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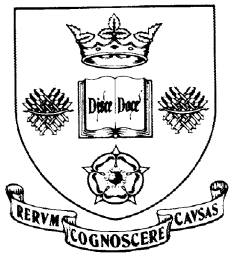

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Abstract: We explore the relationship between willingness to take financial risk and the probability of taking out a loan for educational purposes as well as the influence of risk attitudes on the size of the loan using data drawn from the U.S. Survey of Consumer Finances. The findings suggest a positive relationship between individuals' willingness to take financial risk and the probability of taking out a loan for educational purposes. Similarly, individuals' willingness to take financial risk appears to be an important determinant of the size of the educational loan. The findings suggest that non-white individuals and individuals from less wealthy backgrounds are less likely to finance education through loans which could potentially increase inequalities in education and income if such individuals are deterred from investing in human capital.

Key Words: Educational Loans; Risk Aversion.

JEL Classification: I22; I23.

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I. Introduction and background

Over the last forty years, in a range of countries there has been an increase in the number of individuals attending post-secondary school education and, in particular, attending university (e.g. the UK, France, Italy and Spain). For example, according to Greenaway and Haynes (2007), the number of students attending university in the UK has increased from 400,000 in the early 1960's to more than 2 million in 2000. At the same time, some OECD countries such as Australia, New Zealand, the UK and the U.S. have moved away from providing public higher education towards private higher education by increasing university fees.[1]

The U.S. was one of the first countries to move away from public provision of higher education by increasing the enrollment fees to attend university. In 1992, the Higher Education Reauthorization Act created the Stafford Unsubsidized loan program in the U.S., which gave access to educational loans to all students regardless of their economic background.[2] This Act created a new possibility for the financial markets in the U.S. to increase the rate of educational loans taken out. To be specific, before 1992, the Federal Stafford loan program for education offered a subsidized loan for those students with financial needs (i.e. low income families). Since 1992, those students without financial needs were entitled to apply to the unsubsidized loan program. Both types of loans have similar terms and conditions, but the subsidized loan only applies interest repayments once the student graduates from university. At the same time, banks and financial institutions started to offer private educational loans with similar terms and conditions to those offered by the unsubsidized Stafford loan.

Chapman (2006) reviews the international reform of higher education provision and argues that, in general, student loans do not offer total protection to borrowers and, in

[1] According to Canton and Blom (2004), this may be due to the recent increase in international labour mobility making it less attractive for governments to invest in higher education if future benefits to education are to be received by other countries.

[2] From 1965 to 1992, access to educational loans was subsidized and restricted to students from low income families.

particular, to those borrowers who are not as successful in the labour market as expected and who receive low levels of income. In a similar vein, Chapman and Ryan (2005) study the effects of the introduction of income contingent loans in Australia.[3] They conclude that higher education participation increased for individuals from middle income families and for females, but there was no change in the participation rate of individuals from low income families. More recently, Chapman and Sinning (2011) use data from the German Microcensus to explore the effects of a hypothetical income contingent loan system in Germany. They conclude that income contingent loans would be financially feasible even for low income graduates.

Most of the existing studies in this area have focused on the effects of replacing grants with loans for education. For example, Swarthout (2006) analyses U.S. survey data to explore whether student loans of large amounts influence students' future occupations. He concludes that taking out a loan for education could influence the career choice of the students. Similarly, Minicozzi (2005) using U.S. data shows how educational debt affects job decisions, making students more likely to choose jobs with initially high wages but with lower wage growth.

In this paper, in contrast to much of the existing literature, we focus on the determinants, rather than the implications, of taking out a loan for educational purposes. We focus on one particular influence on the decision to take out such a loan, namely attitudes towards risk. It is apparent that increasing fees for higher education can have important consequences for students and their families as this could increase the financial pressures associated with attending university and, hence, risk aversion may play an important role in the decision to attend university (Greenway and Haynes, 2007). Furthermore, individuals belonging to wealthy families may find it easier to pay university fees than students from less

[3] Educational loans can be classified into two groups according to the repayment method: mortgage type loans and income contingent loans. Mortgage type loans offer a fixed repayment over a set time period while income contingent loans offer a repayment system which varies according to the individual's future income.

wealthy families, which could increase future educational and wage inequalities. In order to reduce potential inequalities in access to university, income contingent loans are designed to facilitate access to higher education for everyone, offering a repayment system, which varies according to the individual's future income. However, some individuals are more willing than others to take financial risks and this could be an important barrier when deciding to take out a loan to finance investment in university education. Taking out a loan for education involves risk since individuals are uncertain about whether they will be able to meet the future payments as well as being uncertain about their aptitude for studying at university. For this reason, understanding how risk attitudes affect the decision of whether to take out a loan for education represents an important contribution to the economics of education literature as well as being of potential interest to policy-makers.

The shortage of literature in this area is somewhat surprising although one possible explanation could relate to the difficulty of finding a suitable measure of risk attitudes. One exception is Eckel et al. (2007) who explore the relationship between debt aversion and educational loans using experimental techniques. They analyse the role of individuals' attitudes towards debt when deciding to take out a loan for post-secondary education in Canada. The findings suggest that debt aversion is not a barrier to taking out loans for education; however, those individuals who have had any previous experience with debt (i.e. debt use) are found to be more likely to take out an educational loan.[4] Barr and Crawford (1998) argue that it is important to understand whether debt averse individuals are the group most affected by 'high' university fees, which could make investment in human capital even more difficult for them. A lack of information could be another important negative factor when deciding to take out a loan for education. Booij et al. (2008) develop an experiment

[4] The variable debt aversion includes questions designed to measure the person's attitude towards borrowing such as whether the individuals have credit cards and whether the individuals would borrow from a financial institution or from credit cards for unexpected expenditure. Debt use is measured by whether the individual has ever been behind in a bill, loan, rent or mortgage repayment, whether the individual has ever sold an asset to pay a debt and whether the individual's spending is larger than the individual's income.

with Dutch students in order to understand whether having better information about educational loans increases the number of students taking out a loan to attend university. Using an instrumental variable approach, they find that improving information about the conditions of educational loans, such as the interest rate and the repayment period, does not have any impact on the take-up rate.[5]

The aim of the empirical analysis presented in this paper is to explore the relationship between individuals' willingness to take financial risks and the probability of taking out an educational loan as well as the size of the loan using data from the U.S. Survey of Consumer Finances. The results will help us to understand whether risk averse individuals are less willing to take out a loan for educational purposes than less risk averse individuals, which may increase their probability of having lower levels of educational attainment and, hence, potentially influences their future labour market outcomes. Indeed, our empirical findings suggest that willingness to take financial risks is positively associated with the probability of taking out a loan for educational purposes as well as the size of the loan.

III. Data

We analyse the U.S. Survey of Consumer Finances (SCF) developed by the U.S. Federal Reserve Board since 1983. This cross-section survey contains detailed information about the balance sheet, pension, income, demographic characteristics and the use of financial institutions by U.S. families. To be specific, the SCF contains questions related to educational loans. In the 1992, 1995, 1998, 2001 and 2004 cross-section surveys, the head of the household was asked the following questions: *Not counting credit cards or loans you may have told us about, do you have any loan for educational expenses? If so, how much was*

[5] Similarly, Oosterbeek and Broek (2009) use data from the same survey among Dutch students to analyse the low take-up rate of student loans in the Netherlands. They conclude that factors such as the subjective discount rate, earnings prospects and students' risk attitudes have limited explanatory power in explaining the low take-up rate of student loans in the Netherlands.

borrowed not counting the finance charges?[6] The responses to these questions yield detailed information not only about whether the individual has taken out a loan to finance education but also about the size of the loan.

The SCF also contains the following question related to individual's willingness to take financial risk which is answered by the head of household: *which of the following statements comes closest to describing the amount of financial risk that you are willing to take when you save or make investments? Take substantial financial risks expecting to earn substantial returns; Take above average financial risks expecting to earn above average returns; Take average financial risks expecting to earn average returns; Or not willing to take any financial risks.*[7]

We use the responses to this question to create a three point risk attitudes index as follows:

$$r_i = \begin{cases} 0 \text{ if they are not willing to take any financial risks} & 28.28\% \\ 1 \text{ if they are willing to take average financial risks for average returns} & 47.76\% \\ 2 \text{ if they are willing to take above average/substantial finanacial risks for above average/substantial returns} & 23.96\% \end{cases}$$

Thus, the index is increasing in willingness to take financial risk such that if the individual, *i*, is not willing to take any financial risk, the risk attitudes index takes the value of zero, whilst if the individual is willing to take above average financial risk for above average returns or is willing to take substantial financial risk for substantial returns, the risk attitudes index takes the highest value of 2.[8]

Therefore, we exploit the responses to these questions in order to explore the relationship between the probability of taking out an educational loan and the individual's

[6] Unfortunately, the SCF data set does not provide information about the type of loan (i.e. federal or private loan) or the conditions of the loan.

[7] This measure of risk attitudes has been used extensively in the economics literature. See, for example, Shaw (1996), Schooley and Worden (1996), Grabble and Lytton (2001), Finke and Huston (2003) and Hanna and Lindamood (2004).

[8] Due to the small sample size we collapse the top two categories by creating a three point risk aversion index taking 'not willing to take any financial risk' as the base category.

willingness to take financial risk, as well as the relationship between the amount borrowed for educational expenses and willingness to take financial risk. The sample is restricted to those individuals who are in higher education aged between 18 and 65 years old, yielding a total of 1,740 observations.[9] Given the nature of the data, reverse causality may be a potential problem related to the analysis. Attitudes towards risk may be associated with factors such as education, income and wealth. To reduce the potential for reverse causality, we restrict the sample to those individuals who are currently in higher education as we are interested in the relationship between individuals' willingness to take financial risk and the probability of taking out an educational loan before the completion of the investment in education takes place, as completion of the investment could potentially influence individuals' willingness to take financial risk.[10]

IV. Attitudes towards Risk and the Probability of taking out a Loan for Education

Methodology

We explore the relationship between the probability of taking out a loan for education, which is measured by a dummy variable,[11] and the individual's willingness to take financial risk with a probit model as follows:

$$Loan_i^* = x_i\beta_i + \varepsilon_i,\ \varepsilon_i \sim N(0,1) \quad (1)$$

where $Loan_i^*$ denotes the latent variable for the propensity to take out a loan for education, x_i represents a set of explanatory variables and ε_i denotes the error term, which is normally distributed. To be specific, x_i includes the risk attitudes index, r_i, and socio-demographic

[9] It is apparent from the question that it could be the case that individuals took out a loan for the education of their children or even spouse rather than for their own education. In this case, however, we would argue that the analysis still provides information on the relationship between incurring debt for educational purposes and attitudes towards risk.

[10] In the SCF survey, the question relating to educational loans is placed before the risk attitudes question. Therefore, it is important to highlight the potential limitations of the variables and potential issues of reverse causality. For example, some individuals could indicate that they are willing to take financial risk as self-justification for having taken out a loan for education.

[11] The loan variable takes the value of 1 if the individual has a loan (805 observations) and takes the value of 0 if the individual does not have a loan (935 observations).

characteristics such as age, male, white, married, the number of children of the respondent and household size. Unfortunately, the SCF data set does not include detailed information about family background, such as the educational attainment or occupation of the individual's parents, however, we try to capture the possible effects of family background by including in the set of controls the natural logarithm of the total net wealth of the household.[12] We also include in the set of controls whether the respondent (i.e. the student) is working and year dummy variables. Table 1 in the Appendix presents summary statistics of the key variables employed in our econometric analysis.[13]

Following Greene (2003), we model the probability of taking out a loan for education with a probit model where the probability of observing $Loan = 1$ is given by:

$$P(Loan_i = 1) = P(Loan_i > 0) = P(x_i\beta + \varepsilon_i > 0) = P(\varepsilon_i > -x_i\beta) = \Phi(x_i\beta) \quad (2)$$

Results

Tables 2 and 3 present the marginal effects from the probit analysis of the probability of taking out a loan for education. Our findings in Table 2 suggest that willingness to take financial risk is positively related to the probability of taking out a loan for education. As a result of a one-unit increase in the risk aversion index, the probability of taking out a loan for education is increased by around 5.5 percentage points.[14] Similarly, being male, white or married are all positively related to the probability of taking out a loan for education. Males have a 9 percentage points higher probability of taking out a loan for education than females; white individuals have a 10 percentage points higher probability of taking out a loan for education than non-white individuals; and married individuals have an 8 percentage points higher probability of taking out a loan for education than individuals who are not married.

[12] Total net wealth of the household includes: the value of land, buildings, farms or ranches owned by the household; the value of houses, holiday houses or other properties; net worth of businesses owned by any member of the household; the value of owned cars and other vehicles; financial assets and inheritances; net of mortgage and loans (excluding loans for educational purposes).
[13] All monetary variables have been deflated to 2004 prices.
[14] This is evaluated at the mean of the risk attitudes index for the sample.

Age is also an important determinant of the probability of taking out an educational loan. The older the individual is, the higher is the probability of taking out a loan for education. In order to capture any possible non linear effect, we also include age squared in the set of controls. The results confirm that older individuals have higher probabilities of taking out a loan for education than younger individuals and the non linear effect is very small.[15]

We also include net household wealth in our analysis to try to capture the effects of family background on the probability of taking out a loan for education. The results show that the effect of total net wealth is statistically significant and negatively related to the probability of taking out a loan for education, indicating that students belonging to a wealthy household are less likely to take out an educational loan. Finally, if a student is working, he/she has around a 4 percentage point higher probability of taking out an educational loan than a student who is not working.[16]

In Panel B of Table 2, due to the fact that the intervals of potential income loss specified in the hypothetical gambles at 10%, 20%, 33%, 50% and 75% are somewhat irregular, we repeat the probit analysis replacing the risk attitudes index with a set of dummy variables. The results show that individuals who are willing to take average financial risk for average financial returns have a 17 percentage points higher probability of taking out a loan for education than individuals who are not willing to take any financial risk. Similarly, those individuals who are willing to take above average/substantial risk for above average/substantial returns have a 10 percentage points higher probability of taking out an educational loan than those who are not willing to take any financial risk.

The small size of the sample used in our analysis does not allow us to split the sample by gender in order to explore gender differences in the effect of risk attitudes on the

[15] Although the results might be contrary to human capital theory, it is important to acknowledge that, as previously stated, it could be the case that individuals have taken out an educational loan for their children rather than for their own education.

[16] The marginal effect on the risk aversion index does not change significantly if total wealth and the control for whether the student is working or not are omitted.

probability of taking out a loan for education. To overcome this issue, we introduce an interaction term between the risk attitudes index and the male dummy variable. Table 3 presents the results of the probit model after including an interaction term, $r_i \times Male$.[17] The differential effect for a male who is willing to take average financial risk for average returns is around 58 percentage points (Table 3 Panel B).[18] Similarly, the differential effect for a male who is willing to take above average/substantial financial risk for above average/substantial financial returns is around 55 percentage points.[19]

Similarly, in Table 3 (Panels C and D) we introduce an additional term which interacts the risk aversion index with a dummy variable which denotes 25 years old or younger. By including this additional term, we aim to explore whether willingness to take financial risk at different ages affects the probability of taking out a loan for education. We focus on those individuals who are 25 years old or younger as the average age at which individuals finish the Bachelors degree in the U.S. is 25 years old (Tulip, 2007). Our findings show that the effect of the interaction term between being 25 years old or younger and the risk attitudes index is statistically insignificant. After replacing $r_i \times (Age \leq 25)$ with the interaction term between being 25 years old or younger and the risk attitudes dummy variables, we find a positive and statistically significant effect suggesting that a differential risk attitudes effect exists on the probability of taking out a loan for education across the different age groups (Table 3 Panel D).

V. Attitudes towards Risk and the Amount of the Loan

Methodology

Our second aim is to explore the relationship between the individual's willingness to take financial risk and the amount of the loan taken out. This could be particularly interesting as it

[17] The marginal effects of the interaction terms in Table 3 have been estimated following Ai and Norton (2003).
[18] The results relating to the previous set of controls are robust to the inclusion of the interaction term.
[19] According to Ai and Norton (2003), page 126, 'the statistical significance of the interaction effect is often stronger when the interaction effect is positive than when negative, with t-statistics as high as ten.'

is important to understand whether individuals are willing to take out a loan, which, for example, covers all the expenses of their educational investment (fees and living expenses) or whether they are just willing to take out a loan to cover their fees only. According to Tulip (2007), the average total tuition fee in 2003 in a U.S. university was \$8,700,[20] and the average amount of living expenses during the university period was around \$40,000.[21] He argues that the financial constraints of students are given by the attendance fees and the living expenses.

In our analysis, the dependent variable is characterised by the presence of a high proportion of observations with the value zero (see Figure 1 in Appendix).[22] According to Tobin (1958), the tobit model allows for the consideration of all the observations in the sample, including those that are censored at zero. Therefore, following Wooldridge (2002), we model the relationship between the amount of the loan taken out and the risk attitudes index with a tobit model as follows:

$$l_i^* = x_i\beta + \varepsilon_i, \varepsilon_i \sim N(0, \sigma^2) \tag{3}$$

$$l_i = \begin{cases} 0 & \text{if } l_i^* \leq 0 \\ l_i^* = x_i\beta_i + \mu_i & \text{if } l_i^* > 0 \end{cases} \tag{4}$$

where l_i^* is the latent variable, which represents the natural logarithm of the amount of the loan, and l_i is the actual observed amount of the loan. Since the distribution of the amount of the loan is highly skewed, following Brown et al. (2008), we specify a logarithmic dependent variable. Note that for students reporting a zero amount for the loan, $\ln(l_l)$ is recoded to zero as there is no reported amount of the loan between zero and the unity. x_i represents the set of individual characteristics that explain both the probability of taking out a loan for

[20] According to Tulip (2007), the fees for a private university in the U.S. in 2003 are around \$22,000 per year.
[21] This includes the accommodation, transport, books, supplies and miscellaneous expenses.
[22] The average size of the loan for those individuals who took out a loan for education is around \$11,000.

education and the amount of the loan.[23] The vector of parameters to be estimated is represented by β and ε_i represents the normally and homoskedatic distributed error term.

Results

The second column of Tables 2 and 3 presents the results of modeling the amount of the loan for education. The results in Table 2 show that willingness to take financial risk is positively related to the size of the educational loan. Similarly, being white and age both have a positive and statistically significant relationship with the amount of the educational loan. The number of children and the number of household members both appear to be statistically insignificantly related to the amount of the loan for education while the number of household members is negatively related to the amount of the loan taken out. Married individuals have, on average, much larger loans than non married individuals. The results suggest that the relationship between household wealth and the amount of the loan for education is statistically insignificant. In Panel B in Table 2, we replace the risk attitudes index with a set of dummy variables. The results confirm the positive and statistically significant relationship between willingness to take financial risk and the size of the loan taken out.

After introducing the risk attitudes-male interaction term (see Table 3), the results show that the effect of being male is still positive and statistically significant suggesting that males have larger loans for education. Similarly, the results relating to the risk attitudes index indicate that willingness to take financial risk is positively associated with the size of educational loans. However, the interaction term between risk attitudes and being male is negative and statistically significant. In Panel B of Table 3, we replace the risk attitudes index with a set of dummy variables and we find that the differential effect for a male, who is willing to take average financial risk for average financial return, is positive and statistically significant for the amount of the loan taken. Similarly, the differential effect of a male who is

[23] This set of characteristics is the same as that used to explain the probability of taking out a loan for education in Section IV.

willing to take above average/substantial financial risk for above average/substantial financial returns, is positive and statistically significant for the amount of the educational loan take out.

As with the probit analysis, we then explore the determinants of the size of the loan for education including an interaction term between risk attitudes and a dummy variable denoting 25 years old or younger (see Table 3 Panel C). After including this interaction term, the results relating to the other control variables do not change with respect to our previous results. However, whether the student is 25 years old or younger appears to have a statistically insignificant influence on the size of the loan for education. The analysis in Panel D in Table 3 explores the robustness of the results when we replace the risk attitudes index with the set of dummy variables. Our findings show that the interaction terms between being 25 years old or younger and the risk attitudes dummy variables have a statistically significant effect on the probability of taking out a loan for education for those individuals who are willing to take average financial risk only. [24]

VI. Robustness

Methodology

One shortcoming of the tobit model is that it does not allow for the nature of the zero observations assuming that the observations are zero due to other factors rather than the non participation decision of the respondents. Hence, in order to explore the robustness of the findings, we explore a double hurdle specification. According to Cragg (1971), the double hurdle model relaxes this assumption of the tobit model by giving special treatment to the participation decision. The double hurdle model assumes two hurdles in order to observe positive values, each of them is determined by a different set of independent variables. The first hurdle refers to participation and the second one refers to the intensity of use after overcoming mis-reporting or data problems. Given such characteristics, the double hurdle

[24] It is apparent that the results for $r = 1$ and $r = 2$ are not monotonic. This could be due to the large proportion of individuals in the $r = 1$ category (almost 50 per cent).

model has been widely used in the literature to study consumer demand models (see for example Jones, 1992, Yen and Jones, 1997 and Aristei et al., 2008), labour supply models (Blundell and Meghir, 1987) and loan default analysis (Moffatt, 2005). Cragg (1971) develops the double hurdle model by modifying the tobit model in the following way, where *loan* denotes whether or not the individual reported having a loan for educational purposes:

$$l_i = \begin{cases} l_i^* \text{ if } loan = 1 \text{ and } l_i^* > 0 \\ 0 \text{ otherwise} \end{cases} \quad (5)$$

where l_i^* is the latent variable, which represents the natural logarithm of the amount of the loan, and l_i is the actual observed amount of the loan. l_i takes value zero when there is censoring at zero or due to random circumstances.[25] Jones (1992) rewrites equation (5) showing the process involved in observing zero values:

$$l_i = l_i^* = x_{2i}\beta_2 + u_i > 0 \text{ if } x_{1i}\beta_1 + v_i > 0 \text{ and } x_{2i}\beta_2 + u_i > 0$$

or (6)

$$l_i = 0 \text{ if } \begin{cases} x_{1i}\beta_1 + v_i > 0 \text{ and } x_{2i}\beta_2 + u_i \leq 0 \\ or \\ x_{1i}\beta_1 + v_i \leq 0 \text{ and } x_{2i}\beta_2 + u_i > 0 \\ or \\ x_{1i}\beta_1 + v_i \leq 0 \text{ and } x_{2i}\beta_2 + u_i < 0 \end{cases}$$

where x_1 and x_2 are two different sets of variables for the first (i.e. participation) and second (i.e. intensity) hurdles. Both sets of variables include individuals' socio-economic characteristics as previously described in Section IV. However, the set of controls defining the participation equation (i.e. the first hurdle) includes an additional variable, which

[25] On the contrary, Heckman's model (1979) assumes that all the zeros are due to the decision of non participation of the respondents, which would not be appropriate for our purposes as it could be that some students did not get a loan even if they applied for it. However, we also model the probability of taking out a loan and the amount of the loan with a Heckman model. The results are consistent with the analysis, suggesting a positive relationship between the risk attitudes index and both the probability of taking out a loan for education and the amount of the loan. These results are available on request.

indicates whether the individual has been turned down for a loan in the last five years.[26] Hence, a positive amount of the loan is observed only if an individual takes out a loan for education.

Results

Tables 4 and 5 present the results from the double hurdle analysis under the assumption of dependent errors (see, Jones 1992).[27] In other words, we assume there is a relationship between the errors of the participation equation and the errors of the intensity equation. The results in Table 4 suggest that being willing to take financial risk, white, age and male all have a positive and statistically significant relationship with the decision of taking out a loan for education and the amount of the loan taken out. In accordance with the previous results, being married only has a positive effect on the probability of taking out an educational loan. The number of children in the household, as well as household size, have negative and statistically significant effects in the case of the size of the loan. Household wealth has a negative and statistically significant relationship with the decision of taking out a loan for education but a positive effect in the case of the size of the loan. This finding suggests that when the individual belongs to a wealthy household they have a lower probability of taking out a loan for education because they may have sufficient financial assets to finance their education, but when they decide to take out a loan for education, they may be able to obtain larger loans. Clearly, over time relative to 1992 both participation and the amount of the loan have increased. In Panel B in Table 4, we replace the risk attitudes index (r_i) with the set of dummy variables. In this case, being willing to take average financial risk has a positive and statistically significant effect on the first decision (i.e. taking out a loan for education). On the

[26] Unfortunately, the SCF data set does not provide information about the reason for which the loan has been turned down or what type of loan it was. The validity of the instrument has been checked, where the instrument is statistically significant in modelling the probability of taking out a loan but statistically insignificant when modeling the size of the loan.

[27] Tables 4 and 5 show that the correlation terms (ρ) between u_i and v_i are statistically significant. This suggests that the error terms of the two equations that form the double hurdle model are correlated.

contrary, being willing to take above average/substantial financial risk has a positive and statistically significant effect on both the participation decision and the amount of the loan.

Table 5 presents the results after including the interaction term, $r_i \times Male$. The results are robust to its inclusion suggesting that willingness to take financial risk has a statistically significant positive effect in both decision stages. The interaction term between the risk attitudes index and the male dummy variable has a statistically significant negative effect on the decision to take out a loan for education yet a positive effect in the case of the size of the loan.

Table 5 Panel C presents the results after including the interaction term between the risk attitudes index and the dummy variable for 25 years old or younger, i.e. $r_i \times (Age \leq 25)$. Whether the individual is 25 years old or younger has a negative and statistically significant effect on the size of the loan. The risk attitudes index has a statistically significant positive effect on the participation decision only. However, the combined effect of $r_i \times (Age \leq 25)$ is only positive and statistically significant in the case of the amount of the loan for education. This suggests that individuals aged 25 years old or younger, who are willing to take financial risk and who decided to take out a loan for education, have larger educational loans.

VII. Conclusions

We have explored the relationship between attitudes towards risk and the probability of taking out a loan for education as well as the size of the loan using a representative data set from the U.S., based on pooling five cross-sections of the SCF. To be specific, we have explored the relationship between the probability of taking out a loan to finance education and individuals' economic and demographic characteristics, including attitudes towards financial risk. We have also explored how the size of the loan for education varies with socio-economic characteristics and the risk attitudes of the individuals.

We find that willingness to take financial risk is positively related to the probability of taking out a loan for education and with the size of the loan. Similarly, our results suggest that characteristics such as age, male, white and married are all positively related to both the probability of taking out a loan and the size of the educational loan. The results also suggest that household size and household wealth are negatively related to the probability of taking out a loan for education and its size.

Our empirical analysis contributes to the existing literature by helping us to understand whether differences in risk attitudes could lead to inequalities in education. Our results suggest that differences in attitudes towards financial risk may affect investment in higher education by influencing the decision to take out a loan, which can ultimately lead to inequalities in labour income and wealth. In addition, the results suggest that non-white individuals and individuals from less wealthy households are less likely to finance higher education through loans. If risk aversion is concentrated among low socio-economic groups, then our findings predict that individuals from poorer backgrounds will be unlikely to invest in their human capital thereby increasing potentially inequalities in education and income as well as inequalities in the next generation.

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Appendix

Figure 1: Histogram of the Amount of the Loan (sample = individuals who have a loan).

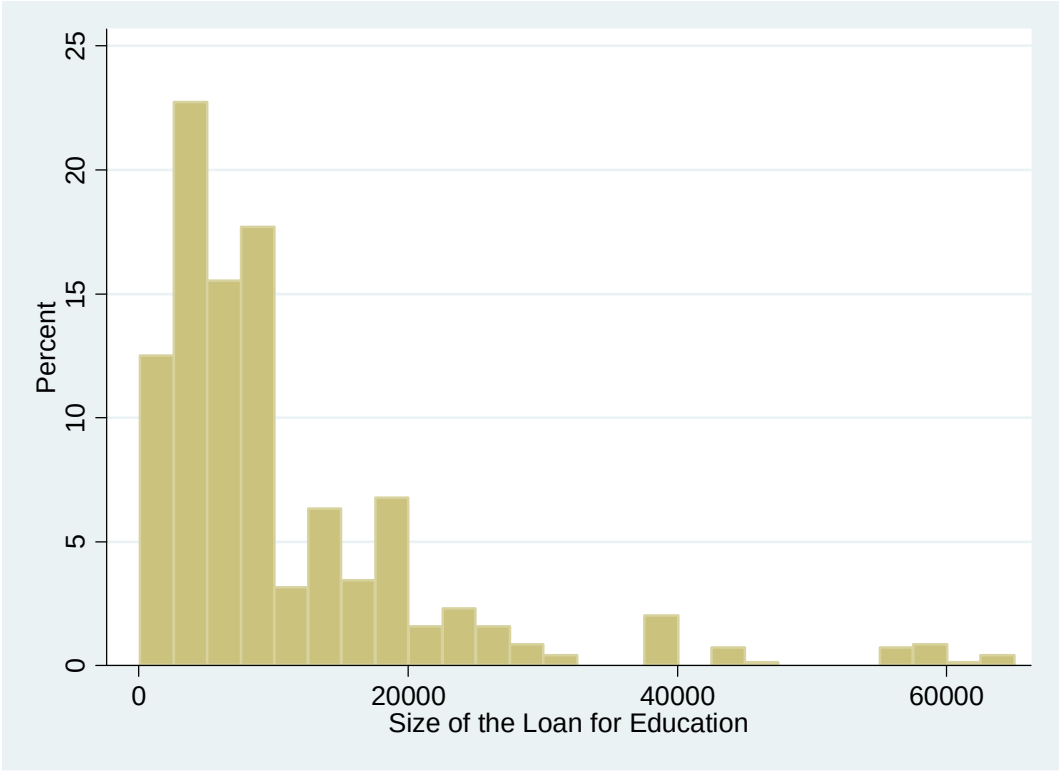

Table 1: Summary Statistics of the SCF data set (Sample = Current Student Head of Household)

	ALL STUDENTS				STUDENTS WITH LOAN			
	MEAN	STDEV	MAX	MIN	MEAN	STDEV	MAX	MIN
Having a Loan	0.462	0.498	1	0	1	0	1	1
Log Amount of Loan	4.276	4.486	11.751	0	8.861	1.029	11.082	4.605
Age	28.685	8.971	65	18	28.099	7.952	65	18
Age Squared	903.278	625.567	4225	324	85.732	554.99	4225	324
Age$\leq$ 25	0.462	0.498	1	0	0.459	0.498	1	0
White	0.680	0.466	1	0	0.737	0.440	1	0
Male	0.540	0.498	1	0	0.614	0.486	1	0
Number of Children	0.352	0.929	6	0	0.304	0.804	4	0
Married	0.244	0.429	1	0	0.291	0.454	1	0
Household Size	2.471	1.378	9	1	2.403	1.390	9	1
Risk Attitudes Index(r_i)	0.956	0.721	2	0	1.037	0.669	2	0
$r_i \times Male$	0.582	0.740	2	0	0.674	0.719	2	0
$r_i \times (Age \leq 25)$	0.463	0.701	2	0	0.481	0.697	2	0
Log of Household Wealth	7.496	4.630	18.006	-11.435	7.414	4.445	12.977	-11.435
Student Working	0.471	0.499	1	0	0.527	0.499	1	0
Turned Down for a Loan	0.270	0.444	1	0	0.285	0.452	1	0
Observations	1,740				805			

Table 2: The Determinants of the Probability of Having a Loan for Education and Size of the Educational Loan.

	Probability of Having a Loan		*Size of the Loan*	
	ME	*tstat*	ME	*tstat*
Panel A: Risk Attitudes Index				
Age	0.023	*(2.75)*	0.024	*(2.87)*
Age Squared	-0.000	*(3.30)*	-0.000	*(3.47)*
White	0.102	*(3.84)*	0.105	*(3.99)*
Male	0.088	*(2.97)*	0.085	*(2.88)*
No. of Children	0.018	*(1.10)*	0.018	*(1.14)*
Married	0.084	*(2.31)*	0.090	*(2.49)*
HH Size	-0.014	*(1.53)*	-0.014	*(1.51)*
r_i	0.057	*(3.23)*	0.060	*(3.44)*
Year 2004	0.190	*(4.68)*	0.205	*(5.25)*
Year 2001	0.075	*(1.68)*	0.090	*(2.09)*
Year 1998	0.163	*(4.00)*	0.177	*(4.48)*
Year 1995	0.125	*(3.04)*	0.140	*(3.51)*
Log Wealth	-0.005	*(1.80)*	-0.005	*(1.72)*
Student Work	0.039	*(1.53)*	0.042	*(1.63)*
Chi- Squared	123.44		121.11	
	p=[0.000]		*p=[0.000]*	
Pseudo R-squared	0.0514		0.0504	
Panel B: Risk Attitudes Dummy Variables				
$r=1$	0.170	*(5.78)*	0.173	*(5.88)*
$r=2$	0.110	*(3.14)*	0.105	*(2.97)*
Chi-Squared	139.56		146.81	
	p=[0.000]		*p=[0.000]*	
Pseudo R-squared	0.0581		0.0611	
Observations	1,740			

Table 3: The Determinants of the Probability of Having a Loan for Education and the Size of the Educational Loan with $r_i \times Male$ and $r_i \times (Age \leq 25)$ Interaction Terms

	Probability of Having a Loan		*Size of the Loan*	
Panel A: Risk Attitudes Index – Male Interaction Term				
	ME	*tstat*	ME	*tstat*
Male	0.159	*(3.53)*	1.635	*(3.58)*
r_i	0.093	*(3.73)*	0.950	*(3.81)*
$r_i \times Male$	-0.072	*(2.05)*	-0.665	*(1.93)*
Chi- Squared	127.64 *p=[0.000]*		145.80 *p=[0.000]*	
Pseudo R-squared	0.0531		0.0206	
Panel B: Risk Attitudes Dummy Variables – Male Interaction Term				
Male	0.346	*(3.01)*	1.171	*(1.23)*
$r = 1$	0.490	*(5.80)*	1.936	*(2.56)*
$r = 2$	0.390	*(3.05)*	3.428	*(3.73)*
$(r = 1) \times Male$	0.585	*(22.75)*	1.210	*(1.79)*
$(r = 2) \times Male$	0.547	*(12.35)*	2.701	*(3.22)*
Chi-Squared	163.37 *p=[0.000]*		176.22 *p=[0.000]*	
Pseudo R-squared	0.0680		0.0249	
Panel C: Risk Attitudes Index – $Age \leq 25$ Interaction Term				
$Age \leq 25$	0.012	*(0.31)*	0.090	*(0.21)*
r_i	0.070	*(2.96)*	0.719	*(3.06)*
$r_i \times (Age \leq 25)$	-0.022	*(0.64)*	-0.164	*(0.48)*
Chi- Squared	107.15 *p=[0.000]*		123.77 *p=[0.000]*	
Pseudo R-squared	0.0446		0.0175	
Panel D: Risk Attitudes Dummy Variables – $Age \leq 25$ Interaction Term				
$Age \leq 25$	0.440	*(0.46)*	0.163	*(0.33)*
$r = 1$	0.525	*(5.41)*	3.526	*(4.81)*
$r = 2$	0303	*(2.60)*	2.362	*(2.71)*
$(r = 1) \times (Age \leq 25)$	0.482	*(12.50)*	1.829	*(2.31)*
$(r = 2) \times (Age \leq 25)$	0.456	*(9.88)*	0.665	*(0.46)*
Chi-Squared	128.78 *p=[0.000]*		143.45 *p=[0.000]*	
Pseudo R-squared	0.0536		0.0202	
Observations	1,740			

Table 4: Robustness: Double Hurdle Model

	Participation		*Intensity*	
	Coef.	*tstat*	Coef.	*tstat*
Age	0.513	*(2.31)*	0.113	*(4.34)*
Age Squared	-0.001	*(2.83)*	-0.001	*(4.15)*
White	1.068	*(8.23)*	0.975	*(4.04)*
Male	0.283	*(3.68)*	0.342	*(3.79)*
N. Kids	0.022	*(0.52)*	-0.112	*(2.16)*
Married	0.222	*(2.28)*	0.080	*(0.79)*
HH Size	-0.042	*(1.67)*	-0.113	*(3.94)*
r_i	0.126	*(2.73)*	0.201	*(3.57)*
Year 2004	0.284	*(1.94)*	1.303	*(7.37)*
Year 2001	0.009	*(0.06)*	1.263	*(6.86)*
Year 1998	0.247	*(1.70)*	1.216	*(7.06)*
Year 1995	0.086	*(0.61)*	0.797	*(4.72)*
Log Wealth	-0.016	*(2.31)*	0.038	*(4.83)*
Student Work	0.038	*(0.55)*	-0.237	*(3.20)*
Turned Down for a Loan	0.188	*(2.45)*	-	-
ρ	0.437		*(2.60)*	
L-Likelihood	-2181.324			
Panel B: Risk Attitudes Dummy Variables				
$r = 1$	0.399	*(5.09)*	0.114	*(1.11)*
$r = 2$	0.230	*(2.49)*	0.391	*(3.48)*
ρ	0.475		*(3.27)*	
L-Likelihood	-2169.228			
Observations	1,740			

Table 5: Robustness: Double Hurdle Model with $r_i \times Male$ and $r_i \times (Age \leq 25)$ Interaction Terms

	Participation		*Intensity*	
	Coef.	*tstat*	Coef.	*tstat*
Panel A:Risk Attitudes Index – Male Interaction Term				
Male	0.398	*(3.40)*	0.094	*(0.63)*
r_i	0.228	*(3.61)*	0.127	*(1.57)*
$r_i xMale$	-0.172	*(1.94)*	0.186	*(1.71)*
Turned Down for a Loan	0.206	*(2.76)*	-	-
ρ	0.403		*(2.68)*	
L-Likelihood	-2223.132			
Panel B: Risk Attitudes Dummy Variables – Male Interaction Term				
Male	0.125	*(0.96)*	0.204	*(1.21)*
$r = 1$	0.270	*(2.60)*	0.109	*(0.80)*
$r = 2$	0.435	*(3.37)*	0.303	*(1.87)*
$(r = 1) \times Male$	0.363	*(2.38)*	0.091	*(0.47)*
$(r = 2) \times Male$	-0.259	*(1.44)*	0.282	*(1.28)*
ρ	0.513		*(4.20)*	
L-Likelihood	-2199.671			
Panel C: Risk Attitudes Index – $Age \leq 25$ Interaction Term				
$Age \leq 25$	-0.001	*(0.79)*	-0.002	*(1.93)*
r_i	0.155	*(2.73)*	0.050	*(0.74)*
$r_i \times (Age \leq 25)$	-0.001	*(0.30)*	0.013	*(4.21)*
Turned Down for a Loan	0.227	*(3.03)*	-	-
ρ	0.428		*(2.04)*	
L-Likelihood	-2217.814			
Panel D: Risk Attitudes Dummy Variables- $Age \leq 25$ Interaction Term				
$Age \leq 25$	-0.002	*(0.64)*	-0.255	*(1.63)*
$r = 1$	0.571	*(5.81)*	0.012	*(0.08)*
$r = 2$	0.369	*(3.08)*	0.422	*(2.61)*
$(r = 1) \times (Age \leq 25)$	-0.231	*(1.84)*	0.388	*(2.10)*
$(r = 2) \times (Age \leq 25)$	-0.192	*(1.25)*	0.174	*(0.82)*
ρ	0.603		*(5.85)*	
L-Likelihood	-2218.411			
Observations	1,740			