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Adult Education and Risk Attitudes

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Abstract

We provide empirical evidence that supports a causal link from education to risk attitudes when using representative data from surveys and artefactual experiments in Lima, Peru. On the one hand, when using three standard experimental measures of risk attitudes we find that they are positively correlated with years of education. On the other hand, we claim that this relationship is causal by taking advantage of an identification strategy that exploits an exogenous boom in construction of new schools in Lima, which allows us to provide evidence that shows that more education increases risk attitudes.

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1. Introduction

Both policymakers and researchers are frequently puzzled by what in many cases is seen as poor decision making by individuals, which is thought to be linked in no small part, to the lack of information and, in particular, poor education. This is particularly true in developing countries, where education-related issues are usually at the forefront of policymaking. In fact, it is not surprising that a crucial objective of economic policy is to increase and improve education in the population as it is expected that by doing so, individuals will be able to make better decisions. However, decisions are not made in a vacuum. Individual risk attitudes help shape and determine economic behavior and ultimately, choice. As such, they deeply influence decision making by individuals. As an example, this may help explain why farmers in developing countries frequent times prefer to stick with inefficient, but generations-tested traditional methods of farming, even after being taught modern, more productive agricultural methods. Likewise, this may also help explain why women entrepreneurs in developing countries are so wary about opening formal bank accounts, by which they lose physical track of their money, regardless of any time spent teaching them of the benefits and convenience of having such bank accounts[1]. Thus, from a policy perspective a better understanding of the extent to which education may shape risk attitudes is of particular importance since, as mentioned above, schooling is typically viewed as a crucial one that can help individuals improve decision-making by providing individuals with better understanding of mechanisms and processes related to decision making, which may help them make better choices.

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[1] Risk attitudes are not the only culprit. Trust, utility curves, and others may also be at play.

However, there is little consensus on the nature of the link between education and risk aversion, if any. Theoretically, some researchers have argued that such a link may be negative. For instance, Breen, et al (2014) develop a rational choice model of educational decision-making in which the utility of educational choices depends on the risk aversion individuals as well as on their time discounting preferences. While individuals from advantaged socioeconomic backgrounds may not affected by risk aversion, those with lower time discounting preferences and low risk aversion may be more likely to opt for more education, which in their model may likely result in higher long-term pay-offs. Thus, these researchers find that risk aversion and time discounting preferences may mediate the effect of socio-economic background on educational choices and the effect of these factors on educational decision-making may vary across socioeconomic groups[2]. On the other hand, Brodaty, et al (2014) have argued that the link between education and risk aversion may be positive. They propose a model in which an individual's investment in education maximizes expected utility conditional on public and private information. Their model takes future wage risk into account and treats the direct and opportunity costs of education as additional sources of risk. They argue for significant and substantial effects of expected returns on individual education choices. The risk affecting education costs and, in particular, the randomness of time-to-degree, also plays an important role in explaining enrollment in higher education. In fact, they claim that more educated individuals bear more risk and are more risk averse than other groups and yet they will study more because of higher returns and markedly lower

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[2] Similarly, related theoretical results stress that earnings uncertainty may depress human capital investment (Lehvari and Weiss, 1974, and Olson, White and Sheffrin, 1979).

expected investment costs. In fact, as described by Outreville (2015) the relationship between risk aversion and the level of education is even more ambiguous. This researcher explains that from a causality point of view, it may be argued that investors with a high level of education are less risk averse, but it may also be argued that less risk-averse individuals choose to pursue a higher level of education. (Outreville, 2015)

The ambiguity in theory is also reflected empirically. For instance, Harrison et al. (2007) provide experimental evidence that shows a positive and statistically significant link between higher education and risk aversion. This effect appears to be monotonic given that the sign and significance of the effect remain regardless of the magnitude of the prize of lottery employed[3]. Similarly, Dohmen, et al (2010) use data from a German survey as well as experimental data to study the intergenerational links related to risk taking and show a positive causal effect between education level of parents and the risk aversion of the children. Finally, additional studies that find a positive link between education and risk aversion are Hardeweg (2013) and Jung (2014), among others. However, while there is plenty of research that shows a positive link between education and different measures of risk aversion, there is also plenty of evidence that shows that such a link may be negative. For instance, Riley and Chow (1992) use data from investment decisions of a sample of US households and show that risk aversion tends to decrease significantly as the years of education increase. Similarly, Caliendo et al. (2009) apply different measures of risk aversion and find a negative and statistically significant effect with higher education, albeit with a very low marginal effect. Other

[3] However, they also find that the more specific the type of degree, major, or faculty do not explain risk aversion.

studies that find a negative link between education and risk aversion, are Donkers, et al. (2001), Hartog, et al. (2002), and Hryshko et al. (2011).

Furthermore, other studies, such as Halek and Eisenhauer (2001) provide evidence showing ambiguous effects between educational level of individuals and risk aversion measures. Hartlaub and Schenider (2012) find that students with a higher social background are not only less sensitive to their school performance, and individual risk aversion is irrelevant to their educational plans. On the other hand, they find that students with a lower social background are more risk-averse and thus, more likely to opt for a further education. Similarly, Belzil and Leonardi (2007) find that such a link may be non-linear by showing evidence that schooling continuation probabilities decrease with risk aversion at low grade levels, but increase with risk aversion at the time when the decision to enter higher education is made, where differences in attitudes toward risk account for a modest portion of the probability of entering higher education and differences in parental human capital and abilities are more important.

Unlike previous studies, in this research we offer three specific contributions to the literature on risk attitudes and education, which we believe are of significance to the understanding in the relationship of these two variables. First, we specifically test the causal association that goes from education to risk aversion, by exploiting an exogenous government shock on construction of school infrastructure for the specific case of Lima, the capital city of Peru. In this regard, our study is closest to Jung (2014) who a regression discontinuity design with British data to provide evidence positive and causal evidence that education causes risk aversion, which was significant for individuals with lower education, only. Second, unlike Jung (2014) and others, we apply risk measures from artefactual experiments and thus, do not employ survey measures, which are typically considered to be less reliable (Bertrand and Mullainathan, 2001). In particular, we employ three "tried and true" artefactual measures that have been broadly employed and accepted in the literature as good proxies of risk attitudes. Finally, our experimental and related data are representative of the city in which it was collected, Lima, something that was explicitly taken into account and rather uncommon in this type of empirical work. As Cardenas, et al (2014) explain, the vast majority of experimental data collection from artefactual efforts have been gathered among limited or particular populations, such as small samples of college students (Glaeser et al., 2000; Burks, Carpenter and Verhoogen, 2003; others). Given the above, we believe that the contributions of our paper are significant to both, the literature on risk aversion and potentially to policymakers, who may be able to better assess the effecitivness of educational promotion as a policy tool. Overall, our findings are consistent with the studies that show a positve link between education and risk aversion (Harrison, et al., 2007; Dohmen, et.al, 2010; among several others), but unlike most we test for causal inference between education and risk aversion and find that the causality that goes from the former to the latter is positive, rather robust, and statistically significant.

Our paper is organized as follows. The next section describes our data as well as the experimental design employed in order to obtain our artefactual measures at the individual level. Section 3 describes the specific risk games applied in detail. Section 4 presents our identification strategy. Section 5 shows the econometric methodology employed. Section 6 describes our results. Finally, in section 7 we present a brief summary and conclude.

2. Data and Experimental Design[4]

The individuals who participated in this research were recruited in fulfillment of strata quotas for Lima and were selected on the basis of education, average family income of the districts or the territorial units that make up each city, gender, and age. The individuals. They were invited so that the distributions within these combinations of characteristics resembled those of the populations in the city. The recruitment methods in the cities included phone calls, door-to-door calls, e-mail invitations, and calls in public and workplaces. The day before the experimental sessions, the recruiter reminded the participant to assist and arranged or discussed the her or his transportation. The day of the sessions, which were 20 in total, the participants were welcomed and at the accorded time sessions started; around 30 individuals were invited for each session, under the assumption that approximately one third would not show up, thus allowing each experimental session to have between 20 to 25 participants. Individuals were not allowed to communicate during sessions[5]. As the sessions progressed, participants received information about their peers, depending of the particular activity (Cardenas, et al, 2013). Each experimental session followed the exact same protocol, with the exact same sequence of activities in order to guarantee consistency[6]. Following the batteries of

[4] The experimental data employed in this paper, which are publicly available, come from a research effort funded by the Inter-American Development Bank, of which Chong was co-principal investigator. For the sake of self-containment, this section draws very heavily from previous papers that also describe the same experimental design and application on the field, in particular, Cardenas, et al (2013). In addition, Candelo et al., (2009) provide a technical note with additional detailed account of the experimental design and implementation of exercises employed in this paper.

[5] In fact, during the recruitment process it was avoided having two people who knew each other within one session (Cardenas, et al, 2013).

[6] The field team participated in a training workshop during the first quarter of 2007, which provided a uniform approach to implementation and related fieldwork details such as sampling

experiments, participants completed a survey. To reduce idiosyncratic measurement error, the surveys were administered by the coordinators of the experiments and supported by a group of pollsters especially trained for these purposes (Cardenas, et al, 2013). Our full final sample size is 540 individuals.

The three experimental risk games applied in this research are all "tried and true" activities. The aim was not to create a new risk measure or refine existing ones, but to employ broadly accepted experimental risk measures that are believed to adequately capture risk attitudes in individuals. In this regard, we follow the well-known tripartite concept by Kahneman and Tversky (2000) and later consolidated in experimental measures using gambling approaches by Binswanger (1980) and more recently Barr (2003). Each player makes three individual decisions that measure attitudes towards risk, ambiguity, and losses. As described in Cardenas, et al (2013), from which we heavily draw, in the first activity, which measures risk aversion, there is a distribution of tokens for each of ten envelopes, so that five of them represent low payoffs and the other five represent high payoffs in each envelope. The game consists of six gambles with 50-50 payoffs that go from low to high expected amounts of money, which is informed to the participants during the session. Note that the high and low values marked in the tokens are different in each envelope. In particular, the player has to decide between one of these six lotteries, which range from a sure low payoff, with values of (1/3, 01/3), to an all-or-

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procedures, protocol, timing of actions (i.e., invitations, pre-survey, experiments, post-surveys), elements to be included in experimental sessions and the construction of questionnaires. The materials used, such as surveys and protocol delivered to supervisors, are in Spanish (Cardenas, et al, 2013).

nothing higher expected payoff, with values of (0, 0.95) with four intermediary combinations[7]. The participants know the exact probabilities of the payoffs.

As described by Cardenas et al, (2013), from which we draw, the second activity aims at measuring risk ambiguity by offering the same payoffs for these six lotteries, but unlike in the previous activity, individuals ignore the exact probabilities, but are shown that of the ten balls included in the bag, at least three correspond to the low payoff and at least other three to the high payoff. The remaining four balls are included without telling the participants to what category, low or high, they corresponded. Finally, as Cardenas, et al (2013) explain, the third activity measures loss aversion and also uses six lotteries with 50/50 probabilities, but includes the possibility of negative payoffs and in order to avoid negative payments players are endowed with a fixed amount, regardless of gains or losses, so that the net value in each possible choice would be equivalent to the values of the first stage of these risk tasks. Each of the three stages has a distinct purpose.

In order to ensure that the participants clearly understand the activities, the coordinator simulates each of the games for the participants making sure not to bias the election of the participants during the actual game and by keeping written records (Candelo, et al, 2009). Also, the outcome values associated to the corresponding activities described above are employed as the dependent variables in our empirical approach, as they are considered an objective measure of risk adverse attitudes.

Table 1 presents a description and sources of all the variables employed in this paper. Table 2 reports corresponding summary statistics. The average age is 37, half of

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[7] The other four intermediary lotteries are: (0.25, 0.47); (0.18, 0.62); (0.11, 0.77); and (0.04, 0.91); where the first value refers to the low expected pay off and the second to the high expected one, each with an equal chance (Cardenas, et al, 2013).

the sample is female, married participants is also about fifty percent, and those own a home formal also reach about fifty percent of the sample. In addition, the number of years of education is nearly 11 years, and those employed account for around sixty percent. In addition, Table 3 presents simple pairwise correlations between risk adverse attitudes and education attainment.

5. Econometric Approach

As described above, one of the objectives of this research is to better understand whether there is a statistically significant correlation between education and risk aversion as well as the nature of such a link, if any. In order to do this we employ risk measures from experimental sessions in which agents face risky prospects by making decisions involving money payoffs. Our baseline reduced linear regression form follows the specification:

$$RiskAversion_i = \alpha + \beta_1 Education_i + \boldsymbol{X}'_i \beta_2 + \beta_3 W_i + \boldsymbol{S}'_i \beta_4 + \varepsilon_i \qquad (1)$$

where $RiskAversion_i$ is the dependent variable i obtained from one of the three risk activities described above, namely risk aversion, risk ambiguity and loss aversion. The values of the dependent variable range from one to six where a higher value stands for higher risk aversion. Our key variable of interest, $Education_i$ represents the years of schooling of the participant and it is obtained directly from surveys applied to the individuals that participated in the experimental games. In addition, the vector $\boldsymbol{X}_i$ reflects a set of individual characteristic such as age, gender, marital status, and type of ownership of the home. W_i is a variable that states the employment status of participant i as an approximate measure of his or her socio-economic status. Vector $\boldsymbol{S}_i$ contains data collected throughout the experimental sessions, in particular, the percentage of women in the session, average age of participants in the session, the standard deviation of females per session, and the standard deviation of the age of participants. We also include session fixed effects to account for observable and unobservable differences within the participants of each session as well as district fixed effects and clusters at the district level. A complete description of every covariate included is shown in Table 1. Finally, ε_i is the error term.

4. Identification Strategy

As it is well known, a weakness of our empirical approach above is that the relationship between education and risk aversion may be endogenous due to unobservables that may be biasing our relationship of interest as the coefficient β_1 in specification (1) may be biased if there is any correlation between education levels and an omitted variable included in the error term and as such, causal inference may be difficult to establish. In order to deal with this issue, we take advantage of an exogenous government policy in Peru implemented in 1997, whose aim was to increase the quality of education in the country through a law enacted to promote the participation of the private sector in education[8]. In particular, we employ the net change in the number of

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[8] The law to Promote Private Investments in Education was issued in 1997 under Legal Decree 882. As a result of this law enrollment in public and private schools grew by nearly thrity percent between 1998 and 2010 nationwide. The private-fostering law prompted that the national school's

private schools in the different districts in Lima after this law was enacted as an exogenous source of variation for educational attainment. We limit our proposed instrument to primary schools as enrollment in this education level better captures the school expansion trend in Lima city (Balarin, 2012)[9]. We argue that this is a purely exogenous policy, which is orthogonal to risk attitudes in the population and are only affected through educational attainments. Furthermore, when focusing on the evolution of primary school openings by district since the law was enacted, we do not find any discernable pattern that may be linked to any observable, as several overlapping factors were at play in the process, such as district demand, entrepreneurship, vacant infrastructure, and several others[10].

Specifically, our proposed instrument is the accumulated variation of the number of new private primary schools across districts in Lima between years 2010 and 2000[11]. We define this variable Z_c as the difference between the number schools in 2010 located in district c ($school_{c,2010}$) minus the number of schools in 2000 ($school_{c,2000}$) divided by the latter number. Thus, we calculate the following equation: $Z_c = \left(school_{c,2010} - school_{c,2000}\right)/school_{c,2010}$. Our school information data come from the National School Registry, which provides basic information regarding the principal of the school (i.e. name, genre, and contact phone number), its district location, and the availability of basic services within the school (i.e. water, electricity, sanitation). These data were matched

enrollment rates doubled in fifteen years between 1998 and 2010, according to the National School Census. Please see Figure 1.

[9] Results do not change if we also include secondary schools.

[10] As an example, there is no clear pattern that relatively rich districts opened more schools after the law was enacted (Balarin, 2012).

[11] When using either the total number of schools or the number of public schools only, our findings do not change.

with data from the National School Census, which is collected by the Ministry of Education of Peru[12]. The census includes nearly 78,000 primary and secondary public and private schools located in over 1,800 districts nationwide. As mentioned above, we restrict our data to the net change in primary schools from 1998 and onwards from each of the 43 Lima districts[13]. From the census data we observe that most districts of Lima there was an expansion in the number of primary schools that range from 0.4 percent to 15 percent during the period under consideration. Interestingly, in five districts whose population accounts for just seven percent of the sample there was a slight decrease of about three percent on average in the cumulative number of schools during this same period. Overall, these is consistent with the process of deregulation in the provision of basic educational services in the country (see Balarín 2015, Arregui 2000, Du Bois 2004). Please see Figure 2.

INSERT FIGURE 2 HERE

As described above, in order to control for endogeneity issues we propose as instrument the accumulated variation of the number of schools that spans from 2000 to 2010, where our identification assumption is that any expansion or contraction in the

[12] Given some data limitations, the specific school census years employed were the following: 1998, 2000, 2001, 2002, and from 2004 to 2013.

[13] The districts in Lima are the following: Ancon, Ate, Barranco, Brena, Carabayllo, Chaclacalyo, Chorrillos, Cieneguilla, Comas, El Agustino, Independencia, Jesus Maria, La Molina, La Victoria, Lima, Lince, Los Olivos, Lurigancho, Lurin, Magdalena del Mar, Miraflores, Pachacamac, Pucusana, Pueblo Libre, Puente Piedra, Punta Hermosa, Punta Negra, Rimac, San Bartolo, San Borja, San Isidro, San Juan de Lurigancho, San Juan de Miraflores, San Luis, San Martin de Porres, San Miguel, Santa Anita Santa Maria del Mar, Santa Rosa, Santiago de Surco, Surquillo, Villa El Salvador, and Villa Maria del Triunfo.

number of schools that occurs in the district in which the individual i lives, have systematic effect on their risk adverse attitudes only through their education attainments. We propose that the instrument works as follows. Following an instrumental variables approach, Equation (3) represents the first stage in our estimation. We employ a two-stage least square method to test for the relationship between years of education of an individual instrumented by the accumulated variation of schools in his or her district of residence. The corresponding estimation is given by:

$$RiskAversion_i = \beta_1 E[Education_i|\bar{Z}_i] + \bar{X}_i'\beta_2 + \beta_3\overline{W_i} + \bar{S}_i'\beta_4 + \varepsilon_i \qquad (3)$$

where $RiskAversion_i$ embodies the risk aversion attitude of individual *i* that ranges from 1 (=lowest risk aversion) to 6 (=highest risk aversion). The vector $\bar{X}_{ijt}$ includes a set of covariates that have information on participants' age, gender, marital status and residence ownership[14]. We also control for employment (W_i) and a set of characteristics of the participants that attended the experimental session ($\bar{S}_i'$) along with individual *i*. While in our ordinary least square regressions we include district fixed effects, in the two-stage approach this is not necessaryas the variability of our instrument is at the district level. $E[Educ_i|\bar{Z}_i]$ is the predicted value of the educational attainments of individual *i*. It is obtained from:

$$Education_i = \pi_0 + \pi_1 Z_i + X_i'\pi_2 + \pi_3 W_i + S_i'\pi_4 + \mu_i \qquad (4)$$

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[14] As mentioned previously, a full description of the variables used is presented in Table 1.

In this second stage formulation, Z_i represents the instrumental variable, namely the accumulated variation between 2010 and 2000 in the number of schools in participants' district of residence. The same set of covariates as in equation (3) is included here, following a similar notation.

6. Findings

This section examines the effects of education on risk aversion, the latter measured via artefactual experiments. As described above, the first experimental task aims at measuring the unwillingness to take risks in a gamble setting with a known probability of higher or lower payoffs, we call this "normal risk attitudes". Similarly, the second risk measure addresses risk ambiguity in a gamble in which the participants has an unknown probability of higher or lower payoffs, which it is commonly labeled as "risk ambiguity". Finally, the last risk measure assesses a more extreme risk attitude, which is obtained in a gamble setting with a known probability of loss. This is commonly labeled as "loss aversion".

We present our ordinary least squares results in Table 4. This table includes our three risk aversion measures as dependent variables and focus on years of education as our key variable of interest. All our results include standard errors clustered at the district level, as well as fixed effects at the district level and fixed effects at the session level, when indicated. Our most straightforward specification is shown in columns 1, 4, and 7, which shows the results for our three risk measures and simply controls for education and fixed effects at all levels. We find that regardless of the specific risk attitude measure employed, the coefficient of our variable of interest is positive and statistically significant at one percent[15]. In this table we also present additional results that include a broad set of controls along the lines of Equation (1), which thus include key individual characteristics, socio-economic characteristics, and session characteristics, among them, age, gender, marital status, home ownership, employment, average age of the individuals per session, and others. For the sake of comparison, we include similar specifications with and without fixed effects at the session and district level. We find that our variable of interest is always positive and statistically significant at one percent or higher, which provides further evidence on the strength of the relationship between years of education and risk attitudes. Overall, we find that the added controls yield the expected signs, but are not statistically significant at conventional levels for most cases. In fact, in our most complete specification in Column 3, we find that an additional year of education is associated with an increase in risk aversion of about ten percentage points. In the case of risk ambiguity, whereas the resulting point estimates tend to be lower in terms of magnitudes, the increase in years of education is still linked to an increase of nearly ten percentage points in our risk ambiguity index, as derived from Column 6. Finally, in the case of Loss Aversion, we find that every additional year of education increases loss-prone attitudes by around 12 percent in the most complete specification, which is shown in Column 9.

Table 5 presents our endogeneity-corrected results when employing the identification strategy described above. As explained previously, we exploit the

[15] When including a quadratic term for education we find that the sign of the linear term remains positive and statistically significant at one percent, and the quadratic term yields a negative, but non-statistically significant coefficient. This finding is consistent of the specifications and methods employed. Given this, we do declined to present non-monotonic specifications in the paper.

continuous district-level variation in the number of primary schools that spanned from 2000 to 2010 at the district level in Lima and match this variable to each participant of the experimental sessions based on their report of their corresponding district of residence. Reduced-form regressions in Table 5 are described subsequently[16].

As in the previous table we report our findings for our three experimental risk-related measures, risk aversion, risk ambiguity, and loss aversion. As before, we also provide simple specifications that control for years of education only, but include clusters at the district level and fixed effects at the district and session levels. Similar to the previous table, in subsequent columns we progressively add additional controls. Specifically, the columns 1 to 3 show our risk aversion results. We find that the coefficients of the education variable are positive and statistically significant at conventional levels. In particular, for every additional year of education risk aversion in Lima increase by 19 to 35 percentage points, depending on the specification employed. In every specification the Kleibergen–Paap F-statistic largely passes largely the Staiger and Stock's (1997) threshold of 10 as defined by rule of thumb by Stock and Yogo (2005). In particular, our most complete specification in column 3 also passes this test. Thus, we are able to reject that the maximum IV size distortion is larger than 10 percent, which renders our instrument as a reasonably strong one.

We repeat this same approach, but employ risk ambiguity as the dependent variable. We show results in columns 4 to 6. Again, we find that our education coefficient is positive and statistically significant at conventional levels. As before, once corrected

[16] For the sake of economy we are not reporting first-stage regressions. However, they are fully available upon request.

for endogeneity in schooling our coefficients become substantially larger, which highlights the importance of addressing these issues in order to overcome a possible downward bias in the ordinary least squares results. As in the case of risk aversion we report the Kleibergen-Paap statistic as an under identification test and find that they are all above the required level. Finally, we repeat the same approach employing our third risk measure, namely loss aversion. The results are presented in the last three columns in Table 5. While in general the estimated coefficients do provide additional empirical support to a positive relationship between education and risk attitudes, our finding losses statistical significance at conventional levels in the more complete specification, which is shown in column 9[17]. Thus, while we find a very robust causal relationship for the two relatively less stringent experimental definitions of risk attitudes, we only find partial support for this finding in the more extreme definition employed.

7. Summary and Conclusions

In this paper provide empirical evidence on the link between risk aversion and education when using representative data from surveys and artefactual experiments in Lima, Peru. We find that the relationship between years of education and measures of risk attitudes is positive and statistically significant at conventional levels when employing ordinary least squares. Furthermore, we employ an exogenous government policy as part of our identification strategy, which is orthogonal to the dependent variable, and find evidence that, with one exception, supports a causal link that goes from years education to risk attitudes. Our results

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[17] We also employed ordered probits and IV ordered probits as an alternative method. Our findings very similar. Appendix 1 provides basic findings using the alternative method.

are closer in line to the studies that show a positive link, rather than a negative or non-monotonic one.

From a policy perspective our findings support the idea that more education may sometimes end up translating in unexpected decisions by individuals, which may help explain the apparent paradox of people failing to take advantage of new learned technologies, methods, or processes, regardless of capital or related resources. The fact that these unexpected behaviors are more prominent in more traditional, rural areas in developing countries is consistent with an increase in risk aversion due to more education. In future research we expect to further study these issues.

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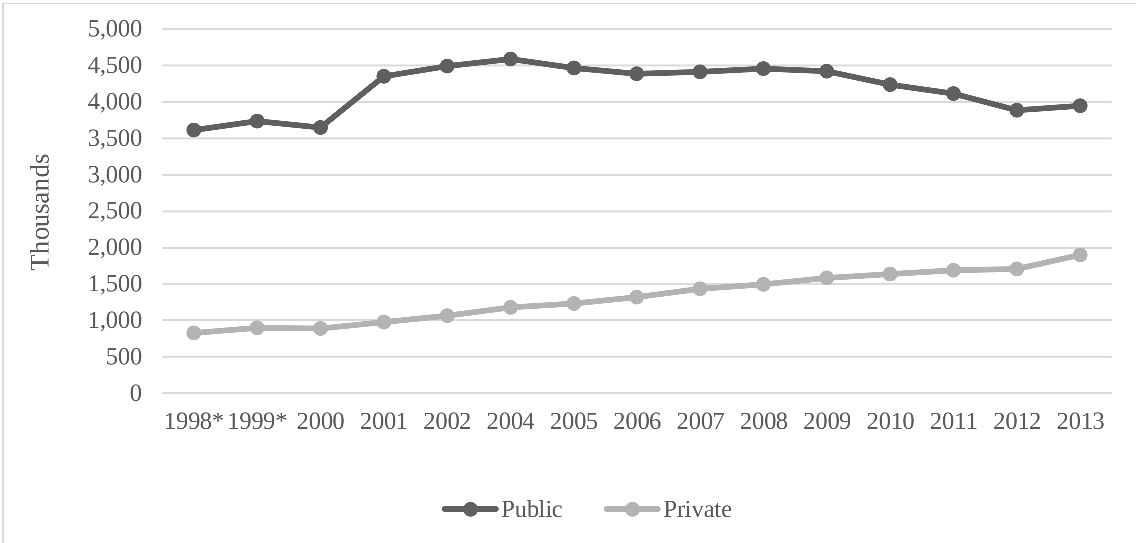
FIGURE 1. ENROLLED URBAN STUDENTS BY TYPE OF SCHOOLS, 1998-2013

(number of students from pre school, primary and secondary school)



Note: The enrollment rate was computed over the total of the urban population from 5 to 19 years old. (*) For 1998 and 1999 the population value was imputed using the *rate of natural increase (per thousand) 1950-1955 to 2045-2050*, compiled by INEI. Source: INEI: "Peru: Estimates and Projections 1950-2050 Demographic Analysis Bulletin No. 36"; MINEDU: School Census 1998-2002, 2004-2013.

FIGURE 2. ACCUMULATED VARIATION IN THE NUMBER OF SCHOOLS

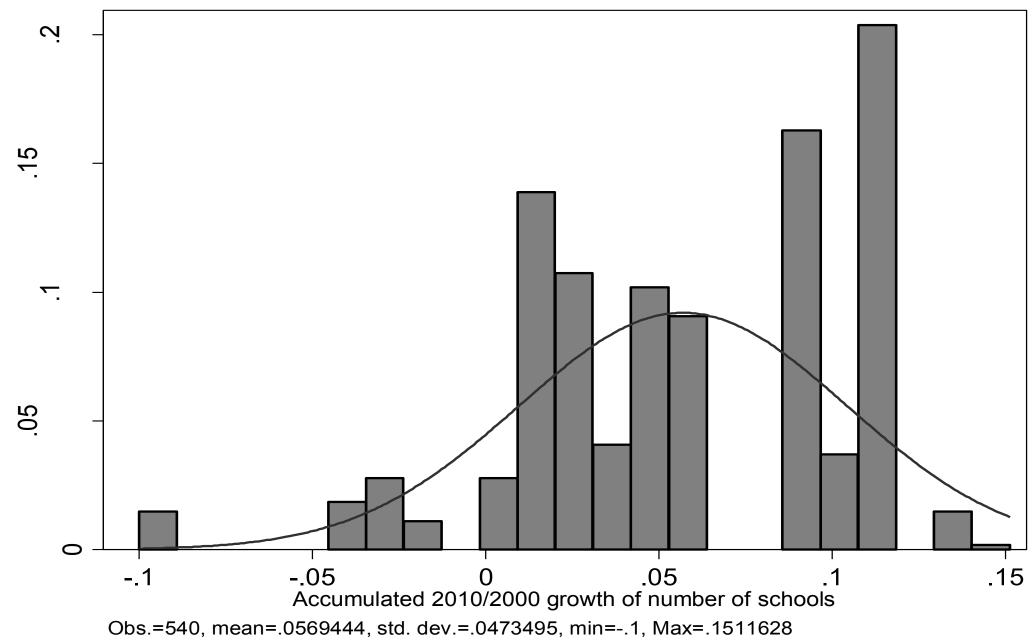


TABLE 1. VARIABLES DEFINITIONS

Variable	Definition
Individual characteristics	
Schooling	Number of years of education of the individual. *Source: Primary survey and experiments.*
Age	Age of the individual. *Source: Primary survey and experiments.*
Gender	Dummy variable that takes the value of 1 when the individual is female, and 0 if is male. *Source: Primary survey and experiments.*
Marital status	A categorical variable that indicates the marital status of the surveyed individual. It was converted into a set of dummies. A first dummy variable takes the value of 1 when the individual is married or joined and 0 otherwise. A second dummy variable takes the value of 1 when the individual has become widowed, separated or divorced, and 0 otherwise. In all regressions, the base category (omitted) was "Marital status; single". *Source: Primary survey and experiments.*
Type of ownership of house	A categorical variable that indicates the type of ownership of the house inhabited by the surveyed individual. Categories were regrouped and dichotomized as follows. A dummy variable that takes the value of 1 when the individual is an owner (house is fully paid or in payment process), and 0 if is not an owner (house is rented, leased, or occupied with permission or by force).
Socioeconomic characteristics	
Employment status	A categorical variable that indicates the employment status of the individual during the previous week to the survey: worker, did not worked the previous week but had a job, was searching for a job, was a student, was dedicated to household tasks, is retired or pensioner, or is permanently incapacitated to work. Categories were regrouped and dichotomized as follows. The resulting dummy variable takes the value of 1 when the individual is employed (worked or did not worked the previous week but had a job), and 0 otherwise. *Source: Primary survey and experiments.*
Session characteristics	
Percentage of women	*Source: Primary survey and experiments.*
Mean of age per session	*Source: Primary survey and experiments.*
Standard deviation of sex per session - dispersion of women	*Source: Primary survey and experiments.*
Standard deviation of age per session	*Source: Primary survey and experiments.*

TABLE 2. SUMMARY STATISTICS

	N	Mean	Std. Dev.	Min	Max
Individual characteristics					
Schooling (years)	540	10.7	3.8	0.0	21.0
Age (years)	540	37	13	17	76
Gender: Female (%)	540	0.5	0.5	0.0	1.0
Marital status (%)					
Single	540	0.4	0.5	0.0	1.0
Married or joined	540	0.5	0.5	0.0	1.0
Widow, separated, divorced	540	0.1	0.3	0.0	1.0
Type of ownership of house (%)					
Formal owner	540	0.5	0.5	0.0	1.0
Socioeconomic characteristics					
Employment status: employed (%)	540	0.6	0.5	0.0	1.0
Risk attitudes					
Risk aversion	540	4.1	1.6	1.0	6.0
Risk ambiguity	540	4.3	1.6	1.0	6.0
Loss Aversion	540	3.6	1.9	1.0	6.0
Session characteristics					
Number of players	540	22.6	4.6	14.0	32.0
Percentage of women	540	53.6	12.2	22.7	83.3
Standard deviation of sex per session - dispersion of women	540	0.5	0.0	0.4	0.5
Mean of age per session	540	35.1	3.4	25.9	41.3
Standard deviation of age per session	540	12.4	2.6	6.8	16.3

TABLE 3. CORRELATION MATRIX

	Schooling	Risk Aversion	Risk ambiguity
Risk Aversion	0.0424		
Risk ambiguity	0.0587	0.5567	
Loss aversion	0.0761	0.3965	0.4001

Pairwise correlations are reported.

TABLE 4. EDUCATION AND RISK ATTITUDES: ORDINARY LEAST SQUARES

Dependent Variable	Risk Aversion			Risk Ambiguity			Loss Aversion		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Individual characteristics									
Years of education	0.0865***	0.113***	0.103***	0.0785***	0.0967***	0.0960***	0.142***	0.117***	0.115***
	(0.0187)	(0.0196)	(0.0216)	(0.0199)	(0.0308)	(0.0324)	(0.0193)	(0.0197)	(0.0198)
Age		-0.0130*	-0.0140**		-0.00654	-0.00735		-0.0108**	-0.0119**
		(0.00685)	(0.00622)		(0.00691)	(0.00639)		(0.00469)	(0.00483)
Gender: female		0.145	0.173		0.314**	0.326**		0.328**	0.375**
		(0.192)	(0.191)		(0.152)	(0.142)		(0.160)	(0.144)
Marital status: married or joined		0.224	0.253*		0.0264	0.0343		0.209	0.221
		(0.156)	(0.142)		(0.173)	(0.191)		(0.153)	(0.134)
Type of ownership of house: formal owner		-0.0150	-0.127		-0.0684	-0.0340		0.359	0.318
		(0.222)	(0.199)		(0.251)	(0.223)		(0.318)	(0.234)
Socioeconomic characteristics									
Employed		-0.108	-0.0498		-0.131	-0.119		-0.0943	0.00474
		(0.125)	(0.152)		(0.141)	(0.145)		(0.109)	(0.127)
Session characteristics									
Percentage of women		0.0123*	0.0277***		0.0146**	0.0122		-0.0157*	-0.0114
		(0.00696)	(0.00944)		(0.00623)	(0.0100)		(0.00930)	(0.0113)
Mean of age per session		-0.0639**	-0.0517		-0.0210	-0.0677		0.00340	0.0262
		(0.0262)	(0.0499)		(0.0305)	(0.0422)		(0.0398)	(0.0713)
Standard deviation of sex per session - dispersion of women		-1.330			4.018			1.764	
		(2.871)			(3.127)			(2.501)	
Standard deviation of age per session		0.134***	-0.00823		0.0729**	0.0152		0.0664	0.00821
		(0.0379)	(0.0838)		(0.0360)	(0.0545)		(0.0497)	(0.110)
Constant	3.163***	3.824**	3.658***	3.454***	0.495	4.564***	2.063***	1.323	1.598
	(0.227)	(1.862)	(1.200)	(0.233)	(2.351)	(1.243)	(0.274)	(1.641)	(1.211)
Session Fixed Effects	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes
District Fixed Effects	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes
SE Clustered by District	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	540	540	540	540	540	540	540	540	540
R-squared	0.034	0.112	0.180	0.034	0.071	0.149	0.085	0.126	0.197

FE= Fixed effects. SE= standard errors. The observations are at the participant level. Robust standard errors are reported in parenthesis. Coefficients that are significantly different from zero are denoted by the following system: * = 10%; ** = 5%; *** = 1%.

TABLE 5. EDUCATION AND RISK ATTITUDES, INSTRUMENTAL VARIABLES

	Risk Aversion			Risk Ambiguity			Loss Aversion		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Individual characteristics									
Years of education	0.185***	0.270***	0.348*	0.139***	0.229***	0.325*	0.130**	0.111*	0.126
	(0.0630)	(0.0910)	(0.210)	(0.0516)	(0.0716)	(0.170)	(0.0551)	(0.0749)	(0.142)
Age		-0.00110	0.00317		0.00350	0.00871		-0.0113*	-0.0112
		(0.0101)	(0.0161)		(0.00774)	(0.0119)		(0.00590)	(0.0102)
Gender: female		0.0974	0.143		0.274*	0.298**		0.330**	0.374***
		(0.182)	(0.173)		(0.149)	(0.146)		(0.164)	(0.143)
Marital status: married or joined		0.260	0.263*		0.0566	0.0436		0.208	0.222*
		(0.171)	(0.155)		(0.138)	(0.161)		(0.154)	(0.131)
Type of ownership of house: formal owner		-0.231	-0.299		-0.250	-0.195		0.367	0.310
		(0.240)	(0.210)		(0.248)	(0.201)		(0.270)	(0.217)
Socioeconomic characteristics									
Employed		-0.175	-0.169		-0.187	-0.230		-0.0918	-0.000407
		(0.127)	(0.165)		(0.126)	(0.143)		(0.111)	(0.122)
Session characteristics									
Percentage of women		0.0274**	-0.0300		0.0273***	-0.0235		-0.0162	-0.0458*
		(0.0117)	(0.0308)		(0.0100)	(0.0400)		(0.0132)	(0.0253)
Mean of age per session		-0.0574*	-0.105		-0.0155	-0.160		0.00316	0.150
		(0.0329)	(0.419)		(0.0265)	(0.288)		(0.0393)	(0.205)
Standard deviation of sex per session - ersion of women		1.720	-14.75		6.586**	-11.54		1.651	-0.339
		(3.561)	(25.75)		(3.105)	(20.66)		(2.749)	(13.63)
Standard deviation of age per session		0.149***	0.0689		0.0857**	0.0998		0.0659	-0.0758
		(0.0448)	(0.224)		(0.0413)	(0.143)		(0.0506)	(0.143)
Constant	2.133***	-0.870	12.10	2.802***	-3.457	11.59	2.185***	1.497	0.622
	(0.677)	(3.630)	(25.70)	(0.554)	(2.665)	(20.51)	(0.620)	(2.971)	(12.50)
Session Fixed Effects	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes
District Fixed Effects	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes
SE Clustered by District	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	540	540	540	540	540	540	540	540	540
Under identification test (KP rk LM stat)	30.03	34.20	10.17	30.03	34.20	10.17	30.03	34.20	10.17

FE= Fixed effects. SE= standard errors. The method of estimation is two-stage least squares. The observations are at the participant level. Robust standard errors are reported in parenthesis. Coefficients that are significantly different from zero are denoted by the following system: * = 10%; ** = 5%; *** = 1%. Instrument: Accumulated growth (%) of number of primary schools 2010-2000, by participant's district of residence

APPENDIX 1. EDUCATION AND RISK ATTITUDES, ORDERED PROBITS

	Risk aversion	Risk ambiguity	Loss aversion
Individual characteristics			
Years of education	0.110***	0.112***	0.118***
	(0.0268)	(0.0383)	(0.0236)
Age	-0.0136*	-0.00615	-0.0119***
	(0.00825)	(0.00865)	(0.00457)
Gender: female	0.185	0.392**	0.425***
	(0.226)	(0.177)	(0.161)
Marital status: married or joined	0.227	-0.0733	0.151
	(0.168)	(0.246)	(0.159)
Type of ownership of house: formal owner	-0.235	-0.0182	0.320
	(0.229)	(0.273)	(0.237)
Socioeconomic characteristics			
Employed	0.0249	-0.0279	0.105
	(0.192)	(0.177)	(0.134)
Session characteristics			
Percentage of women	-0.0431	-0.0544	-0.0785
	(0.101)	(0.0700)	(0.0537)
Mean of age per session	-0.0194	-0.167*	0.0105
	(0.134)	(0.0955)	(0.119)
Standard deviation of sex per session - dispersion of women	-16.54	-21.26	-14.11
	(28.63)	(21.25)	(17.29)
Standard deviation of age per session	-0.0256	0.000998	-0.124
	(0.195)	(0.136)	(0.113)
Constant	-13.12	-20.23	-12.64
	(25.05)	(17.66)	(15.51)
Session Fixed Effects	Yes	Yes	Yes
District Fixed Effects	Yes	Yes	Yes
SE Clustered by District	Yes	Yes	Yes
Observations	540	540	540
Pseudo R-squared	0.00921	0.0321	0.0321
Wald chi2	20.66	43.52	179.5
Prob > chi2	5.48e-06	4.01e-06	0
Log pseudolikelihood	-912	-8.427e+06	-8.427e+06
Clusters	48	48	48

FE= Fixed effects. SE= standard errors. The method of estimation is maximum likelihood. The observations are at the participant level. Robust standard errors are reported in parenthesis. Coefficients that are significantly different from zero are denoted by the following system: * = 10%; ** = 5%; *** = 1%.