Cognitive Skills, Gender and Risk Preferences

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Abstract

In this paper we utilise data from a unique new birth-cohort study to see how the risk preferences of young people are affected by cognitive skills and gender. We find that cognitive ability (measured by the percentile ranking for university entrance at age 18) has no effect on risk preferences measured at age 20. This is in contrast to experimental studies that use IQ measures to proxy cognitive skills. However we do find that gender matters. While young women are significantly *more* likely than young men to assess themselves as being prepared to take risks, women choose to invest significantly *less* when they are confronted with a clearly specified investment decision based on hypothetical lottery winnings. This difference between the impact of gender on risk attitudes and the hypothetical lottery investment suggests that impatience and framing affect young women and men differently.

JEL Classification: D01, D80, J16, J24
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I. Introduction

It is increasingly recognised that individual differences in risk aversion may contribute to explaining observed disparities in economic outcomes. For example, where remuneration in high-paying jobs is linked to bonuses based on a company's performance, individuals who are more risk averse than others may choose not to take such jobs because of the uncertainty. Differences in risk attitudes may also affect individual choices about seeking performance feedback or entering a competitive environment. This has been recognised in work charting gender differences in risky choices, as summarised by Eckel and Grossman (2008) for example.

But do individual attributes such as cognitive ability also affect people's liking for risk? According to several recent studies, the answer is yes. If so, higher cognitive skills are likely to affect individual's economic outcomes indirectly through greater risk-taking behaviour, as well as through the more direct influence of cognitive ability on earnings.

Burks, Carpenter, Goette and Rustichini (2009) suggest that differences in perception of risky options due to cognitive ability may systematically affect individuals' choices. The more complex is an option, the larger the noise. If people of high cognitive skills perceive a complex option more precisely than people with low cognitive skills, they will be more likely to choose riskier options. Using a sample of 1,000 trainee truckers in the US, Burks et al (2009) found that lower cognitive ability - as measured by a nonverbal IQ test involving Raven's matrices - is associated with greater risk aversion and more pronounced impatience.[2] A related study, by Dohmen et al. (2010), used a random sample of around 1,000 adults representative of the German population to show that higher cognitive ability is associated with lower risk aversion and less pronounced impatience.[3] Finally. Booth, Cardona Sosa[a] and Nolen (2011), in an experiment involving 231 college students in the UK, found a small statistically significant association between cognitive ability and the

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[2] These authors collected three measures of cognitive skills: a nonverbal IQ test (Raven's matrices), a test of the ability to plan (the 'Hit 15' task), and a quantitative literacy (or numeracy) test. In their analysis they reported only the impact of IQ but they note that their results were robust to using the common factor obtained from a factor analysis of all three measures.

[3] Dohmen et al. (2010) used two tests of cognitive ability that were similar to certain modules of the Wechsler Adult Intelligence Scale (WAIS). One was the *symbol correspondence test*, which asks subjects to match as many numbers and symbols as possible in 90 seconds according to a given correspondence. The other, the *word fluency test,* gives subjects a timed vocabulary test.

probability of entering a real-stakes experimental lottery. Their measure of IQ was the twenty-minute version of the Raven's matrices.

Our goal in the present study is not to replicate the above studies based on experimental data. Instead, it is to investigate if individual's risk preferences at age 20 are affected by an *alternative* measure of ability that is widely available through surveys (rather than through tests administered by the research team). The ability measure that we utilise is the percentile ranking used for college entrance, measured at age 18. We are also interested in explaining differences in risk preferences between young men and women, controlling for ability. To measure risk preferences we use information from a unique new birth cohort study. At wave 2, conducted in 2008, individuals were asked to self-assess their attitudes to risk. They were also asked to consider how they would invest lottery winnings. While the first question is relatively simple, the second is more complex since it involves a time dimension (the uncertain returns are not realised for two years) as well as a choice of six investment amounts. The relative simplicity of the risk attitudes questions and the complexity of the hypothetical lottery question mean that responses to the latter are more likely to be affected by issues of framing, broad bracketing and the like.

2. The Data Source and Main Variables

2.1 The Data

Our birth-cohort data - from the Youth in Focus Project (YIF) - are unique in providing detailed information about cognitive skills and family welfare histories, as well as individual and household attributes. The birth-cohort comprises young Australians who were aged 18 at the time of the first wave conducted in 2006. Measures of cognitive ability and demographic attributes were obtained from the first wave, while information about risk attitudes was obtained from the second wave carried out in 2008. Individuals were considered out-of-scope if institutionalized, unwell, overseas or in the armed forces.

The YIF Project uses Australian administrative social security records to identify all young people born between October 1987 and March 1988 who appeared in the Centrelink administrative data between 1991 and July 2006 (Breunig et al., 2009; Cobb-Clark, Ryan and

Sartbayeva, forthcoming).[4] A comparison of the number of young adults in these administrative data with census data reveals that over 98 percent of all young people born between October 1987 and March 1988 are represented in the administrative data (Breunig et al., 2009).

A stratified (on welfare history) random sample of young people was selected from the administrative data for interview by phone and through a self-completion questionnaire (SCQ). These data were then matched to the administrative social security data for the youth's family.[5]

2.2 The Dependent Variables

Risk Attitudes

The questions about risk attitudes were asked in the youth self-completion questionnaire in the second wave when individuals were aged 20. Each respondent was first asked: "How do you see yourself: Are you generally a person who is fully prepared to take risks or do you try to avoid taking risks?" Respondents were asked to rank themselves on an 11-point scale from 0 to 10 with 0 being labelled "avoid taking risks" and 10 as "fully prepared to take risks."[6]

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[4] The Australian social security system is nearly universal for families with children. Some payments such as the Child Care Benefit have no income test at all, while others, such as the Family Tax Benefit, are denied only to families in the top quintile of the income distribution. At the other extreme are welfare payments targeted towards low-income parents (mainly single parents) or unemployed individuals, which are also subject to income, asset and/or activity tests. Young people are also in the administrative data if they receive benefits in their own right. However most are in the data because a family member (usually a parent) received a payment at some point between 1993 and 2005 which depended in part on his or her relationship to the youth. These social security records provide high-quality, fortnightly data on payment details for nearly the entire birth cohort.

[5] Following best practice (Groves et al., 2004), the survey team used approach letters, incentive payments, repeated call backs, and Computer Assisted Telephone Interviewing (CATI) to maximize response rates. While response rates differed somewhat across strata, these differences stemmed primarily from differences in contact rates rather than refusal rates (Breunig et al., 2009). Overall, 36.1 percent of young people responded to the survey, 73.1 percent of whom also completed the self-completion questionnaire. More than 96 percent of youths consented to having these survey data linked to their administrative records.

[6] A general risk question of this same form in the German Socio-Economic Panel Study (GSOEP) was experimentally validated by Dohmen et al (2006) and shown to be a reliable measure of an individual's actual propensity to take risks Dohmen et al. (2006) used a pool of 450 subjects with characteristics comparable to the respondents of the GSOEP and conducted real-stakes lottery experiments. Participants in the experiment also answered the same general risk question from the SOEP questionnaire that is used in this paper. The responses turned out to be good predictors of actual risk taking behaviour in the paid experiment.

The mean category for general risks is 5.6 and is significantly lower than the mean of just over 8.1 for financial risk. Clearly respondents are more willing to take financial risks than to take general risks, although the standard deviation of the financial risks variable is slightly larger.

Hypothetical Lottery Investment

In the YIF questionnaire, respondents were next asked to consider the following hypothetical lottery: "Please consider what you would do in the following situation: Imagine that you had won 100,000 dollars in the lottery. Almost immediately after you collect the winnings, you receive the following financial offer from a reputable bank, the conditions of which are as follows: There is the chance to <u>double the money within two years</u>. It is equally possible that <u>you could lose half the amount</u> invested. You have the opportunity to invest the full amount, part of the amount, or reject the offer. What share of your lottery winnings would you be prepared to invest in this financially risky, yet lucrative investment? The subject then ticked a box indicating if s/he would invest A\$100,000, \$80,000, \$60,000, \$40,000, \$20,000, or "Nothing, I would decline the offer."[7]

We ordered categorically the responses to the hypothetical lottery question, such that a zero indicates that none of the \$100,000 is invested whereas a value of 5 indicates that all of the winnings are invested. The mean response is just under 1 (so the mean amount invested is \$20,000) and the SD is just over 1.

A priori we would expect different responses to the risk attitudes and the hypothetical lottery questions. The hypothetical lottery question is not as straightforward as the simple risk attitudes questions because it involves not only a time dimension (the outcome will not be realised until two years hence) and uncertain returns, but also a choice of investment amounts. Moreover, the fact that it is more complex may raise narrow bracketing issues.[8]

Risk aversion and impatience are conflated in responses to this question: patient individuals are more likely to be willing to wait for two years to receive returns than those

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[7] At the time of writing, A\$1was worth US\$0.96.
[8] Rabin and Weizsacker (2009:1508) define narrow bracketing as where 'a decision maker who faces multiple decisions tends to choose an option... without full regard to the other decisions and circumstances that she faces'.

who want their winnings now, ceteris paribus. If the returns were available immediately, then the expected value of the investment is clearly greater than the certainty-equivalent and any risk-neutral individual would invest everything in the lottery. Yet we shall see that individuals observed in the data do not do this, and this is likely to reflect their risk-aversion, their time preference, and whether they narrow or broad bracket the choices inherent in this question.

2.3 Other controls and sample selection issues

We will be examining if risk preferences are correlated with cognitive ability and gender. While responses to cognitive ability ('score'), gender and other controls were collected at wave 1, responses to the risk preferences variables were not collected until wave 2, as noted above. Therefore we wish to see if there are significant differences in the means of explanatory variables across waves 1 and 2.

Before comparing the means across waves, we first define the variable we use to proxy cognitive skills. The variable 'score' is the percentile ranking for university entrance based on respondents' academic performance in grades 11 and 12. This ranking is measured from 30.0 to 99.9.[9] Australian children begin school at age five, complete a further six years of primary school, and leave secondary school after finishing 12th grade. All students completing secondary school with minimum coursework requirements obtain a percentile ranking based on their academic performance in grades 11 and 12. In 2007, the share of women enrolled in university education in Australia was around 55% and gender parity had been achieved by 1987 (Booth and Kee, 2011). We might therefore expect a similar proportion would provide values for the variable 'score'.[10] Indeed, in wave 1, conducted in 2006, the female percentage of the sample with usable responses including score is 57%.

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[9] Australia comprises six states and two territories, and each calculates this ranking slightly differently. Rankings were therefore calibrated to an Australia-wide scale, ranging from 30 to 99.99. Unlike other states and territories, Queensland ranks students on a scale from 1 (highest) to 25 (lowest). Hence we use transformed scores for Queensland students, following Cardak and Ryan (2006), so that they are equivalent to those in other jurisdictions.

[10] Students wishing to go to university register their preferences (in rank order) for specific degree programs with a central administrative agency. University placement offers are made on the basis of students' entrance rankings (see Marks et al., 2001).

Table 1: Comparing means across waves

Variable	Wave 1 usable sample [1]	Subsample that did not respond to general risk question [2]	Subsample that responded to general risk question [3]	Difference [2]-[3]
Dependent variables				
General risk attitude			5.59	
Financial risk attitude			8.12	
Lottery investment			0.98	
Individual attributes				
Score	71.77	68.06	74.74	-6.68***
Female	0.57	0.53	0.61	-0.08***
Age	18.66	18.66	18.66	0
Aboriginal	0.02	0.02	0.01	-0.01
Type of school				
Government	0.56	0.57	0.54	0.03
Catholic	0.24	0.25	0.22	0.03
Parent's highest education attained				
High school	0.06	0.05	0.07	-0.02
Certificate	0.18	0.17	0.18	-0.01
Diploma	0.11	0.1	0.12	-0.02
Bachelor	0.16	0.14	0.17	-0.03*
Other	0.03	0.03	0.03	0
Number of observations	1586	704	882	

Notes: * denotes 10% significance, ** denotes 5% significance and *** denotes 1% significance.

Other demographic variables that we use as controls include whether or not the youth is Aboriginal, the youth's age, and the type of school he or she attended (nondenominational state school, Catholic school, or independent non-Catholic school). We also have information about the mother's highest educational qualifications.[11] We have necessarily made a number of sample restrictions. Our estimating subsample comprises 882 Australian-born children-parent pairs present in both waves with valid information on all control variables (including parental responses to education).[12] We drop all individuals not born in Australia.

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[11] A corresponding parent or guardian (in 96.5 percent of cases the biological mother) was selected from the administrative data for a separate interview. The highest educational qualification of this individual is used in the regressions reported in some specifications in our paper.

[12] The full sample comprises 4079 cases, of whom 2684 were at school for the final exams and 1874 of whom provided valid information on the university entrance ranking (score). The restriction of obtaining valid information on risk attitudes in wave 2 left us with 1032 cases.

Table 1 presents, in columns [1] and [3], the means for the wave 1 sample (1586 cases) and wave 2 sample (882 cases) respectively. Column [2] displays the means for the subsample of wave 1 individuals who did *not* respond at wave 2 (704 cases). The final column gives the difference in means between the responding and non-responding subsamples. It shows that there are statistical differences for only three variables – score, female and having a parent with a university degree.

Since our particular interest is in estimating the association between risk attitudes, and score and gender, we will therefore need to check if sample selection is a problem in our estimation by utilising appropriate sample selection models. To facilitate the interpretation of our results, we use standardized measures of the test scores in our econometric analysis. However, our results are robust if we instead use the non-standardized measures (these estimates are available from the authors on request).

2.3.2 Identification

The YiF dataset contains a set of variables proxying respondents' 'sense of control'. [13] According to the psychology literature (see for example Rotter, 1966), individuals are characterised by attitudes or beliefs about the relationship between their own behaviour and its consequences. Those individuals believing that their own efforts affect life's outcomes have what is described as an internal locus of control of 'self-efficacy', whereas those who believe that external factors such as 'luck' affect life's outcomes have an external locus of control (see Gatz and Karel, 1993). These variables in YiF have been used by Barón and Cobb-Clark (2010) to show that young people with a more 'internal locus of control' have a higher probability of finishing secondary school and, conditional on completion, meeting the requirements to obtain a university entrance rank. (Check correlation between Score and these variables.)

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[13] The questions designed to elicit individuals beliefs about control include the following, all of which are given on a four point scale ranging 1 (strongly disagree), 2 (Disagree), 3 (Agree), 4 (Strongly agree):
1. There is really no way I can solve some of the problems I have.
2. Sometimes I feel that I'm being pushed around in life.
3. I have little control over the things that happen to me.
4. I can do just about anything I set my mind to.
5. I often feel helpless in dealing with the problems of life.
6. What happens to me in the future mostly depends on me.
7. There is little I can do to change many of the most important things in my life.

In our analysis we use these wave 1 'sense of control' variables as determinants of the probability of responding to the self-completion questionnaire (SCQ) in wave 2. Our rationale for so doing is that individuals with a low 'sense of control' are likely to be less motivated to bother completing/returning the SCQ (since they think nothing they do will have any effect). We also include the predetermined variable taking the value one if the parent read to the child at night and zero otherwise.[14] Pyschologists believe that such an activity makes children feel more connected, and this might contribute to the probability an individual will return the SCQ.

3. The Results

We estimate ordered probit models of the determinants of general risk attitudes, of financial risk attitudes, and of the amount invested in the hypothetical risky financial investment. For each of these three risk outcomes, we estimated ordered probits with and without sample selection. These pairs of estimates are presented in Table 2 for each outcome. The full set of estimates for the selection equations is presented in Appendix Table A.1.

Excluded from the risk equations but included in the sample-selection equations are the variables measuring an individual's *sense of control* as well as the dummy variable indicating *being read to at night* as a child. None of these variables is correlated with risk attitudes but some of them are significantly correlated with the probability of responding to the wave 2 questionnaire. In all the selection equations, *feeling helpless in dealing with the problems of life* significantly decreases the probability of response and *what happens to me in the future mostly depends on me* significantly increases the probability. Also *being read at night often or very often* increases the probability of response significantly.

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[14] When you were younger did your parents read to you at night? (1=Every night, 2=Often, 3=Sometimes, 4=Not very often, 5=Not at all).

Table 2. Risk Preferences: Ordered probit estimates with and without sample selection.

	General Risk		Financial Risk		Lottery Investment	
	Ordered probit	Ordered probit with selection	Ordered probit	Ordered probit with selection	Ordered probit	Ordered probit with selection
	[1]	[2]	[3]	[4]	[5]	[6]
Standardised score	0.057 (0.037)	0.052 (0.047)	-0.016 (0.037)	-0.032 (0.043)	0.053 (0.039)	0.037 (0.051)
Female	0.267*** (0.071)	0.264*** (0.075)	0.48*** (0.072)	0.472*** (0.076)	-0.376*** (0.077)	-0.389*** (0.079)
Age	-0.042 (0.19)	-0.043 (0.191)	-0.119 (0.19)	-0.141 (0.19)	0.291 (0.206)	0.295 (0.206)
Aboriginal	-0.429 (0.297)	-0.425 (0.299)	-0.266 (0.299)	-0.261 (0.299)	0.346 (0.312)	0.361 (0.313)
Type of school						
Government	0.131 (0.087)	0.133 (0.088)	0.184** (0.087)	0.184** (0.087)	-0.126 (0.094)	-0.124 (0.096)
Catholic	0.073 (0.102)	0.077 (0.106)	0.095 (0.103)	0.102 (0.105)	-0.074 (0.11)	-0.07 (0.114)
Parent's highest education						
High school	0.136 (0.138)	0.129 (0.143)	0.214 (0.139)	0.199 (0.142)	-0.337** (0.152)	-0.355** (0.156)
Bachelor	0.01 (0.099)	0.007 (0.101)	0.241** (0.1)	0.247** (0.101)	-0.144 (0.108)	-0.16 (0.109)
Certificate	0.102 (0.096)	0.099 (0.097)	0.079 (0.096)	0.073 (0.097)	-0.107 (0.104)	-0.108 (0.104)
Diploma	0.101 (0.112)	0.098 (0.114)	0.081 (0.112)	0.072 (0.114)	-0.124 (0.122)	-0.135 (0.123)
Other	0.196 (0.218)	0.194 (0.218)	0.413* (0.221)	0.409* (0.221)	-0.003 (0.235)	-0.006 (0.235)
Athro	-	-0.036 (0.236)	-	-0.089 (0.195)	-	-0.135 (0.266)
Log-likelihood	-1847.293	-2850.852	-1848.825	-2860.942	-1166.09	-2175.304
Pseudo R-squared	0.0068	-	0.0155	-	0.0143	-
Observations	882	1586	882	1586	882	1586

Notice from Table 2 that there is little difference in the magnitude of the estimated coefficients and the standard errors across the selection and non-selection ordered probit models. Moreover, observe that the estimated rho from the sample selection model – indicating the degree of correlation between unobservables in the two equations – is not statistically significant.[15] Hence the estimates in the first column in each pair of outcomes represent our preferred specification.

Next, we consider each outcome in more detail, beginning with general risk attitudes. First consider the ordered probit estimates presented in column [1] of Table 2. Individuals with higher scores are more likely to be prepared to take *general* risks, although the impact is small and is not statistically significant. It is interesting that the girls are significantly more prepared to take risks than boys. None of the other controls is statistically significant. Indeed, the only significant variable is female. Next we turn to the ordered probit estimates of the willingness to take financial risks, displayed in columns [3] and [4] of Table 2. Cognitive skills have no statistically significant correlation with willingness to take financial risks. Again young women are more willing to take financial risks than young men, ceteris paribus. Individuals whose responding parent had a degree are more likely to take financial risks, as are those youths who attended state schools.

The YiF survey not only asked respondents about general risk attitudes but also about their risk attitudes in a number of specific domains. Elicited using the same 11-point scale, these questions covered: driving risk; financial risk; leisure risk; occupational risk; health risk; and faith in others risk.[16] We present in Appendix Table A.3 a comparison of

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[15] 'Athrho' is defined as usual as:

$$\operatorname{atanh} \rho = \frac{1}{2} \ln\left(\frac{1+\rho}{1-\rho}\right)$$

Thus, if 'rho' (correlation between error terms of the two regressions) is close to zero, so is 'athrho' and there's no evidence of sample selection.

[16] The partial correlation coefficients between these risk domains are: general-driving: 0.2914; general-financial: 0.3854; general-leisure: 0.5488; general-occupational: 0.4480; general-health: 0.3581; general-faith in others: 0.3618; driving-financial: 0.4005; driving-leisure: 0.3065; driving-occupational: 0.3882; driving-health: 0.4823; driving-faith in others: 0.2424; financial-leisure: 0.3882; financial-occupational: 0.3847; financial-health: 0.3853; financial-faith in others: 0.2926; leisure-occupational: 0.4506; leisure-health: 0.2857; leisure-faith in others: 0.3145; occupational-health: 0.4170; occupational-faith in others: 0.3274; and health-faith in others: 0.3631

estimates for all risk categories. In summary, across all risk domains young women were significantly more likely than young men to report a greater willingness to take risks. The biggest effect, however, was found for financial risk. Notice also that there was no statistically significant correlation between *score* and willingness to take any form of risk.

Columns [5] and [6] of Table 2 report ordered probit estimates of the willingness to invest a proportion of the hypothetical lottery winnings in a risky financial investment.[17] Cognitive ability, as proxied by *score*, has an economically and statistically insignificant impact on the amounts placed in the risky financial investment.

Being female is again statistically significant but notice that the sign is now negative: young women are *less* willing to use their lottery winnings to make the risky financial investment than young men. The other demographic variables have no effect, with the exception of parental highest educational level being high school, which is negatively correlated.

As noted earlier, we expected different responses to the risk attitudes and the hypothetical lottery questions. This was for several reasons. First, the simplicity of the risk attitudes questions and the complexity of the hypothetical lottery question mean that responses to the latter are more likely to be affected by issues of framing, broad bracketing and the like. Second, risk aversion and impatience are conflated in responses to the hypothetical lottery question: patient individuals will be more willing to wait for two years to receive returns than those who want their winnings now. If the returns were available immediately, then the expected value of the investment is clearly greater than the certainty-equivalent and any risk-neutral individual would invest everything in the lottery. Yet we see that young women observed in the data are less likely than young men to do this, in spite of the fact that they were *more* likely than young men to be willing to take general and financial risks (a finding that is robust across all the risk domains – see Appendix Table A.3). This difference between the impact of gender on risk attitudes and the hypothetical lottery investment suggests that impatience and framing affects young women and men differently.

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[17] See Donkers, Bas, Bertrand Melenberg and Arthur Van Soest (2001) for a classic paper estimating risk attitudes from a lottery.

One striking aspect of our results is that – for the risk attitudes questions - we find a statistically significant gender effect of a different sign to that found in some of the literature. As summarized in Eckel and Grossman (2008), the majority of experimental studies have found that women are more risk averse than men, although Eckel and Grossman (2008) also note that 'there is enough counter-evidence to warrant caution. For example, both field and lab studies typically fail to control for knowledge, wealth, marital status and other demographic factors that might bias male/female differences in risky choices.' These are the sorts of attributes that we have been able to control for in our analysis using the YIF dataset.

In order to provide an easy interpretation of the magnitude of the estimated coefficients, we also estimated all the non-selection specifications in Table 2 by ordinary least squares (OLS). The ordered probit and OLS results are compared in Appendix Table A.2. There it can be seen that, using OLS estimation, the female dummy variable is no longer statistically significant for general risk, but that women report themselves one category higher than men for willingness to take financial risks. For the lottery investment, the OLS estimates show that women invest less than comparable men by around A$3,800. However, the appropriate estimation method remains ordered probit.

4. Robustness

The inclusion of *score* in the analysis reported above reduced our estimating sample from 1152 cases with usable responses for risk and other controls to 882 cases. As a check on the robustness of the estimated coefficients to female gender presented in Table 2, we next report the results when we drop *score* from the analysis and re-estimate on the sample of 1152 cases. Our results are given in Table 3.

Table 3: Ordered Probit Estimates, full sample with usable risk responses

Dependent variable	[1] General risk	[2] Financial risk	[3] Lottery
Female	**0.187***(0.061)**	**0.414***(0.1)**	**-0.342*** (0.066)**
Log-likelihood	-2431.851	-2457.864	-1522.414
Pseudo R-squared	0.0019	0.009	0.0086
Observations	1152	1152	1152

Notes: Standard errors in parenthesis; *, ** and *** denote 10%, 5% and 1% levels of significance respectively.

Notice from Column [1] that, in this larger sample including cases with missing score, women remain significantly more likely than men to report willingness to take general risks. However the magnitude of this coefficient is around two-thirds of its original size. From the second column, we see that women are as likely in this sample to take financial risks as in the slightly smaller sample represented in Table 2. Finally, note from the third column that women remain less likely to invest lottery winnings. Thus our gender findings are robust across the subsamples.

6. Conclusion

In this paper we utilised data from a unique new birth-cohort study, the *Youth in Focus* Project (YIF), to see how the risk preferences of young people are affected by cognitive skills and gender. Our measure of cognitive skills was the percentile ranking used for Australia-wide university entrance at age 18. We found that cognitive ability has no effect on risk preferences measured at age 20. This is in contrast to experimental studies that use IQ measures to proxy cognitive skills.

However gender was found to have a statistically significant effect on young people's risk preferences. While young women are significantly *more* likely than young men to assess themselves as being prepared to take risks across all domains, women choose to invest significantly *less* when they are confronted with a clearly specified investment decision based on hypothetical lottery winnings.

The relative simplicity of the risk attitudes questions and the complexity of the hypothetical lottery question mean that responses to the latter are more likely to be affected by issues of framing, broad bracketing and the like. Moreover, risk aversion and impatience are conflated in responses to the hypothetical lottery question: patient individuals will be more willing to wait for two years to receive returns than those who want their winnings now. If the returns were available immediately, then the expected value of the investment is clearly greater than the certainty-equivalent and any risk-neutral individual would invest everything in the lottery. Yet we see that young women observed in the data are less likely than young men to do this, in spite of the fact that they were *more* likely than young men to assess themselves as willing to take risks across all the risk domains. This difference between the impact of gender on risk attitudes and the hypothetical lottery investment suggests that impatience and framing affects young women and men differently.

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Table A1. Risk Preferences: Ordered probit estimates with and without sample selection.

	General Risk		Financial Risk		Lottery Investment	
	Ordered probit	Ordered probit with selection	Ordered probit	Ordered probit with selection	Ordered probit	Ordered probit with selection
	[1]	[2]	[3]	[4]	[5]	[6]
Standardised score	0.057 (0.037)	0.052 (0.047)	-0.016 (0.037)	-0.032 (0.043)	0.053 (0.039)	0.037 (0.051)
Female	0.267*** (0.071)	0.264*** (0.075)	0.48*** (0.072)	0.472*** (0.076)	-0.376*** (0.077)	-0.389*** (0.079)
Age	-0.042 (0.19)	-0.043 (0.191)	-0.119 (0.19)	-0.141 (0.19)	0.291 (0.206)	0.295 (0.206)
Aboriginal	-0.429 (0.297)	-0.425 (0.299)	-0.266 (0.299)	-0.261 (0.299)	0.346 (0.312)	0.361 (0.313)
Type of school						
Government	0.131 (0.087)	0.133 (0.088)	0.184** (0.087)	0.184** (0.087)	-0.126 (0.094)	-0.124 (0.096)
Catholic	0.073 (0.102)	0.077 (0.106)	0.095 (0.103)	0.102 (0.105)	-0.074 (0.11)	-0.07 (0.114)
Parent's highest education						
High school	0.136 (0.138)	0.129 (0.143)	0.214 (0.139)	0.199 (0.142)	-0.337** (0.152)	-0.355** (0.156)
Bachelor	0.01 (0.099)	0.007 (0.101)	0.241** (0.1)	0.247** (0.101)	-0.144 (0.108)	-0.16 (0.109)
Certificate	0.102 (0.096)	0.099 (0.097)	0.079 (0.096)	0.073 (0.097)	-0.107 (0.104)	-0.108 (0.104)
Diploma	0.101 (0.112)	0.098 (0.114)	0.081 (0.112)	0.072 (0.114)	-0.124 (0.122)	-0.135 (0.123)
Other	0.196 (0.218)	0.194 (0.218)	0.413* (0.221)	0.409* (0.221)	-0.003 (0.235)	-0.006 (0.235)
Selection model						
There is really no way I can solve some of the problems I have (Base: Strongly disagree)						
Disagree		-0.027 (0.097)		-0.029 (0.098)		-0.01 (0.098)
Agree		0.052 (0.132)		0.052 (0.132)		0.061 (0.131)
Strongly agree		-0.022 (0.278)		-0.037 (0.277)		-0.033 (0.276)

Sometimes I feel that I'm being pushed around in life (Base: Strongly disagree)

Disagree	0.01 (0.114)	0.012 (0.114)	0.017 (0.114)
Agree	0.006 (0.127)	0.019 (0.127)	0.04 (0.131)
Strongly agree	-0.174 (0.266)	-0.193 (0.265)	-0.166 (0.266)

I have little control over the things that happen to me (Base: Strongly disagree)

Disagree	0.065 (0.097)	0.058 (0.097)	0.053 (0.097)
Agree	0.087 (0.151)	0.064 (0.15)	0.056 (0.151)
Strongly agree	0.178 (0.358)	0.147 (0.357)	0.195 (0.362)

I can do just about anything I set my mind to (Base: Strongly disagree)

Disagree	0.5 (0.322)	0.531* (0.322)	0.475 (0.333)
Agree	0.426 (0.293)	0.451 (0.292)	0.391 (0.3)
Strongly agree	0.384 (0.291)	0.403 (0.288)	0.346 (0.296)

I often feel helpless in dealing with the problems of life (Base: Strongly disagree)

Disagree	-0.127 (0.113)	-0.129 (0.113)	-0.131 (0.113)
Agree	-0.2 (0.142)	-0.204 (0.139)	-0.213 (0.139)
Strongly agree	-0.138 (0.233)	-0.077 (0.234)	-0.084 (0.232)

What happens to me in the future mostly depends on me (Base: Strongly disagree)

Disagree	0.682** (0.34)	0.657* (0.338)	0.664** (0.338)
Agree	0.608** (0.291)	0.592** (0.289)	0.618** (0.292)
Strongly agree	0.719** (0.29)	0.689** (0.289)	0.725** (0.392)

There is little I can do to change many of the most important things in my life (Base: Strongly disagree)

Disagree	-0.085 (0.092)	-0.073 (0.092)	-0.07 (0.092)
Agree	0.056 (0.145)	0.046 (0.144)	0.057 (0.145)
Strongly agree	0.38 (0.347)	0.408 (0.349)	0.362 (0.346)

When you were younger did your parents read to you at night? (Base: Every night)

Often	-0.3*** (0.107)	-0.287*** (0.104)	-0.287*** (0.104)
Sometimes	-0.342*** (0.113)	-0.345*** (0.112)	-0.34*** (0.113)
Not very often	-0.126 (0.138)	-0.122 (0.138)	-0.12 (0.138)

Not at all		-0.253 (0.174)		-0.256 (0.173)		-0.241 (0.177)
Standardised score		0.196*** (0.035)		0.19*** (0.035)		0.189*** (0.035)
Female		0.153** (0.069)		0.158** (0.069)		0.161** (0.069)
Age		0.154 (0.184)		0.108 (0.184)		0.106 (0.184)
Aboriginal		-0.071 (0.258)		-0.079 (0.258)		-0.081 (0.258)
Type of school						
Government		-0.136 (0.087)		-0.138 (0.087)		-0.151* (0.088)
Catholic		-0.23** (0.1)		-0.229** (0.1)		-0.244** (0.101)
Parent's highest education						
High school		0.175 (0.143)		0.17 (0.143)		0.171** (0.142)
Bachelor		0.055 (0.099)		0.07 (0.099)		0.071 (0.099)
Certificate		0.097 (0.092)		0.092 (0.092)		0.102 (0.092)
Diploma		0.145 (0.111)		0.139 (0.111)		0.139 (0.111)
Other		-0.053 (0.209)		-0.064 (0.209)		-0.06 (0.209)
Constant		-3.481 (3.434)		-2.634 (3.435)		-2.581 (3.441)
Athro	-	-0.036 (0.236)	-	-0.089 (0.195)	-	-0.135 (0.266)
Log-likelihood	-1847.293	-2850.852	-1848.825	-2860.942	-1166.09	-2175.304
Pseudo R-squared	0.0068	-	0.0155	-	0.0143	-
Observations	882	1586	882	1586	882	1586

Table A2. Risk Preferences: Ordered probit and OLS estimates.

	General Risk		Financial Risk		Lottery Investment	
	Ordered probit	OLS	Ordered probit	OLS	Ordered probit	OLS
	[1]	[2]	[3]	[4]	[5]	[6]
Standardised score	0.057 (0.037)	0.121 (0.075)	-0.016 (0.037)	-0.016 (0.077)	0.053 (0.039)	0.037 (0.051)
Female	0.267*** (0.071)	0.55 (0.145)	0.48*** (0.072)	1.02*** (0.148)	-0.376*** (0.077)	-0.389*** (0.079)
Age	-0.042 (0.19)	-0.076(0.191)	-0.119 (0.19)	-0.238 (0.396)	0.291 (0.206)	0.295 (0.206)
Aboriginal	-0.429 (0.297)	-0.425 (0.299)	-0.266 (0.299)	-0.647 (0.616)	0.346 (0.312)	0.361 (0.313)
Type of school						
Government	0.131 (0.087)	0.133 (0.088)	0.184** (0.087)	0.395** (0.181)	-0.126 (0.094)	-0.124 (0.096)
Catholic	0.073 (0.102)	0.077 (0.106)	0.095 (0.103)	0.231 (0.214)	-0.074 (0.11)	-0.07 (0.114)
Parent's highest education						
High school	0.136 (0.138)	0.129 (0.143)	0.214 (0.139)	0.439 (0.288)	-0.337** (0.152)	-0.355** (0.156)
Bachelor	0.01 (0.099)	0.007 (0.101)	0.241** (0.1)	0.5** (0.207)	-0.144 (0.108)	-0.16 (0.109)
Certificate	0.102 (0.096)	0.099 (0.097)	0.079 (0.096)	0.207 (0.2)	-0.107 (0.104)	-0.108 (0.104)
Diploma	0.101 (0.112)	0.098 (0.114)	0.081 (0.112)	0.225 (0.234)	-0.124 (0.122)	-0.135 (0.123)
Other	0.196 (0.218)	0.194 (0.218)	0.413* (0.221)	0.825** (0.455)	-0.003 (0.235)	-0.006 (0.235)
Log-likelihood	-1847.293	-	-1848.825	-	-1166.09	-
Pseudo R-squared	0.0068	0.0164	0.0155	0.0554	0.0143	0.0317
Observations	882	882	882	882	882	882

Table A3. Risk Preferences: Ordered probit estimates.

	Financial risk	General risk	Driving risk	Leisure risk	Occupational risk	Health risk	Faith on others risk	Lottery investment
Standardised score	-0.016 (0.037)	0.057 (0.037)	0.029 (0.037)	0.003 (0.037)	-0.051 (0.037)	0.008 (0.037)	-0.001 (0.037)	0.053 (0.039)
Female	0.48*** (0.072)	0.267*** (0.071)	0.406*** (0.072)	0.452*** (0.072)	0.183** (0.071)	0.308*** (0.071)	0.16** (0.071)	-0.376*** (0.077)
Age	-0.119 (0.19)	-0.042 (0.19)	-0.304 (0.193)	0.049 (0.19)	-0.075 (0.19)	0.136 (0.191)	-0.059 (0.189)	0.291 (0.206)
Aboriginal	-0.266 (0.299)	-0.429 (0.297)	0.102 (0.306)	-0.013 (0.297)	-0.129 (0.3)	0.177 (0.3)	0.339 (0.3)	0.346 (0.312)
Type of school								
Government	0.184** (0.087)	0.131 (0.087)	0.084 (0.088)	0.079 (0.086)	-0.059 (0.087)	0.017 (0.087)	0.025 (0.086)	-0.126 (0.094)
Catholic	0.095 (0.103)	0.073 (0.102)	-0.073 (0.103)	-0.008 (0.102)	-0.16 (0.102)	-0.05 (0.103)	-0.073 (0.102)	-0.074 (0.11)
Parent's highest education								
High school	0.214 (0.139)	0.136 (0.138)	0.161 (0.14)	-0.034 (0.138)	0.096 (0.138)	0.139 (0.139)	-0.219 (0.138)	-0.337** (0.152)
Bachelor	0.241** (0.1)	0.01 (0.099)	0.13 (0.101)	-0.031 (0.099)	0.024 (0.099)	0.073 (0.1)	-0.048 (0.099)	-0.144 (0.108)
Certificate	0.079 (0.096)	0.102 (0.096)	0.032 (0.097)	-0.039 (0.096)	0.13 (0.096)	0.078 (0.097)	-0.137 (0.096)	-0.107 (0.104)
Diploma	0.081 (0.112)	0.101 (0.112)	-0.163 (0.113)	-0.046 (0.112)	-0.118 (0.112)	-0.149 (0.113)	-0.019 (0.112)	-0.124 (0.122)
Other	0.413* (0.221)	0.196 (0.218)	0.224 (0.221)	0.305 (0.217)	0.236 (0.217)	0.196 (0.218)	0.22 (0.217)	-0.003 (0.235)
Log-likelihood	-1848.825	-1847.293	-1836.429	-1949.949	-1983.111	-1935.686	-2028.286	-1166.09
Pseudo R-squared	0.0155	0.0068	0.0124	0.0119	0.004	0.0066	0.0035	0.0143
Observations	882	882	882	882	882	882	882	882