2,839	57.05	3,766	76.48	3,916	79.26	2,743	55.12	3,025	60.65	2,998	60.19
Not really	119	2.39	507	10.17	273	5.49	548	11.13	476	9.63	498	10.01	435	8.72	546	10.96
Not at all	7	0.14	28	0.56	19	0.38	34	0.69	21	0.43	22	0.44	15	0.30	44	0.88
<i>Females</i>																
Very	1,100	20.83	2,127	40.19	2,463	46.52	671	12.78	508	9.70	2,229	42.08	1,289	24.34	1,248	23.64
Fairly	4,053	76.75	2,760	52.14	2,596	49.04	4,059	77.30	4,248	81.13	2,599	49.07	3,208	60.57	3,191	60.45
Not really	124	2.35	383	7.24	225	4.25	496	9.45	451	8.61	447	8.44	753	14.22	766	14.51
Not at all	4	0.08	23	0.43	10	0.19	25	0.48	29	0.55	22	0.42	46	0.87	74	1.40

Source: LSAY Data 1995 cohort. Non-weighted figures.

Figure 1 provides a first summary of the relation between non-cognitive skills and probabilities of school completion for both male and female students. In the figure, the histograms report the percentages of individuals that provide any of the four answers to the personality trait questions. The darker area on the left of each graph corresponds to the answer “Very”, the last area on the right to the answer “Not at all”. Generally speaking the distribution of the answers does not appear to vary considerably between early school leavers and students that did complete their high school education. There are a few exceptions to this evidence and at least one of these exceptions appears quite surprising: for both men and women, in fact, the percentage of respondents that declare to be “Very hard working” is much higher among early school leavers than it is for school completers. Early school leavers also tend to define themselves as more outgoing and, perhaps not surprisingly, less intellectual than those students that completed Year 12.

Although for each personality question a wide majority of respondent answer “Very” and “Fairly”, this pattern does not appear to be driven by the respondents answering all the questions in a purely mechanical way. Table 5 reports the degrees of correlation among the answers to the non-cognitive skill questions. In all, the correlations appear quite low, even among adjectives that belong to the same personality dimension (namely: “Open to new experiences” and “Intellectual” for the trait “Openness to new experiences”; “Popular” and “Outgoing” for the trait “Extroversion”). This finding is reassuring with respect to the quality of the data we are using for this report. Mechanical answering of these questions would have, in fact, seriously hindered the possibility to interpret and employ the personality trait variables in a meaningful way.

Figure 1: Non-cognitive skills and school completion

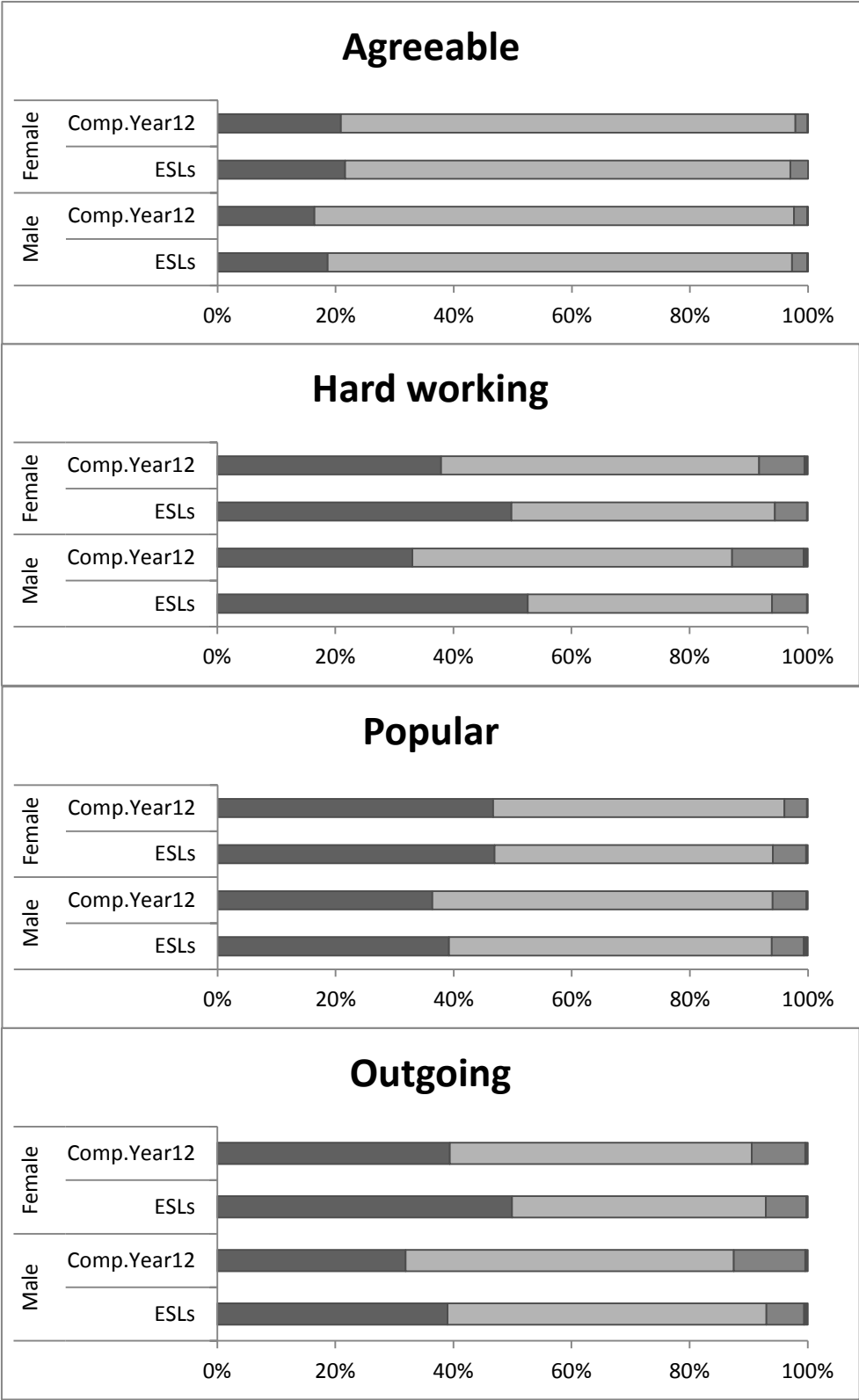


Figure 1: Non-cognitive skills and school completion (continued)

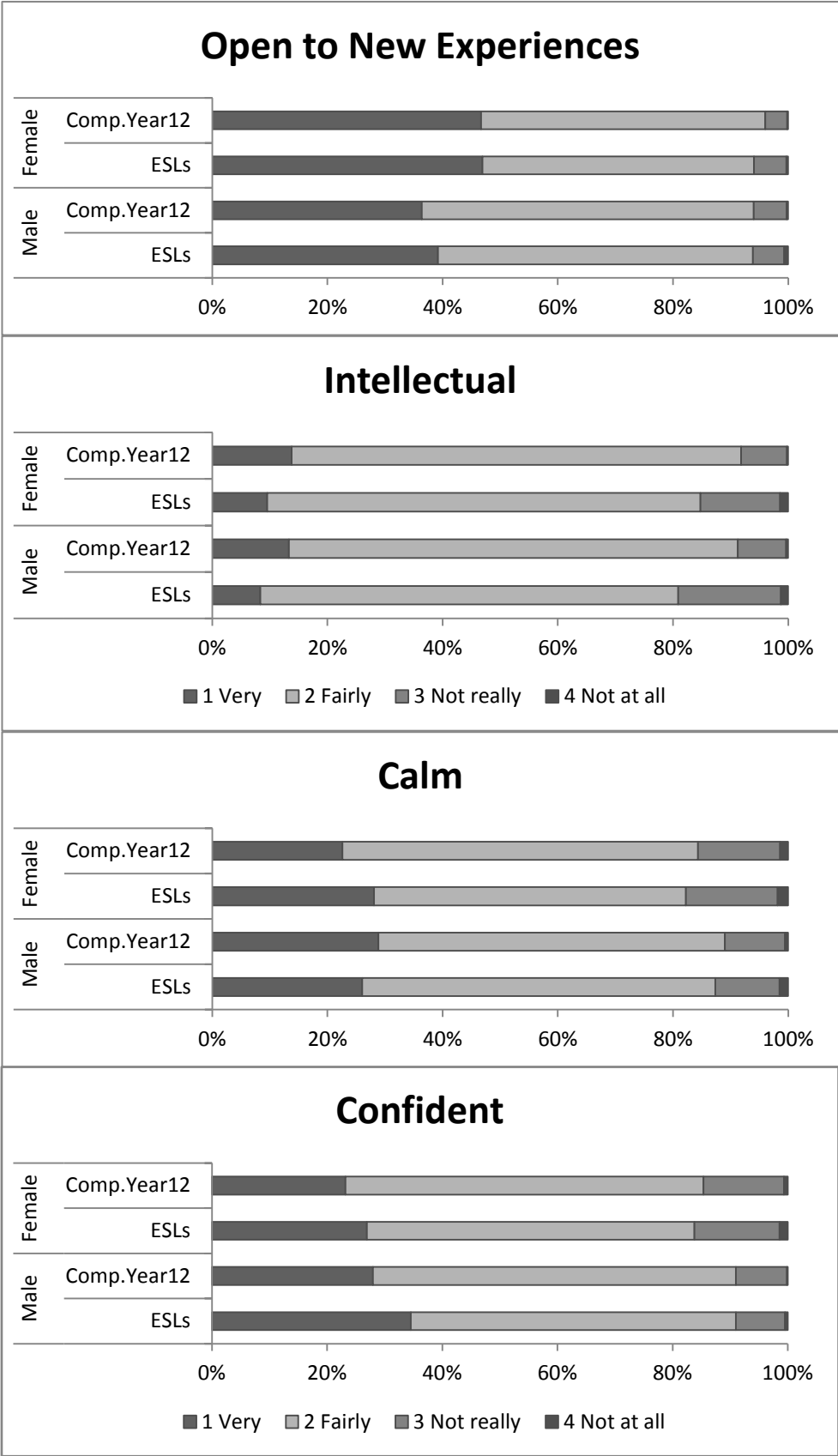


Table 5
Correlation among personality traits

Adjective	Agreeable	Hard working	Popular	Outgoing	Open to new experiences	Intellectual	Calm	Confident
Agreeable	1.0000							
Hard working	0.1859	1.0000						
Popular	0.1610	0.1134	1.0000					
Outgoing	0.1339	0.1731	0.2783	1.0000				
Open to new experiences	0.1558	0.1427	0.1956	0.2733	1.0000			
Intellectual	0.1089	0.1140	0.1445	0.0517	0.1362	1.0000		
Calm	0.2156	0.1306	0.0656	0.0688	0.1017	0.0844	1.0000	
Confident	0.1539	0.1825	0.2483	0.3658	0.2398	0.1514	0.1415	1.0000

Source: LSAY Data 1995 cohort. Non-weighted figures.

3.2 Disadvantaged groups: definitions and descriptive statistics

The second aspect investigated in this report is the type of activities early school leavers engage in after having left education. In particular we are interested in studying whether these activities are influenced by some kind of disadvantage experienced by the youth. As a starting point for this kind of analysis, we first identify the LSAY respondents that can be considered “disadvantaged” by using some very broad definitions of disadvantage.¹³

We identify six main categories of individuals to focus our attention on:

- 1) Aboriginals or Torres Strait Islanders;
- 2) Individuals with a non-English speaking background;
- 3) Individuals that report any form of disability;
- 4) Individuals that do not live with both parents;
- 5) Respondents whose parents occupation lies in the lowest quartile of the ANU3 occupational status scale (as reported in wave 2)
- 6) Individuals that report living in household without assets such as computers, washing machines or colour TV sets.

Evidently, some of these categories do not automatically identify a disadvantage (for example, being a member of an Indigenous community is of course not a disadvantage *per se*). Nonetheless, we interpret these categories as indicative of the fact that the respondent belongs to one or more segments of the population which might experience some form of

¹³ The need for some broad definitions of disadvantage is driven by the relative low total number of observations in the sample.

socio-economic distress.¹⁴ The last category is possibly the most controversial one. As the LSAY does not include specific questions on household income, possibly due to the difficulties in obtaining precise information on this topic from young respondents, we interpret this category as a proxy for the income of the family. In order to minimize the presence of a measurement error associated with this variable, we do not include in this category any respondent that reports living in a house that contains luxury items, such as pianos or swimming pools. It would potentially be possible to identify other categories of disadvantaged respondents (for example, teenage parents). Nonetheless, the sample size of the LSAY data does not allow us to include those individuals in our analysis, as the number of observations would be extremely limited.

Table 6 reports some basic statistics regarding the respondents we identify as disadvantaged. Given our definitions, the total percentage of individuals that report a form of disadvantage is quite high, 47%. Each individual can also belong to more than one of the six categories. Nonetheless, only 16 respondents belong to more than three disadvantaged groups.

Table 6
Respondent experiences a form of disadvantage

	All Individuals		Males	Females
	No	Yes	Yes	Yes
Aboriginal, Torres Strait Islander	9,477	228	98	130
%	97.65	2.35	2.12	2.56
Non-English speaking background	8,994	938	444	494
%	90.56	9.44	9.30	9.58
Has a disability (self-reported)	9,824	483	252	231
%	95.31	4.69	5.04	4.35
Does not live with both parents	8,283	2,024	937	1,087
%	80.36	19.64	18.74	20.49
Parents occupation in lowest status quartile	7,855	1,414	664	750
%	84.74	15.26	14.99	15.50
Lack of assets in the household	6,911	1,568	689	879
%	81.51	18.49	17.96	18.94

Source: LSAY Data 1995 cohort. Non-weighted figures.

¹⁴ The fact the Indigenous Australians are over-represented among disadvantaged citizens is documented in a number of papers. See Stephens (2010) for the labour market implications of this disadvantage and Draca *et al.* (2005) with respect to the educational disadvantage of Indigenous Australians. See Maru and Chewings (2011) for a broad review of the studies on poverty and disadvantage of the Indigenous population.

It can be noted that the percentage of respondents whose parents' occupation lies in the lowest quartile of the ANU3 occupational scale is lower than 25%. This is due to the way we construct this variable. The occupations of mothers and fathers are ranked separately. We only include in our variable the sub-set of respondents that have *both* parents in the lowest occupational quartile (unless only one of the two parents works, in which case the occupation of the working parent will determine the inclusion of the respondent in our variable).

Table 7 provides some preliminary evidence on the relation between disadvantage and likelihood of school completion. Using the shares of early school leavers among the students that do not report any type of disadvantage as our comparison group, we can see that all but one of the categories of disadvantage that we have identified for our analysis are associated with sharp increases in the percentages of school drop-outs. The only category that does not follow this pattern is that of students with non-English speaking background. A possible explanation can be found in the heterogeneity of this group, which includes young individuals from very different socio-economic status and family background. Given that this report explicitly focuses on early school leavers, the observation of these figures leads us to decide to exclude students with non-English-speaking background from the group of disadvantaged individuals in the remainder of the report. The gap in completion rates between non-disadvantaged students and those that we include in our treatment groups can be extremely high. It is a very well known fact that Indigenous individuals have very low school completion rates, so that our figures only confirm this evidence. It is worth stressing the very high percentage of ESLs among students that live without one or both of their parents. This category of students is the most numerous one among those we identified as disadvantaged. The fact that more than 40% of all these students do not complete their high school education suggests the need for policies interventions that might target the students as well as their families.

Table 7
Percentage of early school leavers

	All individuals	Males	Females
All sample	27.36	33.13	21.98
No disadvantage	21.46	26.92	16.13
Aboriginal, Torres Strait Islander	57.21	54.35	59.63
Non-English speaking background	17.76	21.30	14.55
Has a disability (self-reported)	33.95	35.11	32.68
Living without both parents	40.10	48.15	33.2
Parents occupation in lowest status quartile	35.88	43.32	29.54
Lack of assets in the household	36.15	41.96	31.53

Source: LSAY Data 1995 cohort. Non-weighted figures.

3.3 Personality traits of disadvantaged individuals

In the last two sections we briefly described the two main dimensions that we employ for exploring the reasons and the consequences of early school leaving: personality traits and physical or social disadvantages. In Table 8 we combine these two dimensions in order to start exploring their degree of complementarity. We report the total percentage of individuals that answer “Very” or “Fairly” for each adjective included in the set of questions on non-cognitive skills. We then break the responses down on the basis of the disadvantage status of the respondent. We can therefore observe how the answers of the individuals that we have identified as disadvantaged vary with respect to those of their peers which do not experience any form of physical or social distress.

The first thing to be noted is that for all the adjectives an overwhelming majority of respondents tend to cluster in the “Very” and “Fairly” categories, as already pointed out in section 3.1. The total percentage of sampled individuals in these two categories varies from 86% for the adjective “Calm” up to 97.5% for the adjective “Agreeable”. Given these figures, it is not surprising to observe a relatively limited variation in the responses across different groups of individuals. Nonetheless, the overall picture from Table 8 suggests that young individuals that experience some form of disadvantage have a lower likelihood to report “Very” or “Fairly” as answers to the proposed adjectives. The adjective “Hard working” represents an exception to this pattern, as students whose parents have low-status job and those that live in households that lack some basic items tend to define themselves as more hard working than the average.

The adjectives “Popular”, “Intellectual” and “Confident” are those for which the difference in the percentages between disadvantaged and non-disadvantaged respondent is more pronounced. Interestingly, for each of these adjectives the gap is driven by the answers of a different subgroup of the population. While students with a disability are those that suffer the most in terms of popularity, Indigenous students are less prone than the others to define themselves as intellectual (and they also appear to clearly report lower values when asked about their degree of popularity, openness to new experiences and self-confidence). Finally, the respondents living without one or both parents show a lower level of self-confidence in comparison to their peers.

Table 8
Non-cognitive skills of disadvantaged respondents

	Agreeable		Hard working		Popular		Outgoing	
	% of "Very" and "Fairly"	Difference with non-disadvantaged respondents	% of "Very" and "Fairly"	Difference with non-disadvantaged respondents	% of "Very" and "Fairly"	Difference with non-disadvantaged respondents	% of "Very" and "Fairly"	Difference with non-disadvantaged respondents
All	97.52		90.84		90.40		90.37	
No disadvantage	97.72		90.23		91.56		90.46	
Any disadvantage	97.25	-0.47	91.69	1.46	88.82	-2.74	90.25	-0.21
Aboriginal	96.02	-1.70	90.75	0.52	87.50	-4.06	93.83	3.37
Has a disability	97.70	-0.02	89.19	-1.04	85.26	-6.30	91.67	1.21
Living without parents	96.62	-1.10	90.13	-0.10	88.72	-2.84	89.72	-0.74
Lowest quart ANU3	97.30	-0.42	93.47	3.24	88.23	-3.33	91.50	1.04
No assets in household	97.56	-0.16	93.79	3.56	88.90	-2.66	89.99	-0.47

	Open to new experiences		Intellectual		Calm		Confident	
	% of "Very" and "Fairly"	Difference with non-disadvantaged respondents	% of "Very" and "Fairly"	Difference with non-disadvantaged respondents	% of "Very" and "Fairly"	Difference with non-disadvantaged respondents	% of "Very" and "Fairly"	Difference with non-disadvantaged respondents
All	94.87		89.16		86.06		87.75	
No disadvantage	95.31		90.27		86.66		88.93	
Any disadvantage	94.27	-1.04	87.63	-2.64	85.25	-1.41	86.38	-2.55
Aboriginal	91.19	-4.12	82.65	-7.62	85.09	-0.16	86.84	-2.09
Has a disability	96.03	0.72	86.14	-4.13	83.09	-2.00	85.13	-3.80
Living without parents	94.09	-1.22	87.22	-3.05	83.93	0.84	84.02	-4.91
Lowest quart ANU3	93.96	-1.35	88.00	-2.27	86.26	2.33	88.65	-0.28
No assets in household	94.50	-0.81	88.46	-1.81	86.74	0.48	85.67	-3.26

Source: LSAY Data 1995 cohort. Non-weighted figures.

In all, the statistics presented in Table 8 suggest a link between disadvantages and lower values in the answers to the questions on personality traits. A deep investigation on the nature of this relation would go behind the scope of this report. Nonetheless, the relation between non-cognitive skills and disadvantages can in fact be crucial in explaining the higher proportion of early school leavers across certain segments of the student population. Therefore, the design and the implementation of our multivariate analysis will explicitly take this finding into account.

3.4 Post-school activities for early school leavers.

The study of post-school activities of early school leavers can critically inform policy makers on the type of interventions that can lead to lower drop-out rates and higher rates of re-engagement in education. Tables 9 and 10 link these activities (defined in very broad terms) to the two explanatory dimensions that we employ in our analysis: non-cognitive skills and forms of disadvantage. We record the activities in terms of participation in educational activities or participation in the labour market in the first year after having left school.

In Table 9 we restrict our sample to the early school leavers that answered the questions on personality skills in wave three of the survey. In total, we calculate our percentages on a sample of 2,187 individuals. Combining the figures in the first two columns of Table 9, we can see that around 49% of the early school-leavers in this sample re-engage in education within one year after dropping out of school. 35% of the observed individuals are occupied in working activities and do not study, while 15% of them report to be either unemployed or not in the labour force and they are also not studying. The percentages per gender indicate that female early school leavers have a higher probability to engage in work or study only, while males have a higher propensity to combine the two activities. Women are also more likely than men to be unemployed or inactive one year after having left school.

Table 9
Employment and study status a year after school leavings (ESL), percentages

	Work and study	Study only	Work only	Unempl.	Not in LF and not studying
<i>All sample</i>	37.83	11.34	35.25	12.15	3.43
Males	44.93	9.42	31.81	11.52	2.32
Females	27.87	14.04	40.08	13.02	4.98
<i>Agreeable</i>					
Not really or not at all	26.15	15.38	43.08	10.77	4.62
Very or fairly	38.28	11.17	35.00	12.18	3.37
<i>Hard working</i>					
Not really or not at all	28.26	18.84	30.43	14.49	7.97
Very or fairly	38.50	10.82	35.53	12.04	3.11
<i>Open to new experiences</i>					
Not really or not at all	28.47	18.98	34.31	13.87	4.38
Very or fairly	38.51	10.92	35.34	11.96	3.26
<i>Intellectual</i>					
Not really or not at all	36.19	12.47	33.74	14.67	2.93
Very or fairly	38.63	11.11	35.55	11.48	3.24
<i>Popular</i>					
Not really or not at all	26.21	16.13	33.87	16.94	6.85
Very or fairly	39.39	10.73	35.43	11.41	3.04
<i>Outgoing</i>					
Not really or not at all	29.17	16.07	39.88	10.71	4.17
Very or fairly	38.62	11.04	34.81	12.14	3.39
<i>Confident</i>					
Not really or not at all	25.52	19.93	34.62	13.64	6.29
Very or fairly	39.58	10.10	35.43	11.89	3.00
<i>Calm</i>					
Not really or not at all	34.29	13.14	38.57	10.57	3.43
Very or fairly	38.63	10.94	34.58	12.44	3.407

Source: LSAY Data 1995 cohort. Non-weighted figures. All percentages based on a sample of 2,187 early school leavers with recorded answers for the non-cognitive skills questions.

In the remainder of the table we link the patterns of post-school activities to the answers given to the questions on non-cognitive skills. The figures in the table reveal two implications that will be tested in our empirical section. First of all, respondents that answer “Not very” or “Not at all” to the personality traits questions show a lower propensity to combine work and study one year after having left school if compared to those individuals that answer “Fairly” or “Very”. They also tend to engage more in study activities only compared to their peers with

higher values of self-reported personality traits, while the evidence on those that only engage in work is more mixed. The second aspect that can be noted is that the early school leavers that answer “Not at all” or “Not really” to the personality questions are more likely than the others to be unemployed or completely inactive in the first year after school (the only clear exception is with respect to the adjective “Calm”). This last element can have strong implications in terms of the need for policy actions. Following the studies by Cunha and Heckman (2007) and Cunha et al. (2010), which invoke early interventions to limit the differences in non-cognitive skills among young children, it can be argued that this kind of interventions might in the long run help youth shaping their career and reduce the risk of inactivity for those out of school.

Table 10 reports the choice of post-school activities for early school leavers taking the disadvantage status of the respondents into account. We now refer to the total sample of 2,515 early school leavers included in our dataset. Looking at the first three rows of the table we can notice that the figures reported with respect to the total sample are absolutely in line with those reported at the beginning of Table 9, which refer to the early school leavers that answered the questions on personality traits. There are some evident differences between the early school leavers that do or do not report forms of disadvantage. In particular, around 19% of disadvantaged respondents declare to be unemployed and inactive. The corresponding figure for the non-disadvantaged ones is equal to 11.5%. The difference is even more pronounced among women. The proportion of unemployed or inactive youth is particularly high among Indigenous respondents (almost 28%). Disadvantaged individuals are less likely to combine work and study activities and have a higher probability to be employed. The percentage of “working only” respondents is, perhaps unsurprisingly, particularly high among students that live in households lacking assets such as washing machines or TV colour sets. These figures, similarly to those reported for individuals whose parents have a low-status occupation, suggest that for these respondents the decision to leave school might have been primarily driven by financial constraints.

Table 10
Employment and study status a year after school leavings (ESL), percentages

	Work and study	Study only	Work only	Unempl.	Not in LF and not studying
<i>All sample</i>	37.83	11.34	35.25	12.15	3.43
Males	44.93	9.42	31.81	11.52	2.32
Females	27.87	14.04	40.08	13.02	4.98
<i>No disadvantage</i>	44.89	11.32	32.2	8.65	2.94
Males	52.30	9.36	27.19	8.62	2.53
Females	32.85	14.49	40.34	8.70	3.62
<i>Any disadvantage</i>	31.82	11.36	37.85	15.13	3.84
Males	37.91	9.48	36.21	14.29	2.12
Females	24.25	13.71	39.89	16.17	5.98
Aboriginal, Torres Strait Islander	28.85	7.69	35.58	22.12	5.77
Has a disability (self-reported)	30.43	15.94	32.61	15.22	5.8
Living without at least one parent	28.05	11.92	37.10	19.31	3.62
Parents occupation in lowest status quartile	34.34	10.78	37.59	14.29	3.01
Lack of assets in the household	29.02	13.57	39.67	12.53	5.22

Source: LSAY Data 1995 cohort. Non-weighted figures. All percentages based on a sample of 2,515 early school leavers.

4. Methodology

As outlined in the introductory part of this report, we aim at addressing two different research questions:

- 1) What is the role of non-cognitive skills in the decision of dropping out of school? And in particular, is there any distinction in the way personality traits relate to early school leaving of disadvantaged and non-disadvantaged students?
- 2) How do the patterns of activities after school differ between disadvantaged and non-disadvantaged early school leavers, once we control for personality traits and other observable characteristics?

We will employ different empirical methodologies for addressing these questions. For the first research question we will rely on standard methods on probability analysis (“probit regressions”). Our dependent variable will be a binary variable which takes the value of 1 in case the student drops out of school and of 0 otherwise. We can then study the probability of

leaving school before obtaining a secondary school qualification as a function of individual and school-level factors. In order to understand the relation between early school drop-out and personality traits we will first limit the set of explanatory variables to include the non-cognitive skill variables and a few basic individual controls (such as gender and disadvantage status). The robustness of this relation will then be tested by augmenting the set of right-hand side variables with controls for the observable characteristics of the respondents (such as the type of attended school, their geographical location, their performances at school, etc.).

The second research question explicitly requires a comparison between two groups of respondents: those that we have identified as disadvantaged and those that do not belong to this category. It is therefore natural to base our empirical analysis on the use of propensity score matching. One of the most appealing characteristics of the matching technique is its highly intuitive structure. We want to isolate the effect of belonging to a disadvantaged group on the choice of post-school activities for early school leavers. Matching procedures compare the outcomes (in our case, the type of activity the youth engage in after having left school) of a group of individuals (the treatment group, in our case early school leavers that experience some form of disadvantage) with the outcomes of another group of individuals (the control group, in our case early school leavers that do not belong to any disadvantaged group). The critical element is that the comparison takes place after the individuals of the treatment group are matched to those in the control group on the basis of a (possibly very large) set of observable characteristics. By controlling for these characteristics, matching procedures attempt to ensure that the only observable difference between the matched individuals is the participation in the treatment or in the control group. In other words, the matching techniques aim at estimating counterfactual outcomes: they estimate what the outcome of a treated individual would have been in case she had not been treated. They do so by using data for control group individuals which are similar to the treated ones with respect to a number of observable dimensions, apart from the treatment status.

While the technical details of this procedure are highlighted in Appendix A, it is worth pointing out here the two main assumptions that need to be satisfied for the matching procedure to provide unbiased estimates:

1. Conditional Independence Assumption (CIA): after conditioning on covariates, assignment between treatment and control group is effectively random; that is, there

are no unobserved differences other than the treatment status between the two groups relevant to the outcome variable.

2. Common Support Assumption (CSA): for each program participant, there is an individual with the same (or sufficiently similar) characteristics who does not participate, and hence who can be used as the matched counterfactual observation.

Matching techniques have two limitations. First of all, they require very rich datasets in order to provide robust estimates. Exact one-to-one matching (“Nearest Neighbour” method), in particular, can be extremely demanding in terms of quality of the employed data. In order to minimise any issue related this type of problems in this report we rely on the so-called Kernel method (Heckman *et al.*, 1997), which uses “weighted averages of (nearly) all individuals in the control group to construct the counterfactual outcome”.¹⁵ The second limitation of matching procedures is that they do not allow assessing the exact contribution of each observable variable to the determination of the studied outcome. In this respect, we will complement the results obtained through the propensity score matching procedure with a multinomial logit analysis on the probability that early school leavers select into education, employment or inactivity within the first year after having left school. The set of variables used in this probabilistic regression study will be the same as the one employed for the matching analysis. Once again we will focus our attention on the role of personality traits and we will assess their empirical importance with respect to both disadvantaged and non-disadvantaged respondents.

5. Empirical results

5.1 Probability of early school leaving and personality traits

As mentioned in the previous section, the starting point of our empirical analysis is the assessment of the relation between non-cognitive skills and the likelihood of dropping out of school for students that do or do not experience a form of disadvantage. In this respect we run a probit regression in which the probability of early school leaving is studied as a function of a set of variables which includes the self-reported values for the non-cognitive skills described in section 3. Table 11 reports the results of this analysis with respect to the personality traits only, while all the remaining coefficients can be found in Table B2 in Appendix B. All the

¹⁵ Caliendo and Kopeinig, p. 43.

parameters reported in the two tables are reported as marginal effects. This means that for each variable in the tables we can interpret the reported figure as the change in the probability of dropping out of school that is linked to one-unit change in the explanatory variable, keeping all other variables constant. The tables contain 4 columns. In the first one we report the marginal effects of the non-cognitive skills in case we do include any other explanatory variable. The second column reports the results in case the set of explanatory variables is augmented by a number of standard socio-demographic controls (see Table B2 for the complete list of controls). Finally, in the third and the fourth column we present the results obtained by splitting the sample between disadvantaged and non-disadvantaged students.

Table 11
Probability of early school leaving

Personality trait	All individuals		All individuals		Not disadvantaged		Disadvantaged	
	Marg. Eff.	Std. Err.	Marg. Eff.	Std. Err.	Marg. Eff.	Std. Err.	Marg. Eff.	Std. Err.
<i>Agreeable (reference: very)</i>								
Fairly	0.013	0.012	0.000	0.010	0.011	0.012	-0.021	0.018
Not very or not at all	0.040	0.033	0.037	0.029	-0.018	0.033	0.102**	0.048
<i>Hard working (ref.: very)</i>								
Fairly	-0.112***	0.010	-0.048***	0.009	-0.049***	0.011	-0.044***	0.015
Not very or not at all	-0.165***	0.016	-0.040***	0.015	-0.044**	0.018	-0.036	0.027
<i>Open to new exp (ref.: very)</i>								
Fairly	0.011	0.010	-0.025***	0.009	-0.026**	0.010	-0.023	0.015
Not very or not at all	0.047**	0.024	-0.014	0.019	-0.002	0.024	-0.030	0.031
<i>Intellectual (reference: very)</i>								
Fairly	0.098***	0.012	0.026**	0.013	0.025*	0.015	0.031	0.022
Not very or not at all	0.277***	0.02	0.077***	0.018	0.107***	0.022	0.039	0.029
<i>Popular (reference: very)</i>								
Fairly	-0.069***	0.017	-0.021	0.014	0.007	0.016	-0.053**	0.023
Not very or not at all	-0.033	0.024	-0.01	0.019	0.011	0.023	-0.038	0.031
<i>Outgoing (reference: very)</i>								
Fairly	-0.025**	0.011	-0.021**	0.009	-0.007	0.011	-0.043***	0.016
Not very or not at all	-0.084***	0.017	-0.047***	0.015	-0.033*	0.018	-0.071***	0.026
<i>Confident (reference: very)</i>								
Fairly	-0.043***	0.012	-0.021**	0.010	-0.033***	0.012	-0.007	0.016
Not very or not at all	-0.028	0.018	-0.001	0.015	-0.014	0.019	0.020	0.025
<i>Calm (reference: very)</i>								
Fairly	-0.004	0.011	-0.001	0.009	-0.006	0.011	0.005	0.016
Not very or not at all	0.015	0.016	0.037***	0.014	0.017	0.017	0.055**	0.023
Number of observations	8589		8588		5107		3481	
Other controls included	No		Yes		Yes		Yes	

Estimation based on LSAY 1995 cohort data

As we observed in Table 5, the correlation in the self-reported values for adjectives that define the same traits is quite low. Therefore, we prefer to include the answers for each adjective among the regressors and we do not collapse the answers for adjectives that denote the same traits. For each adjective we keep the answer “Very” as the reference category and report the marginal effects for the answers “Fairly” and “Not very or not at all”.¹⁶

The results indicate that even after the inclusion of all the controls, the relation between the probability of early school leaving and certain personality skills is still valid and significant from a statistical point of view. Generally speaking, this link is less pronounced for disadvantaged students. This first element of empirical evidence can possibly be explained by the fact that for students that experience some form of disadvantage the decision to quit formal education before obtaining a qualification can be driven by socio-demographic characteristics while personality traits play a minor role. Nonetheless, two results appear to be confirmed across all specifications. First of all, less hard working respondents show a lower propensity to prematurely leave school. This result, which may appear quite surprising, can possibly be explained by the interpretation that students give to the adjective “hard working”. Respondents might assume that the type of (typically intellectual) effort that is required to optimally perform at school should not be considered as “work”. The fact that the exact opposite result is generally found with respect to the adjective “Intellectual” seems to confirm this interpretation.

The second result that can be noted relates to the trait “extroversion”. Students that define themselves as not very outgoing or not very popular show a lower tendency to remain in education until completion of their studies. This last result is particularly evident for disadvantaged students and combined with the previous one it opens up interesting questions in terms of policies for retaining students into education. While any policy aiming at directly influencing the personality traits of students would be of extremely difficult application and would face controversial ethical issues, the results presented in table 11 suggest that policy interventions aimed at shaping school curricula so as to accommodate the creativity and the desire for work experience of students might be quite effective in limiting the occurrence or early school leaving. Furthermore, these interventions can be expected to exert their effects on all students, including those that experience some form of disadvantage.

¹⁶ Given the limited amount of individuals that answer “Not very” or “Not at all” for any of the proposed adjectives, we collapse the answers to these two categories in a unique value.

5.2 Disadvantage and post-school choices: a matching approach

As several other studies have illustrated, Australia has one of the highest percentages of early school leavers among all the OECD countries. One of the aims of this report is to shed some light on the set of activities that former students engage in once they prematurely leave education.

As pointed out in the descriptive section, we focus on three main activities: work, study and other activities. This last category mainly includes respondents that do not engage in any working or educational activity. We study the probability of early school leavers choosing any of these three activities depending on their disadvantage status. Using the matching procedure described in section 4 and Appendix A, we first control for a number of observable characteristics that may influence both the likelihood of a student to experience a disadvantage and the choice among different post-school activities. This procedure enables us to select a group of non-disadvantaged individuals as similar as possible to the set of disadvantaged respondents included in our sample so as to obtain a meaningful comparison between the two subsets of respondents. The advantage of performing this type of technique on the LSAY 1995 dataset is that we can augment the set of standard socio-demographic characteristics employed for the matching by the variables that summarise the non-cognitive skills of the respondents. Table B3 in Appendix B shows the share of respondents that give a positive answer to each of the questions defining the observable characteristics employed in our matching procedure. The shares are reported separately for disadvantaged and non-disadvantaged respondents. The figures in bold refer to the shares after the implementation of the matching procedure. In general, the matching guarantees a substantial reduction in the differences in these shares across the two subgroups of respondents. As it can be seen in the last column of Table B3, after the matching, all the differences become statistically insignificant, confirming that the two subgroups of individuals that we employ for our analysis are not characterized by major differences in their observable characteristics, including personality traits.

Table 12
Propensity score matching outcomes

	Unmatched sample				Matched: Kernel Procedure			
	Not disadv.	Disadv.	Difference	t-value	Not disadv.	Disadv.	Difference	t-value
Studying	0.277	0.238	-0.039	-2.05	0.258	0.238	-0.020	-0.98
Working	0.623	0.580	-0.043	-1.96	0.629	0.580	-0.049	-2.11
Other	0.099	0.182	0.083	5.33	0.113	0.182	0.069	4.33

Estimation based on LSAY 1995 cohort data

Table 12 shows the probabilities of early school leavers choosing any of the three activities within one year after having stopped studying. If we compare the choices of disadvantaged and non-disadvantaged students before the matching, we can observe some clear differences in these probabilities. Disadvantaged ESLs have an 18% probability of being unemployed and not enrolled in any formal education. This percentage is almost twice the corresponding figure for non-disadvantaged students. Conversely, disadvantaged respondents show a lower probability of being employed or being enrolled in education. We then repeat the same type of analysis comparing disadvantaged students with non-disadvantaged students who share the same observable characteristics (matched individuals). We can note that differences in the probabilities of being employed and of being inactive still persist. This result leads to conclude that controlling for observable characteristics (including personality traits) does not effectively contribute to reduce the gap in the probability of inactivity after early school leaving. This outcome can be explained in two non-mutually exclusive ways. First of all, the set of observable characteristics presented in Table B3 may not fully capture the whole spectrum of dimensions that can determine the likelihood of experiencing a form of disadvantage. The second explanation is that the probability of choosing to enrol in education or to engage in a working activity or to end up in inactivity is strictly connected to the disadvantaged status *per se*. In other words, experiencing one of the forms of disadvantage outlined so far and summarised in section 3 is one of the main driving forces that determine which type of activity early school leavers choose after having dropped out of school. Evidently, this second explanation implies that any policy intervention aimed at shaping the activity choice of disadvantaged early school leavers should aim at tackling the source of the disadvantage more than affecting the observable characteristics of the individuals that experience the disadvantages. Given the importance of such a policy implication, in the next

section we try to further explore the role of personality traits in the determination of post-school activities for early school leavers.

5.3 Disadvantage and post-school choices: the role of personality traits

The propensity score matching technique employed in the previous section is particularly effective in the evaluation of outcomes across different subgroups of a population. Nonetheless, it does not allow to fully appreciate the contribution of each single explanatory variable to the determination of the outcome. In order to overcome this limitation and assess the importance of non-cognitive skills in the choice of post-school activities for disadvantaged and non-disadvantaged ESLs we introduce an additional element in our empirical analysis. Table 13 reports the results of a multinomial logit regressions in which the probability of choosing any of the three activities (working, studying or inactivity) one year after having left school is studied as a function of the same variables employed in the matching. As in the rest of this report, we focus our attention on the personality traits. The coefficients associated with all the other explanatory variables are presented in Table B4 in Appendix B. The analysis is performed separately for early school leavers with and without forms of disadvantage, and as for the probit analysis previously described the parameters are presented in forms of marginal effects. For example, if we look at the first row in table 13, we observe that with respect to those respondents that declare to consider themselves as “Very agreeable”, reporting to be “Fairly agreeable” is linked to a 1.4 percentage point reduction in the probability of studying for non-disadvantaged respondents and to a 3.3 percentage point increase for disadvantaged respondents (neither effect is statistically significant).

In all, the main message of the table is a lack of a strong relation between personality traits and the probability of choosing any of the three activities. For non disadvantaged respondents most of the significant relations can be detected with respect to the employment choice. In particular, this choice appears less likely for those ESLs that declare not to be open to new experiences, not popular and not confident. Conversely, respondents that declare not to be calm have a 10 percentage point higher probability of working than those that describe themselves as “Very calm”.

Table 13
Probabilities of post-school activities: the role of personality traits

Variable	Non-Disadvantaged			Disadvantaged		
	Studying Marg. Eff.	Working Marg. Eff.	Other Marg. Eff.	Studying Marg. Eff.	Working Marg. Eff.	Other Marg. Eff.
<i>Personality trait</i>						
<i>Agreeable (reference: very)</i>						
Fairly	-0.014	0.054	-0.040	0.033	-0.017	-0.016
not very or not at all	-0.067	0.136	-0.069	0.091	-0.037	-0.054
<i>Hard working (reference: very)</i>						
Fairly	-0.033	0.016	0.017	0.064**	-0.049	-0.015
not very or not at all	0.068	-0.117	0.049	0.064	-0.122*	0.058
<i>Open to new exp. (ref.: very)</i>						
Fairly	-0.002	0.004	-0.002	-0.028	0.004	0.024
not very or not at all	0.098	-0.180**	0.082	-0.083	-0.023	0.106*
<i>Intellectual (reference: very)</i>						
Fairly	0.050	-0.084	0.034	0.000	0.043	-0.044
not very or not at all	0.048	-0.071	0.023	-0.018	0.017	0.001
<i>Popular (reference: very)</i>						
Fairly	0.049	-0.046	-0.003	0.023	-0.028	0.006
not very or not at all	0.062	-0.128*	0.066	0.031	-0.099	0.068
<i>Outgoing (reference: very)</i>						
Fairly	0.033	-0.008	-0.025	0.037	-0.046	0.009
not very or not at all	0.013	-0.052	0.040	0.064	-0.049	-0.015
<i>Confident (reference: very)</i>						
Fairly	0.053	-0.047	-0.006	-0.006	0.009	-0.002
not very or not at all	0.109*	-0.152**	0.043	0.029	-0.033	0.004
<i>Calm (reference: very)</i>						
Fairly	-0.015	0.021	-0.007	-0.038	0.048	-0.010
not very or not at all	-0.074	0.109**	-0.036	-0.089**	0.106**	-0.017
Number of observations		955			1077	
Log-Likelihood		-788.23			-971.479	
LR-Test (dF)		104.52			140.79	
Pseudo-R2		0.062			0.068	

Estimation based on LSAY 1995 cohort data.

For disadvantaged students, the number of statistically significant relations is even more limited. Respondents that declare to be “Very hard working” tend to have a 12 percentage point higher probability of being employed compared to non hard working individuals and a 6.4 percentage point smaller probability of being enrolled in education one year after having dropped out of school. Less calm respondents tend to cluster into work and avoid going back into education. The figures related to the trait “openness to new experiences” deserve some attention. Differently from what is observed for non-disadvantaged respondents, in fact,

disadvantage individuals not very open to new experiences display a higher probability of ending up in inactivity in their first year out of school.

The multinomial analysis confirms what already suggested by the propensity score analysis: with respect to the choice of post-school activities, the role of non-cognitive skills appears quite limited. Furthermore, the relation between personality traits and likelihood of employment or study does not vary considerably between disadvantaged and non-disadvantaged students.

6. Discussion and policy implications

This report has addressed two main research questions:

- 1) What is the role of non-cognitive skills in the decision of dropping out of school? And in particular, is there any distinction in the way personality traits relate to early school leaving of disadvantaged and non-disadvantaged students?
- 2) How do the patterns of activities after school differ between disadvantaged and non-disadvantaged early school leavers, once we control for personality traits and other observable characteristics?

Our results indicate that the influence of non-cognitive skills is different for the two research questions under analyses. The perception that students have of their own personality and characteristics can be linked to their decision of dropping out of school. Conscientiousness and extraversion, in particular, appear to be the traits that are more closely linked to the decision to drop out of school. Conversely, selection into employment, study or inactivity is not significantly influenced by personality traits. The choice of the post-school activity, in fact, appears to be driven more by the disadvantaged condition *per se* than by other elements of differentiation among different subgroups of the population. Disadvantaged early school leavers show a much higher propensity to fall into inactivity during the first year after exiting education comparing to their non-disadvantaged peers.

These results bear some interesting policy implications and should be assessed in relation to what is already established in the existing literature. Previous studies on the links between personality skills and economic outcomes of teenagers are not particularly numerous. This is due to the lack of data but also to the fact the non-cognitive skills are generally studied with respect to young individuals, in order to assess which interventions can effectively contribute to the shaping of individual personalities. To our knowledge only two contributions have focused on the link between school outcomes and personality traits of adolescents. The

reference is to the working papers of Kalil, Karjanapan and Sartbajeva (2010) and Barón and Cobb-Clark (2010). As briefly pointed out in the literature review section, these two papers employ data from the Youth in Focus survey which contain information on one particular personality trait: locus of control. Although we make use of information on a wider set of non-cognitive skills, the results we present are very consistent with those reported in the two cited papers. Personality characteristics do matter for the successful completion of school level education. Barón and Cobb-Clark (2010) also point out that while students with a more internal locus of control have better school performances, there is little evidence for a more external locus of control to be driven by a disadvantaged socio-economic status. A more internal locus of control also relates to higher chances of university enrolment, meeting the university entry requirement and getting a full-time job. These results are particularly evident for disadvantaged students in the work of Kalil *et al.*

Differently from other individual characteristics, personality traits tend to stabilise over time so that most of the policy recommendations proposed in the literature suggest policy interventions to be conducted during early childhood. Our results can be read in a different perspective. Since we focus our analysis on teenagers, suggesting policy interventions with the aim of directly influencing the determination of personality skill may be inappropriate and potentially risky from an ethical point of view. As our findings indicate that disadvantaged students prematurely leaving school have a high propensity of falling into inactivity, a policy aimed at retaining students in education could be particularly beneficial for supporting disadvantaged students and helping them in closing the gap in terms of university entry rates and employability. In this respect, taking personality traits into account could help the design of educational strategies that facilitate the achievement of secondary school qualifications by disadvantaged students. Curricula that accommodate different degrees of conscientiousness, self confidence or extroversion of students' without hindering the quality of the process of knowledge transmission might be particularly useful tools in the attempt to improve school retention rates. This is all the more necessary as our results indicate that the decision to leave school early, to the extent that it is driven by personality, is not necessarily a rational choice. If it were, one would expect that personality determines not only the decision whether to leave school early or not, but also what to do after leaving school. Such a link could not be found, which suggests that early school leaving is not planned by the students while having alternative activities in mind that would be more suitable to their personality. Assisting young people in such a far-ranging decision is crucial to avoid detrimental outcomes.

Appendix A: Propensity Score Matching

Most of the theory on the implementation of propensity score matching is based on the seminal work of Rosenbaum and Rubin (1983 and 1985) and has found wide application in the economic literature. The main argument behind this method can be summarized as follows.¹⁷

For any early school leaver we would like to define Y as an outcome variable (for example whether she is employed one year after dropping out of school) specifying how this outcome would have changed had the individual been identified as belonging to a disadvantaged category or not. If we define a dummy D_i that equals one in case the student is identified as disadvantaged and zero otherwise, we are interested in evaluating the treatment effect (i.e., the effect of being disadvantaged) that we can express as:

$$\tau_i = Y_i(D_i = 1) - Y_i(D_i = 0) \quad (1)$$

Evidently, for each individual i is only one of the two outcomes that can be observed. Although the exact estimation of τ_i is not possible, it is still feasible to identify some average treatment effects.¹⁸ In particular, most of the literature has focused on the estimation of the *average treatment effect on the treated*, which we can define as:

$$\tau_{ATT} = E(\tau | D = 1) = E[Y(1) | D = 1] - E[Y(0) | D = 1] \quad (2)$$

where $E[Y(0) | D = 1]$ is not observed. Simply approximating this last term with the average outcome observed for the untreated $E[Y(0) | D = 0]$ would lead to biased estimates, since:

$$E[Y_1 | D = 1] - E[Y_0 | D = 0] = \tau_{ATT} + \{E[Y_0 | D = 1] - E[Y_0 | D = 0]\} \quad (3)$$

where the term in curly brackets on the RHS represents the bias term that can be attributed to the earnings of non-VET students, it is not necessarily representative of what VET students would have earned if they had not taken the VET courses. So τ_{ATT} can be identified only if

¹⁷ The description of the theoretical framework for the implementation of matching estimators is largely based on Angrist (1998), Caliendo and Kopeinig (2008) and Angrist and Pischke (2009), chapter 3.

¹⁸ For simplicity, the subscript i will be eliminated from the equations.

$$E[Y_0 | D = 1] - E[Y_0 | D = 0] = 0 .$$

Within non-experimental frameworks, this last result can only be achieved by invoking some identifying assumptions. In particular, it is worth mentioning two crucial assumptions.

Conditional Independence Assumption (CIA): given a set of covariates X , not affected by the treatment, potential outcomes are independent of treatment assignment. Formally:

$$Y(0), Y(1) \perp D | X, \quad \forall X . \quad (4)$$

Nonetheless, conditioning on a high dimensional set of variables X can be extremely demanding. In this respect, the finding of Rosenbaum and Rubin (1983) is particularly useful: if potential outcomes are independent of treatment conditional on covariates X , they are also independent of treatment conditional on a balancing score $b(X)$. Furthermore, within the set of possible balancing scores, Rosenbaum and Rubin identify the propensity score, i.e. the probability for an individual to participate in a treatment given their observed covariates X , as the coarsest balancing score. So, given the propensity score, CIA can be re-written as:

$$Y(0), Y(1) \perp D | P(X), \quad \forall X . \quad (5)$$

Common Support (Overlap Condition):

$$0 < P(D = 1 | X) < 1 \quad (6)$$

This assumption “prevents X from being a perfect predictor, in the sense that we can find for each participant a counterpart in the non-treated population and vice versa”.¹⁹

¹⁹ Caliendo and Hujer (2006).

Appendix B: Additional Tables

Table B1
Survey size and response rates

Survey Year	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Wave	1	2	3	4	5	6	7	8	9	10	11	12
Avg. age (June 30)	14.5	15.4	16.4	17.4	18.4	19.4	20.4	21.4	22.4	23.4	24.4	25.4
Sample size (N)	13,613	9,837	10,307	9,738	8,783	7,889	6,876	6,095	5,354	4,660	4,233	3,914
Wave 1 retained (%)	100.0	72.3	75.7	71.5	64.5	58.0	50.5	44.8	39.3	34.2	31.1	28.8
Attrition rate (%)	-	27.7	-4.8	5.5	9.8	10.2	12.8	11.4	12.2	13	9.2	7.5

Source: LSAY data 1995 cohort. Non-weighted figures.

Table B2
Probability of early school leaving

Personality trait	All individuals		All individuals		Disadvantaged		Not disadvantaged	
	Marg. Eff.	Std. Err.	Marg. Eff.	Std. Err.	Marg. Eff.	Std. Err.	Marg. Eff.	Std. Err.
<i>Agreeable (reference: very)</i>								
fairly	0.013	0.0121	0.000	0.01	-0.021	0.018	0.011	0.012
not very or not at all	0.040	0.0335	0.037	0.029	0.102**	0.048	-0.018	0.033
<i>Hard working (ref.: very)</i>								
fairly	-0.112***	0.0105	-0.048***	0.009	-0.044***	0.015	-0.049***	0.011
not very or not at all	-0.165***	0.0158	-0.040***	0.015	-0.036	0.027	-0.044**	0.018
<i>Open to new exp. (ref.: very)</i>								
fairly	0.011	0.01	-0.025***	0.009	-0.023	0.015	-0.026**	0.01
not very or not at all	0.047**	0.0239	-0.014	0.019	-0.030	0.031	-0.002	0.024
<i>Intellectual (reference: very)</i>								
fairly	0.098***	0.0122	0.026**	0.013	0.031	0.022	0.025*	0.015
not very or not at all	0.277***	0.0198	0.077***	0.018	0.039	0.029	0.107***	0.022
<i>Popular (reference: very)</i>								
fairly	-0.069***	0.0171	-0.021	0.014	-0.053**	0.023	0.007	0.016
not very or not at all	-0.033	0.0236	-0.010	0.019	-0.038	0.031	0.011	0.023
<i>Outgoing (reference: very)</i>								
fairly	-0.025**	0.0109	-0.021**	0.009	-0.043***	0.016	-0.007	0.011
not very or not at all	-0.084***	0.0171	-0.047***	0.015	-0.071***	0.026	-0.033*	0.019
<i>Confident (reference: very)</i>								
fairly	-0.043***	0.0117	-0.021**	0.01	-0.007	0.016	-0.033***	0.012
not very or not at all	-0.028	0.0181	-0.001	0.015	0.0202	0.025	-0.014	0.019

<i>Calm (reference: very)</i>								
fairly	-0.004	0.0111	-0.001	0.009	0.005	0.016	-0.006	0.011
not very or not at all	0.015	0.0161	0.037***	0.014	0.055**	0.023	0.017	0.017
<i>Other controls</i>								
Student is male			0.060***	0.008	0.076***	0.014	0.052***	0.01
Number of siblings			0.0153***	0.003	0.022***	0.004	0.009**	0.003
School is in urban area			-0.042***	0.008	-0.056***	0.014	-0.032***	0.01
State (reference: NSW)								
ACT			0.040*	0.022	0.114***	0.04	-0.001	0.024
VIC			-0.002	0.012	0.010	0.02	-0.008	0.014
QLD			-0.009	0.012	0.013	0.02	-0.026*	0.014
SA			0.062***	0.014	0.077***	0.023	0.052***	0.017
WA			0.072***	0.014	0.104***	0.024	0.049***	0.017
TAS			0.111***	0.023	0.141***	0.036	0.076**	0.03
NT			0.183***	0.029	0.175***	0.042	0.187***	0.04
School sector (ref.: Public)								
Catholic			-0.080***	0.01	-0.070***	0.019	-0.073***	0.012
Independent			-0.066***	0.012	-0.090***	0.023	-0.044***	0.013
Parents' plans after school (ref.: Study)								
Nothing			0.051**	0.024	0.078*	0.042	0.043	0.029
Don't know			0.035***	0.01	0.066***	0.018	0.015	0.012
Work			0.093***	0.013	0.105***	0.021	0.084***	0.017
Work and study			0.013	0.014	0.013	0.025	0.019	0.017
Student plans to finish Year 12			-0.362***	0.013	-0.381***	0.019	-0.344***	0.018
Test-score reading (0-20)			-0.006***	0.001	-0.008***	0.002	-0.005***	0.002
Test-score mathematics (0-20)			-0.012***	0.001	-0.014***	0.002	-0.010***	0.002
Number of observations	8589		8588		3481		5107	
Log-Likelihood	-4721.10		-3553.61		-1621.43		-1883.68	
LR-Test (dF)	426.50		2760.87		1232.46		1427.45	
Pseudo-R2	0.0432		0.2798		0.2754		0.2748	
Test of Joint Significance								
Agreeable	0.3661		0.3808		0.0114		0.4717	
Hard working	0.0000		0.0000		0.0103		0.0000	
Open to new experiences	0.1078		0.0128		0.2555		0.0352	
Intellectual	0.0000		0.0000		0.3339		0.0000	
Popular	0.0000		0.2503		0.0535		0.8856	
Outgoing	0.0000		0.0051		0.0054		0.2358	
Confident	0.0008		0.0461		0.4584		0.0132	
Calm	0.3979		0.0056		0.0243		0.2773	
All personality traits	0.0000		0.0000		0.0000		0.0000	

Estimation based on LSAY 1995 cohort data.

Table B3
Matching procedure: reduction in bias for covariates

	Not disadvantaged		Disadvantaged		Std bias (in %)		% Bias reduction	p-value (H0: bias=0)		
	Not matched	Matched	Not matched	Matched	Not matched	Matched		Not matched	Matched	
<i>Personality trait</i>										
<i>Agreeable (ref.: very)</i>										
Fairly	0.767	0.768	0.777	0.766	-2.4	0.3	85.4	0.592	0.936	
not very or not at all	0.033	0.033	0.017	0.030	10.7	1.5	86.3	0.018	0.761	
<i>Hard work (ref.: very)</i>										
Fairly	0.428	0.428	0.428	0.430	0.0	-0.4	-721.5	0.992	0.929	
not very or not at all	0.052	0.052	0.062	0.052	-4.2	0.0	99.6	0.341	0.996	
<i>Open to exp. (ref.: very)</i>										
Fairly	0.537	0.536	0.509	0.538	5.6	-0.3	94.4	0.211	0.942	
not very or not at all	0.055	0.055	0.050	0.053	2.0	0.6	70.0	0.649	0.890	
<i>Intellectual (ref.: very)</i>										
Fairly	0.738	0.738	0.733	0.746	1.2	-1.8	-57.2	0.792	0.666	
not very or not at all	0.172	0.172	0.178	0.163	-1.6	2.4	-48.5	0.712	0.565	
<i>Popular (ref.: very)</i>										
Fairly	0.749	0.749	0.799	0.750	-11.9	-0.2	98.2	0.008	0.961	
not very or not at all	0.109	0.109	0.085	0.106	8.1	0.9	88.8	0.071	0.841	
<i>Outgoing (ref.: very)</i>										
Fairly	0.492	0.492	0.509	0.487	-3.4	0.9	71.9	0.450	0.827	
not very or not at all	0.068	0.068	0.069	0.064	-0.5	1.5	-186.9	0.906	0.722	
<i>Confident (ref.: very)</i>										
Fairly	0.571	0.572	0.582	0.558	-2.3	2.7	-20.9	0.611	0.528	
not very or not at all	0.121	0.120	0.095	0.127	8.2	-2.2	73.6	0.066	0.637	
<i>Calm (ref.: very)</i>										
Fairly	0.578	0.578	0.587	0.573	-2.0	1.0	50.4	0.652	0.818	
not very or not at all	0.160	0.159	0.126	0.158	9.7	0.4	96.0	0.029	0.932	
<i>Other controls</i>										
Student is male	0.561	0.560	0.636	0.572	-15.3	-2.4	84.3	0.001	0.582	
Number of siblings	2.456	2.457	2.168	2.430	18.7	1.8	90.4	0.000	0.697	
School is in urban area	0.408	0.408	0.445	0.413	-7.6	-0.9	87.9	0.089	0.831	
State (reference: NSW)										
ACT	0.032	0.032	0.025	0.034	3.9	-1.3	67.7	0.385	0.786	
VIC	0.172	0.172	0.186	0.169	-3.8	0.9	76.5	0.391	0.832	
QLD	0.186	0.185	0.131	0.183	15.1	0.6	95.7	0.001	0.889	
SA	0.130	0.130	0.163	0.139	-9.4	-2.5	73.2	0.033	0.543	
WA	0.170	0.170	0.184	0.171	-3.8	-0.2	93.8	0.397	0.956	
TAS	0.070	0.070	0.051	0.066	7.7	1.7	77.3	0.085	0.701	
NT	0.054	0.054	0.053	0.053	0.2	0.6	-196.0	0.964	0.891	
School sector (ref.: Public)										
Catholic	0.110	0.110	0.135	0.110	-7.8	0.0	99.4	0.079	0.991	

Independent Parents' plans after school (ref.: Study)	0.053	0.053	0.124	0.052	-25.1	0.4	98.3	0.000	0.902
Nothing	0.039	0.039	0.039	0.042	0.1	-1.6	-1103.4	0.976	0.720
Don't know	0.399	0.399	0.364	0.390	7.2	1.8	74.5	0.107	0.673
Work	0.342	0.342	0.334	0.347	1.6	-1.0	38.5	0.716	0.818
Work and study	0.080	0.080	0.102	0.082	-7.6	-0.7	90.2	0.088	0.856
Student plans to finish Year 12	0.416	0.416	0.435	0.417	-3.8	-0.1	96.9	0.398	0.979
Test-score reading (0-20)	11.571	11.575	12.200	11.578	-16.3	-0.1	99.5	0.000	0.986
Test-score mathematics (0-20)	10.702	10.710	11.598	10.808	-26.3	-2.9	89.1	0.000	0.503

Estimation based on LSAY 1995 cohort data.

Table B4
Probabilities of post-school activities: the role of personality traits

Variable	Non-Disadvantaged			Disadvantaged		
	Studying	Working	Other (incl. nothing)	Studying	Working	Other (incl. nothing)
	Marg. Eff.	Marg. Eff.	Marg. Eff.	Marg. Eff.	Marg. Eff.	Marg. Eff.
<i>Personality trait</i>						
Agreeable (reference: very)						
fairly	-0.014	0.054	-0.040	0.033	-0.017	-0.016
not very or not at all	-0.067	0.136	-0.069	0.091	-0.037	-0.054
Hard working (reference: very)						
fairly	-0.033	0.016	0.017	0.064**	-0.049	-0.015
not very or not at all	0.068	-0.117	0.049	0.064	-0.122*	0.058
Open to new exp. (ref.: very)						
fairly	-0.002	0.004	-0.002	-0.028	0.004	0.024
not very or not at all	0.098	-0.180**	0.082	-0.083	-0.023	0.106*
Intellectual (reference: very)						
fairly	0.050	-0.084	0.034	0.000	0.043	-0.044
not very or not at all	0.048	-0.071	0.023	-0.018	0.017	0.001
Popular (reference: very)						
fairly	0.049	-0.046	-0.003	0.023	-0.028	0.006
not very or not at all	0.062	-0.128*	0.066	0.031	-0.099	0.068
Outgoing (reference: very)						
fairly	0.033	-0.008	-0.025	0.037	-0.046	0.009
not very or not at all	0.013	-0.052	0.040	0.064	-0.049	-0.015
Confident (reference: very)						
fairly	0.053	-0.047	-0.006	-0.006	0.009	-0.002
not very or not at all	0.109*	-0.152**	0.043	0.029	-0.033	0.004
Calm (reference: very)						

fairly	-0.015	0.021	-0.007	-0.038	0.048	-0.010
not very or not at all	-0.074	0.109**	-0.036	-0.089**	0.106**	-0.017
<i>Other controls</i>						
Student is male	0.029	-0.018	-0.011	0.015	0.072**	-0.087***
Number of siblings	-0.023**	0.017	0.006	-0.025***	0.008	0.017***
School is in urban area	0.029	-0.040	0.011	0.012	-0.002	-0.010
State (reference: NSW)						
ACT	-0.167**	0.107	0.061	-0.032	-0.027	0.059
VIC	-0.070	0.023	0.047	-0.019	-0.029	0.048
QLD	0.021	-0.020	-0.001	-0.049	0.117**	-0.068*
SA	0.002	0.019	-0.021	-0.014	0.122**	-0.108***
WA	0.081*	-0.057	-0.024	0.039	0.024	-0.064*
TAS	-0.080	-0.028	0.109*	-0.096*	0.038	0.059
NT	-0.133**	0.133*	0.000	-0.052	0.121*	-0.069
School sector (reference: Public)						
Catholic	0.004	0.057	-0.060***	0.033	0.054	-0.086***
Independent	-0.022	0.065	-0.043	0.093	-0.040	-0.053
Parents' plans after school (reference: Study)						
Nothing	-0.074	-0.034	0.108*	-0.047	0.081	-0.034
Don't know	-0.086*	0.075	0.011	-0.065	0.096**	-0.031
Work	-0.094**	0.079	0.015	-0.064	0.119**	-0.055
Work and study	-0.021	-0.026	0.047	-0.040	0.105	-0.065
Student plans to finish Year 12	0.013	-0.008	-0.004	0.027	0.040	-0.067***
Test-score reading (0-20)	0.002	0.000	-0.002	-0.003	0.009*	-0.006*
Test-score mathematics (0-20)	0.006	-0.003	-0.002	0.003	0.004	-0.007*
Number of observations						
		955			1077	
Log-Likelihood						
		-788.23			-971.479	
LR-Test (dF)						
		104.52			140.79	
Pseudo-R2						
		0.062			0.068	

Estimation based on LSAY 1995 cohort data

Appendix C: Personality traits in LSAY and in HILDA

Table C1
Distribution of answers on personality traits

Trait	Dataset	Very	Fairly	No
Agreeable	LSAY	19.23	78.30	2.48
	HILDA, 16-17 year old	30.16	52.90	16.94
	HILDA, all individuals	43.82	46.66	9.52
Hard working	LSAY	39.70	51.14	9.16
	HILDA, 16-17 year old	16.11	48.34	35.55
	HILDA, all individuals	35.16	44.66	20.19
Openness	LSAY	27.10	64.91	7.99
	HILDA, 16-17 year old	11.60	45.19	43.21
	HILDA, all individuals	11.07	42.33	46.59
Extraversion	LSAY	24.27	66.11	9.62
	HILDA, 16-17 year old	21.96	50.23	27.80
	HILDA, all individuals	40.81	43.04	16.15
Stability	LSAY	26.49	60.46	13.05
	HILDA, 16-17 year old	26.95	47.28	26.95
	HILDA, all individuals	18.92	41.28	18.92

Source: LSAY Data 1995 cohort and HILDA 2005 wave. Non-weighted figures.

References

Angrist, J. D. and A. Krueger (1991), "Does compulsory school attendance affect schooling and earnings?", *Quarterly Journal of Economics*, vol. 106, pp. 979-1014.

Angrist, J. D. and J. S. Pischke (2009), *Mostly Harmless Econometrics*, Princeton: Princeton University Press.

Almlund, M., A.L. Duckworth, J.J. Heckman and T. Kautz, (2011), "Personality Psychology and Economics" in Hanushek, E.A., S. Machin and L. Woessmann, (eds.), *Handbook of the Economics of Education*, vol. 4, Elsevier.

Australian Bureau of Statistics (ABS) (2012), "Schools Australia", ABS cat. No. 4221.0, ABS, Canberra, released 4 May 2012.

Barón, J.D. (2008), "Exploring the Factors Associated with Youths' Educational Outcomes: The Role of Locus of Control and Parental Socio-Economic Background", Australian National University, CEPR Discussion Papers n.598.

Barón, J.D. and D.A. Cobb-Clark (2010), "Are Young People's Educational Outcomes Linked to their Sense of Control?", IZA Discussion Paper n.4907.

Becker, A., T. Deckers, T. Dohment, A. Falk and F. Kosse (2012), "The Relationship Between Economic Preferences and Psychological Personality Measures" IZA Discussion Papers no. 6470.

Bertrand, M. and J. Pan (2011), "The Trouble with Boys: Social Influences and the Gender Gap in Disruptive Behavior," NBER Working Papers 17541.

Black, D., C. Polidano, D. Tabasso and Y.-P. Tseng (2011), "Second Chance Education: Re-Engagement in Education of Early School Leavers," Melbourne Institute of Applied Economic and Social Research.

Black, D., C. Polidano and Y.-P. Tseng (2009), “The Re-engagement in Education of Early School Leavers,” Melbourne Institute of Applied Economic and Social Research.

Borghans, L., A.L. Duckworth, J.J. Heckman and B. ter Weel (2008), “The Economics and Psychology of Personality Traits”, *The Journal of Human Resources*, 43, 4, 972-1059.

Caliendo, M. and R. Hujer (2006), “The microeconomic estimation of treatment effects—An overview”, *AStA Advances in Statistical Analysis*, 90, 1, 199-215

Caliendo M. and S. Kopeinig (2008), “Some Practical Guidance for the Implementation of Propensity Score Matching”, *Journal of Economic Surveys*, 22, 1, 31-72.

Cobb-Clark, D.A. and S. Schurer (2012), “The stability of big-five personality traits”, *Economic Letters*, 115, 11-15.

Cobb-Clark, D.A. and M. Tan (2011), “Noncognitive skills, occupational attainment and relative wages”, *Labour Economics*, 18, 1, 1-13.

Cunha, F. and J.J. Heckman (2007), “The Technology of Skill Formation”, *American Economic Review*, 97, 2, 31-47.

Cunha, F., J.J. Heckman and S. M. Schennach (2010), “Estimating the Technology of Cognitive and Noncognitive Skill Formation”, *Econometrica*, 78, 3, 883-932.

Council of Australian Governments (COAG) (2009), “National Partnership Agreement on Youth Attainment and Transitions”, web page:

< http://www.coag.gov.au/coag_meeting_outcomes/2009-07-02/docs/NP_youth_attainment_transitions.pdf >, as seen on 28 May 2012

Draca, M., S. Bradley, G. Leeves and C. Green (2005), “An investigation of the magnitude of educational disadvantage amongst indigenous and non-indigenous minority groups in Australia”, Working Papers 3030, Lancaster University Management School, Economics Department.

European Commission (2011), "Tackling early school leaving: a contribution to the Europe 2020 Agenda", communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, Brussels.

Fletcher, J.M. (2012) "The Effects of Personality Traits on Adult Labor Market Outcomes: Evidence from Siblings", IZA Discussion Papers no. 6391.

Heckman, J.J. (2011), "Integrating Personality Psychology into Economics", IZA Discussion Paper no. 5950.

Heckman, J. J., H. Ichimura and P. Todd (1997), "Matching as an Econometric Evaluation Estimator", *The Review of Economic Studies*, 65, 2, 261-294.

Heckman, J.J., and Y. Rubinstein (2001), "The Importance of Noncognitive Skills: Lessons from the GED Testing Program," *American Economic Review*, 91(2), 145-149.

Heckman, J.J. J. Stixrud and S. Urzua (2006), "The Effects of Cognitive and Noncognitive abilities on Labor Market Outcomes and Social Behavior", *Journal of Labor Economics*, 24, 3, 411-482.

Hill, L. and C. Jepsen (2007), 'Positive outcomes from poor starts: Predictors of dropping back in', *Economics of Education Review*, 26, 588-603.

Jacob, B.A. (2002), "Where the boys aren't: non-cognitive skills, returns to school and the gender gap in higher education", *Economics of Education Review*, 21, 6, 589-598.

Kalb, G., and S.A. Maani (2007), "The Importance of Observing Early School Leaving and Usually Unobserved Background and Peer Characteristics in Analysing Academic Performance," Melbourne Institute Working Paper Series wp2007n05, Melbourne Institute of Applied Economic and Social Research, The University of Melbourne.

Kalil, A., W. Kanjanapan and A. Sartbayeva, (2010), “Non-cognitive skills and the transition to adulthood for Australian youth.” Working paper presented at the Annual Meeting of the Population Association of America, Dallas, TX.

Lamb, S.P. (1994), “Dropping out of school in Australia: changes in participation and outcomes”, *Youth and Society*, 26, 2, 194-222.

Macleod, F. and P. Lambe (2006), ‘Time invariant and time varying influences on the likelihood of participation in post compulsory formal learning opportunities’, paper presented at symposium *Dimensions of Diversity in University Learning* at the Society for Research into Higher Education Annual Conference 2006.

Maru, Y. and V.H. Chewings (2011), “A Review of Measurement and Causal Analysis of Indigenous Poverty and Disadvantage in Remote Australia”, CSIRO Socio-Economics and the Environment in Discussion (SEED) Working Paper Series, May.

Micklewright, J., M. Pearson, and S. Smith (1990), “Unemployment and Early School Leaving,” *Economic Journal*, 100(400), 163-69.

Oreopoulos, P. (2003), “Do Dropouts Drop Out Too Soon? International Evidence From Changes in School-Leaving Laws,” NBER Working Papers 10155, National Bureau of Economic Research, Inc.

Organisation for Economic Cooperation and Development (OECD) (2010), “Education at a Glance: OECD Indicators”. Web page: < <http://www.oecd.org/edu/eag2010> > as seen on 24 May 2012.

Osborne Groves, M. (2005), “How important is your personality? Labor market returns to personality for women in the US and UK”, *Journal of Economic Psychology*, 26, 827-841.

Rosenbaum, P. R. and D. B. Rubin (1983), “The central role of the propensity score in observational studies for casual effects”, *Biometrika*, 70, 1, 41-55.

Rosenbaum, P.R. and D.B. Rubin (1985), "Constructing a Control Group Using Multivariate Matched Sampling Methods That Incorporate the Propensity Score", *The American Statistician*, 39, 1, 33-38.

Rumberger, R.W. (1987), "High school dropouts: A review of issues and evidence". *Review of Educational Research*, 57, 101-121.

Rumberger, R. and S. Lamb (2003), 'The early employment and further education experiences of high school dropouts: A comparative study of the United States and Australia', *Economics of Education Review*, 22, 353-366.

Ryan, C. (2011), "Year 12 completion and youth transition", NCVET Research Report 2370.
Schmitt, D.P., J. Allik, R.R. McCrae and V. Benet-Martinez (2007), "The Geographic Distribution of Big Five Personality Traits" *Journal of Cross-Cultural Psychology*, 38, 2, 173-212.

Stephens, B.J. (2010), "The Determinants of Labour Force Status among Indigenous Australians", *Australian Journal of Labour Economics*, 13, 3, 287-312.

Traag, T., and R.K. van der Velden (2008), "Early school-leaving in the Netherlands," Research Memoranda 003, Maastricht : ROA, Research Centre for Education and the Labour Market.