

PARENTAL RISK AVERSION AND INVESTMENT IN CHILDREN'S EDUCATION

Janaska Nurrachmat^a

Prani Sastiono^b

^{ab} Faculty of Economics and Business, Universitas Indonesia

Email: janaska.nur@gmail.com^a

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Name: Janaska

Nurrachmat

E-mail:

janaska.nur@gmail.com

ABSTRACT

Introduction: The purpose of this study is to investigate the relationship between risk aversion and spending in children's education. Spending in children's education can be classified as an investment with uncertain outcomes and the return might yield in a relatively long time. It is predicted in this study that risk aversion will have negative impact on spending in children's education.

Methods: This study uses IFLS data and two-period panel regression. Multiple time periods are applied to demonstrate time-varying risk aversion.

Results: The results suggest that lower degree of parental risk aversion increases the spending on children's education, which confirms the theory.

Conclusion and suggestion: The result showed that risk aversion significantly affects the spending on children's education. As a consequence, the government should provide clear information about how important an education is, especially a higher degree. Providing the information may drive the parent to not view education for children as a risky investment.

INTRODUCTION

Education during early childhood is the first stepping stone on building human capital and can be considered very important to an individual, since childhood is the best time to form cognitive skills (Cunha and Heckman 2008, 2007). High human capital typically creates a highly qualified worker, which is crucial for developing an economy. In 1958, Jacob Mincer introduced us to his famous equation, which describes wage as a function of schooling and experience (Borjas, 2013). Thousands of articles have been published worldwide to show the positive relationship between wage and education empirically. However, the education decision of an individual from early childhood until high school or even tertiary education depends heavily on the parents.

As we all know, children do not have enough money to invest in education for themselves, and their freedom to decide is limited by regulation due to their psychological instability. This dependency has a more substantial effect in developing countries because some countries cannot afford to apply longer years in mandatory schooling. One of the reasons parents decide to finance children's education is the expectation that the children will get a better life since higher education could later result in higher wages or salaries. If we look from an economic perspective, then this scheme could be portrayed as a long-term investment. The distinction between this kind of investment and average investment is the yield will come over an extensive period of time, and it is hard to keep track of the spending and the yield itself. As a result, it is difficult to calculate the actual investment, and the real return of investment of children's education. Investment always comes with risk, and every individual has a different perception of it. Most parents in developing countries prefer their children to make money as fast as possible rather than sending them to a school. They are also afraid that the children will still not get a job despite many years of schooling. This could be one reason why the poor have difficulty getting out of poverty.

According to the report from the Indonesian Statistic Bureau or BPS (2020), the percentage of the population who have finished secondary education (high school or equivalent) was only around 26%, and only 9.26% of the population possessed high educational background (university or equivalent). However, these figures are deficient if we compare them with other OECD countries. For example, on average, the percentage of secondary graduates in OECD countries is 86.2%, and almost 50% of the population in OECD countries has tertiary education.

As reported by Allen (2016) from the Asian Development Bank, the chance of a getting a full-time employment is higher when an individual has a higher degree of education. If an individual possesses a higher educational degree, it might attract a better potential firm because higher educational degree can be used as a "signal" for productivity (Spence, 1973). According to Barro and Sala-i-Martin (1995) and Romer (1996), human capital is the main factor explaining why some countries have different income levels despite the same level of population and capital stock. In addition, in the conditional convergence model, investment in human capital affects the speed of convergence considerably, the more significant the proportion of educated individuals the faster a country reaches its steady state. Based on that information, all countries worldwide are always trying to push their numbers and figures in education, especially in developing countries.

Unfortunately, education always comes with a cost. Even if a tuition-free policy is applied, the schooling activity is still attached with another spending that must be financed privately. For example; transport, stationery, or uniform in some countries. Because children are unable to finance themselves in their early stages of life, their educational fate will, therefore, be decided by their parents. Wölfel and Heineck (2012) believed that

educational decision is an investment with uncertain outcomes. Thus, in this context, spending in education on children is dependent on parents' risk preferences. Risk preferences can be described as an individual's behavior when he/she must decide between risky or less risky options. An individual can be defined as risk-averse when he/she prefer less risky options in almost everyday situations, in contrast less risk-averse individual will prefer more risky options.

Tabetando (2019) argued that parents have to face many risks. Parents may misjudge their children's ability, they might also not fully know the motivation of their offspring, and future labor market conditions may also add uncertainty. Besides financial risk, schooling can be associated with physical risk. In some remote locations, schooling activity can be classified as dangerous. Lack of adequate road and infrastructure make the journey hazardous; the long-distance journey may discourage the parents from sending the children to school because the children might walk in the night or get lost in the middle of the road. Furthermore, wild animals nearby can worsen the situation (Tanaka and Yamano 2015).

Dohmen et al. (2010) argued that if we estimate decisions in human capital investment without considering risk or time preferences, it could lead to biased results because the economic decision is also considerably determined by them. Few studies have shown that risk preferences have significance impact on various economic decisions in Indonesian individuals (Chowdhury, 2016; Goldbach and Schlüter, 2018; Anandari and Nuryakin, 2019). To the best of the author's knowledge, study that investigates the effect of preferences on investment of education for children is still scarce, which means, based on the above-mentioned knowledge, previous models that attempted to estimate the formation of human capital investment might suffer from omitted variable bias.

In this research, the author wants to explore the relationship between individual's risk preferences and the decision to invest in his/her children's education. To date, the number of researches that seek relationship between risk aversion and investment in children's education is still rather low. This can be another motivation why this research should be carried out, so we can give more contribution in the literature of human capital formation. If this research shows that risk preference has high and significant influence on education investment for children, this could help the government in policy making, such as managing aid and tuition fees, so that the people's perception of risk in education investment in Indonesia could change. The government can also influence the labor market situation by providing more lucrative jobs, allocating more benefits, guaranteeing that the highly educated will get decent jobs and receive proper wage in the future, so that the return could compensate for initial investment. Therefore, the improved policy is expected to have a significant impact on total human capital investment in the whole country.

LITERATURE REVIEW

To the author's knowledge, research investigating the relationship between risk aversion and education spending in Indonesia has not been conducted yet. However, some studies have been conducted to explain the effect of risk aversion in Indonesia. For instance; risk aversion and the choice of employment in the private/public sector (Anandari and Nuryakin, 2019), risk aversion and out-migration (Goldbach and Schlüter, 2018), comparison of risk preferences between entrepreneur and non-entrepreneurs (Sohn, 2017), and the effect of risk and time preferences on smoking behavior (Chowdhury, 2016).

Research concerning education spending for children in Indonesia has been carried out by Maulana and Ginting (2020) who focused on the question: Does education spending differ between biological children and adopted children? The result showed that adopted children receive more financial resources for education, which surprisingly contradicted with the common belief in Indonesia. Feng (2020) carried out relevant research and stated that sibling size negatively impacts the children's educational attainment in the same household. Resosudarmo and Suryadarma (2014) claimed the children who migrated to the city attain three more years of education than their rural counterparts.

In other countries, most existing literature examined the relationship between the risk preferences of an individual and his/her own decision. For instance, how does my risk preference affect my decision to enroll in a university or not, or the decision of having a baby or getting married (Belzil and Leonardi, 2007; 2013; Schmidt, 2008; Spivey and Christy, 2010; Brodaty et al., 2014)? . Unfortunately, however, empirical studies investigating the effect of risk preference on educational spending for the offspring have not been carried out very often.

Wölfel and Heineck (2012) were presumably the first authors who wrote about the topic; they researched in Germany to estimate the effect of parents' risk preferences on the choice of children's secondary school. In Germany, there are several types of secondary school. There is a type a school that can allow the pupil to study in a university, while the other can only bring the pupil to vocational school. Checchi et al. (2014) carried out similar research in Italy, where they investigated the relationship between the risk preference of a parent and the decision, either they send their son/daughter to college or not. Other notable research was conducted by Tanaka and Yamano (2015) and Tabetando (2019). The former analyzed the impact of risk and time preferences on school attendance, delayed enrollment, and education expenditure. The latter investigated if the parents' risk preference could change the percentage of household expenditure in terms of education spending for children. Both studies used data from Uganda.

To explain the relationship between risk aversion and educational investment for children, Tabetando (2019) and Checchi et al. (2014) developed a mathematical model. In this two-period model, the utility function of a parent is described as $U_t = C_t + \beta \frac{Y_{t+1}^\sigma}{\sigma}$, and consists of consumption in the first period and earning Y_{t+1} from the children in the second period, σ is the risk aversion of a parent¹, while β explains parents' altruism².

In this model, we assume that the return of education is measured by children's human capital, because human capital is the most influential factor to explain someone's earnings. The human capital of children is a production function from investment from the parent I_t and partially observed ability of children A_{t+1} . The function is formulated as $H_{t+1} = I_t^a A_{t+1}^{1-a}$.³ In this model we assume there are two types of ability, A_1 & A_2 , where A_2 describes high ability and the distribution comes with the probability q . In this formula, we assume that every investment a parent makes will result in a positive outcome. With the budget constraint $Y = C - I$ the maximization problem is illustrated as:

$$\begin{aligned} \max_{I_t} E [U_t] &= \max_{I_t} E [(Y_t - I_t) + \beta \frac{(I_t^a A_{t+1}^{1-a})^\sigma}{\sigma}] & (2.1) \\ \text{S.t } I_t &< Y_t & - \lambda(I_t - Y_t) \end{aligned}$$

Lagrange

$$L = [(Y_t - I_t) + \beta \frac{(I_t^a A_{t+1}^{1-a})^\sigma}{\sigma}] - \lambda(I_t - Y_t) \quad (2.2)$$

Or

$$L = [(Y_t - I_t) + \beta \frac{(I_t^a)^\sigma (pA_1^{(1-a)} + (1-p)A_2^{(1-a)})^\sigma}{\sigma}] - \lambda(I_t - Y_t) \quad (2.3)$$

Then, the first order condition is

$$\frac{\partial L}{\partial I_t} = \beta a I_t^{a\sigma-1} [pA_1^{(1-a)\sigma} + (1-p)A_2^{(1-a)\sigma}] - \lambda - 1 = 0 \quad (2.4)$$

$$\lambda \geq 0, I_t \leq Y_t \text{ and } \lambda(I_t - Y_t) = 0$$

¹ $0 < \sigma < 1$

² $\beta > 0$

³ $0 < a < 1$

Solving the equation for I_t^* and differentiating again with respect to σ , we will have a positive correlation between σ and I_t^* .⁴ Higher σ means that the individual is less risk averse, because risk aversion is measured by $(1 - \sigma)$ and, therefore, less risk aversion increases the spending. The derivation of other variables also showed that spending in education increases in altruism, income and, ability from children and parents (Checchi et al., 2014; Tabetando, 2019).

Wölfel and Heineck (2012) show that risk-averse fathers decreased the probability of children studying in lower school track. However, risk-averse mothers increased the probability for the children to enroll in lower school track. In Germany, the lower school track has a shorter school duration and the graduate continues to the vocational school, on average generating money faster but lower than the higher school track graduate. Checchi et al. (2014) stated that parental risk aversion decreases the probability of children's college enrollment, and highly risk-averse parents have significantly negative effect.

Tanaka and Yamano (2015) examined the impact of risk and time on three different dependent variables; education spending, school attendance, and delayed enrollment. Although they claimed that risk aversion delayed the school enrollment of children, risk aversion did not satisfy the rest of the explained variables' expectation. This result might be caused by the lack of female head of household, and the study only observed one period of time. In the study by Tabetando (2019), which was also carried out in Uganda but was analyzed using longitudinal data, the estimation with total sample explained that risk aversion did not affect education spending. However, the result showed that risk aversion decreased the educational expenditure for children in a more impoverished household.

RESEARCH METHODS

In this study, the author will use Indonesia Family Life Survey (IFLS). IFLS is a longitudinal survey from Indonesia; it has been collected from the same household five times since 1993 and each wave contains information from more than 30,000 respondents in 13 different provinces across Indonesia. This study will use the dataset from wave four and five, the former was collected in 2007, the latter in 2014.

This study will use 2-period panel data regression. The main characteristic of panel data is observing the same individual (person, firm, region, etc.) over multiple periods. In panel data, there are three types of estimation; Pooled OLS, Fixed effect, and Random effect. Each type has a different method to treat individual heterogeneity effect. In order to find the suitable method, a specification test must be carried first (Wooldridge, 2016).

⁴ See appendix for mathematical derivation

The empirical models can be illustrated as:

POLS:

$$Y_{it} \equiv \alpha + \beta_1 Risk_{it} + \gamma X_{it} + \delta Z_{it} + \theta V_{it} + \varepsilon_{it}$$

FE

$$Y_{it} \equiv \alpha_i + \beta_1 Risk_{it} + \gamma X_{it} + \delta Z_{it} + \theta V_{it} + \varepsilon_{it}$$

RE

$$Y_{it} \equiv \alpha + \beta_1 Risk_{it} + \gamma X_{it} + \delta Z_{it} + \theta V_{it} + c_i + \varepsilon_{it}$$

Y_{it} describes how much a head of household spent for all their children's education in a year and measured in rupiah. $Risk_{it}$ is a dummy variable that characterizes risk aversion of an individual. To fill a research gap, we assume that the risk aversion is a time-varying variable. Guiso et al. (2018) stated that risk aversion could change over time and possible explanations are change in wealth, expected income, and change in utility function caused by emotion. Sakha (2019) also has the same argument; he found that macro and micro level influence could alter risk aversion over time. Time preference is also constructed and assumed in the same method; the variable is put in X_{it} . It also contains control variables that define other parental backgrounds such as income, education level, age, and wealth. δZ_{it} consists of other control sets which describe household traits such as how many people are in the household, how many children they have and are there any children who study at tertiary level? θV_{it} is a control variable which differentiates either the household lives in the urban or rural area.

Table 1. Description of Variables

Variable	Description
Spendeduc (Dependent variable)	Education expenditure per school age children in rupiah
Scorerisk	0 indicates highly risk-averse individual, 4 indicates least risk averse individual
scoretime	0 indicates most patient individual, 4 indicates least patient individual
hhsiz	Total of all household member
income	Monthly income of household's head in rupiah., acquired from expenditure per month
Wealth	Total asset of household in rupiah
Age	Age of head of household
Higheduc	Education of household 1 means head of household has college degree or equivalent

Urban	Dummy variable 1 if individual lives in urban area
numchild	Number of children in the household (biological and adopted)
childuniv	Dummy variable 1 means one of the children in a household has college degree or equivalent
childSHS	1 means the highest educational attainment from children is a degree in upper secondary or equivalent
childJHS	1 means one of the children in a household has a degree in lower secondary school or equivalent
childELE	1 means one of the children in a household has a degree in elementary school or equivalent

Derivation of the mathematical model from Checchi et al. (2014) and Tabetando (2019) predicted that variable income or wealth would positively correlate; head of household who possesses more resources is expected to spend more. High education can roughly represent the high ability of an individual; this also predicted to have positive value. We can easily assume that highly educated individuals will appreciate the value of education more than others and if a household has a child who pursues education in upper secondary or higher, the household will spend more.

In addition, highly educated and wealthy individuals are frequently found in a place with a higher population density. Therefore, the variable *urban* is forecast to have a positive value. Sibling size might have an ambiguous result, Feng (2020) reported that many studies exhibited that number of children is negatively correlated with children’s education. However, other research showed a positive correlation between sibling size and children’s education. This might well also be applied in the variable, which explains how many members a household has. If a family has too many members, it might discourage the head from spending on education because the daily expenses are already high. However, a large household can also be associated with a wealthy family.

RESULT AND ANALYSIS

Table 2 shows the summary statistic from the two-period panel data. By the time gap of IFLS, the head of household with children aged 7-22 in the year 2007 and the head of household with children 14-29 with children aged 14-29 in 2014 will be observed. Around 97% of head of household in this panel data is male.

Table 2. Summary Statistic

Variable	Obs	Mean	Std. Dev.	Min	Max
spendeduc	5124	3.048.704	6.561.332	0	197 Mil.
scorerisk	5124	0.86	1.14	0	4

scoretime	5124	0.59	0.95	0	4
age	5124	46	8.92	24	87
higheduc	5124	0.105	0.30	0	1
income	5124	250.118.60	1.621.857	0	100 Mil.
wealth	5124	29.4 Mil.	87.1 Mil.	0	2.240 Mil.
hhsiz	5124	5.21	1.91	2	18
numchildren	5124	2.32	1.12	0	9
childELE	5124	0.60	0.48	0	1
childJHS	5124	0.41	0.49	0	1
childSHS	5124	0.43	0.49	0	1
childuniv	5124	0.12	0.32	0	1
urban	5124	0.54	0.49	0	1

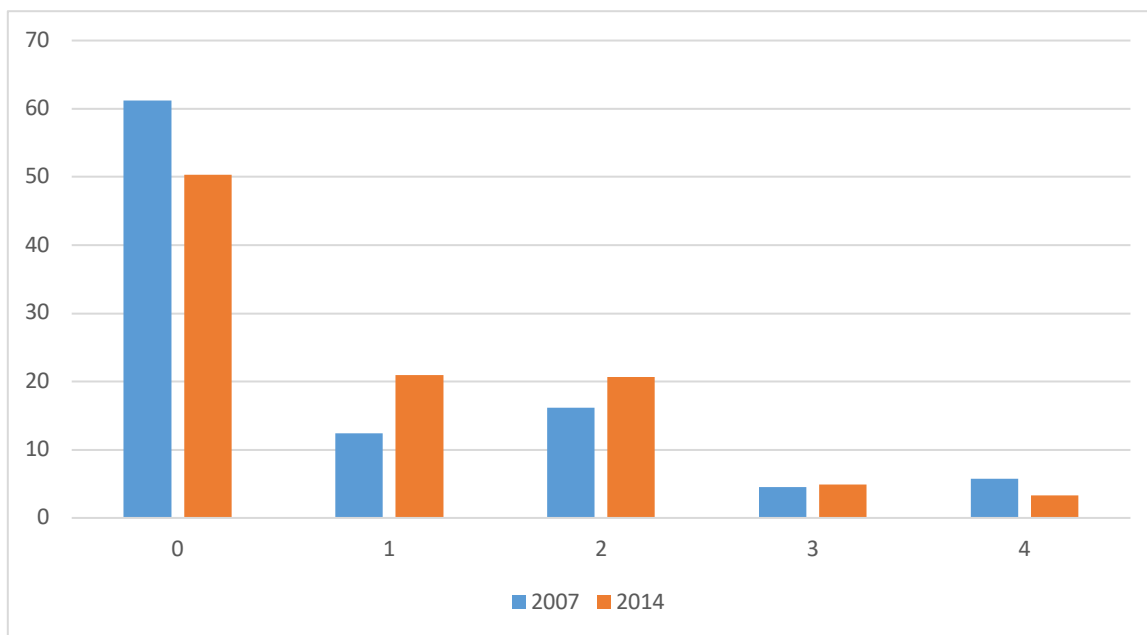


Figure 1. Distribution of risk preferences

Figure 3 shows the distribution of risk preferences in the sample; 0 means the individual is highly risk-averse while 4 represents least risk-averse individuals. We can derive from the table that the head of household in Indonesia is always dominated by a highly risk-averse individual. Another interesting finding is that the percentage of risk-tolerant individual (category 3 & 4) is deficient compared to risk-averse individuals. Religion demographic in Indonesia could be a reason for the distribution, because specific religion forbids gambling and speculative economic transactions. As a consequence, risk-taking behavior might become unpopular opinion or considered awful by society (León and Pfeifer, 2017). However, we can claim that risk aversion in the population was

diminishing. In other words, there are more less risk-averse individuals in 2014 than in previous observation years.

Previous studies investigating the relationship between risk preferences and spending in education assumed that risk preferences were constant. Therefore, most of the studies were not observing the individual in multiple periods. However, from Table 5 it is found that risk preferences from 780 individuals, or around 61%, varied between the period 2007 and 2014. These findings can be additional proof for the studies of Guiso et al. (2018) and Sakha (2019) which claimed that preference could be varied over time and various aspects could be the reason for the change. Thus, this information supports the application of longitudinal study with time-varying preference.

Table 1. Variation in risk preferences across time

2007	2014					Total
	0	1	2	3	4	
0	406	167	154	32	18	777
1	80	28	43	10	5	166
2	91	35	47	12	7	192
3	27	9	15	9	3	63
4	30	11	25	6	5	77
Total	634	250	284	69	38	1275

Source: IFLS

Between IFLS wave 4 and 5 there is a 7 year gap, the amount for education spending could be considerably different between two periods, and the change is not solely caused by the change in risk aversion; the economic condition may affect the decision. For instance, in the 7-year gap a household might become richer, or have more resource to spend on education. The educational degree of children also plays significant role, in the 7-year gap the children are expected to study at a higher degree, which may cost more money, and, thus, change the spending behavior of the household.

Figure 3 exhibits the distribution of income quintile from all households over the year 2007 and 2014. The finding is that the percentage of relatively wealthier households increased, which means there were more wealthy households in 2014. Figure 4 shows the number of children in each educational degree over the two periods from all households. It is shown in the graph that after a 7-year period there are more children who studied at a higher degree and higher academic degree is always associated with higher cost⁵.

⁵ Figure 5 in the appendix shows that spending for upper secondary school and tertiary education is on average higher.

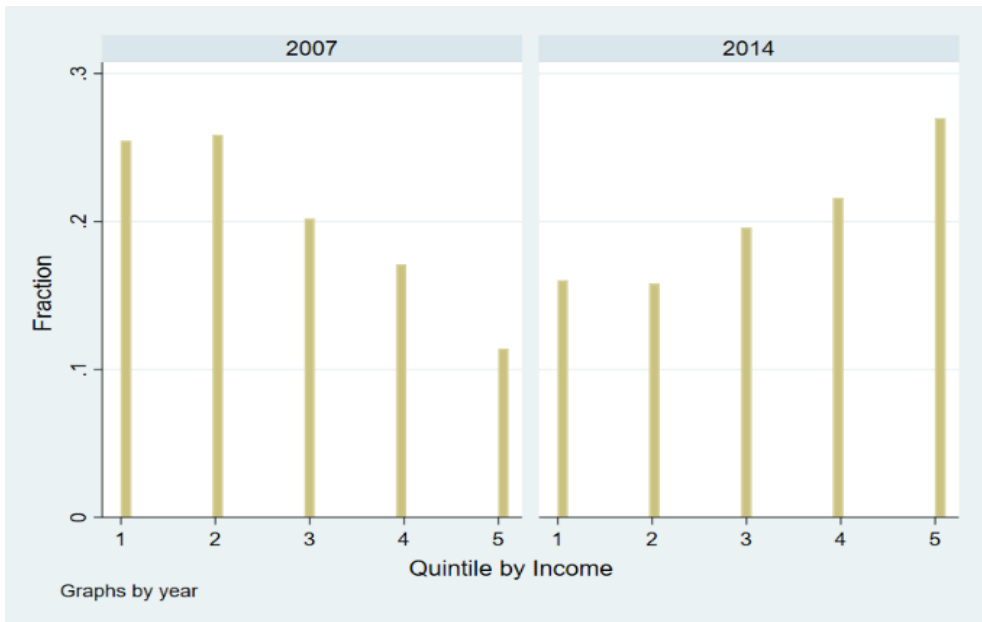


Figure 1. Distribution of income 2007 & 2014

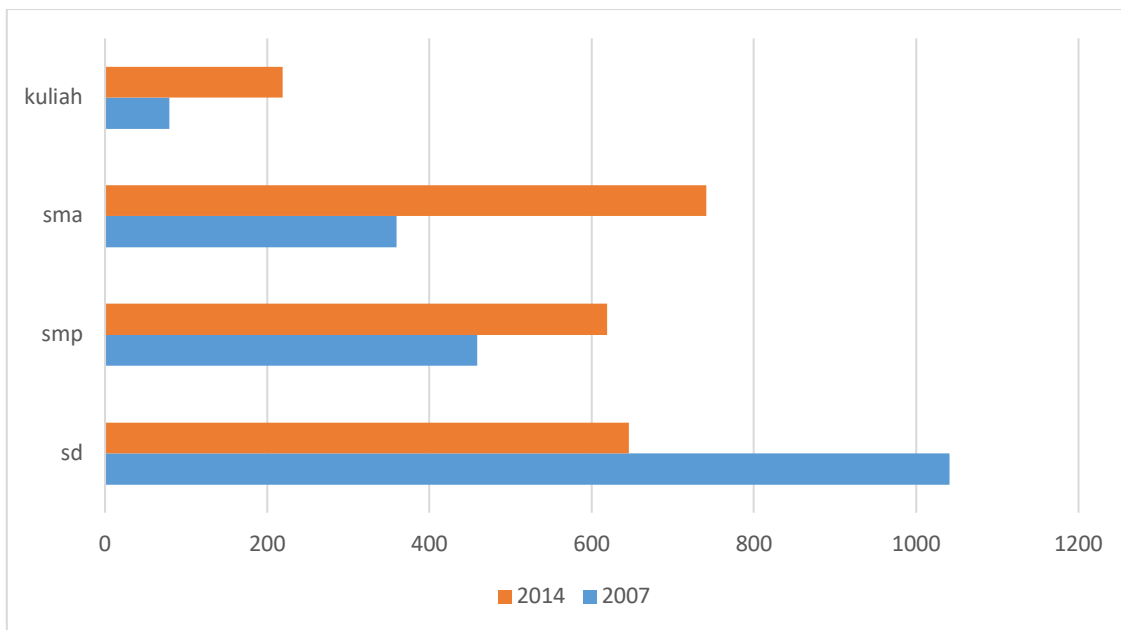


Figure 2. Number of children in different school degree

Table 4 shows the estimation with panel data with the main independent variable described as a categorical variable, the first column (1) shows the main model, while the second column (2) shows the estimation with interaction variable; risk_shs and risk_univ. The former explains the effect of risk aversion and if a household has a child who studied in upper secondary school the latter measures the effect of risk aversion and children with tertiary education. The interaction term assumes that the impact of risk aversion on

spending in children’s education is different for different school degree for children. The impact of risk-averse individual who has children that still sit in high school might differ from an individual that has children who study in the university.

Table 2. Estimation results

	Model 1		Model 2	
	coeff.	t-sta	coeff.	t-sta
scorerisk	187914.6*	(2.32)	56897.6	(0.59)
scoretime	-74747.9	(-0.94)	-78039.7	(-0.99)
age	361268.8***	(5.84)	358926.6***	(5.77)
age-sq	-3921.3***	(-6.08)	-3894.2***	(-6.01)
higheduc	2919523.1***	(5.05)	2943275.6***	(5.07)
income	0.00929	(0.18)	0.00972	(0.19)
hhsz	-192847.1***	(-4.39)	-191661.0***	(-4.34)
urban	694517.3***	(4.10)	701596.1***	(4.21)
wealth	0.0111***	(3.60)	0.0111***	(3.59)
numchildren	-189030.5*	(-2.08)	-191450.9*	(-2.10)
female	-1309182.4**	(-3.12)	-1308797.2**	(-3.13)
childELE	-878078.7***	(-4.14)	-886533.2***	(-4.21)
childSHS	865748.7***	(4.28)	706212.0**	(3.10)
childuniv	2541303.6***	(5.81)	2130218.5***	(3.98)
risk_shs	.	.	175956.1	(1.01)
risk_univ	.	.	472852.0	(1.03)
cons	-4763962.5***	(-3.56)	-4601189.0***	(-3.40)
N	5124		5124	

The specification test from both model shows that there is no panel-wise effect and the variance of the random effect is zero⁶. Therefore, pooled OLS is more suitable for this sample data. As displayed by the first columns risk aversion has significant effect on spending in children’s education; an increase of one level on *scorerisk*, which represent less risk aversion, is expected to increase the amount of spending education for children. This result confirms the theory presented by Tabetando (2019) and Checci et al. (2014).

According to the estimation time preference does not significantly affect the decision of spending in children education. Variables such as *higheduc*, *urban*, *wealth* have significantly positive effect on the dependent variable. Whereas age, household size,

⁶ Model 1 Prob>F=0,9448(Chow), Prob>chibar2=1 (BPLM)
 Model 2 Prob>F=0,9500(Chow), Prob>chibar2=1 (BPLM)

number of children, female head of household have significant negative effect. The impact of children education is various; a Household with a child who currently sits in senior high school or university is estimated to spend more on children education. However, having a child in elementary school has significantly negative effect on spending on children education. In the second model the result shows no significant relationship between newly added variable and dependent variable and the effect of risk aversion is becoming insignificant. Nevertheless, other control variables still have similar effect.

CONCLUSION

This research investigated the relationship between risk aversion and spending in children's education. The results show that variable *score_{risk}* is strongly positively correlated with the dependent variable. It means that less risk averse individual is estimated to spend more in education for children. Then we analyze it further by including interaction term between parental risk aversion and children's educational degree. In the second model the newly added variables show no correlation with the dependent variable and the main interest variable lose its significance. Heterogeneity analysis shows that risk aversion is only significant for poor Household.

There are some limitations to this study. First, Survey data might not be enough to capture accurate information about risk preference because the questions from IFLS are not detailed enough and the respondent may act differently if the stakes are real (Anandari and Nuryakin 2019). However, Dohmen et al. (2011) claimed that hypothetical questions is still a trustworthy method to elicit risk preferences because in their findings, hypothetical questions were capable to predict actual behavior in lottery experiment. Moreover, based on the fact that Indonesian demographic is mostly dominated by Muslim, undertaking a lottery experiment might cause a conflict because they might misinterpret the experiment as Gambling.

Second limitation is lack of substantial variable to control parents' ability and expected or current ability for children may cause unprecise estimation. According to the simple mathematical model presented in the works of Tabetando (2019) & Checchi et al. (2014) Parents may decide to invest more; if they expect that their children possess high ability (aptitude) or are highly motivated in pursuing their education. Third, spending for children education can be defined as act of Altruism or even common manner for parents. Therefore, another variable or method are required which could separate the effect of risk aversion and altruism on spending in children education. The information of decision-making in the household or the spouse's preferences should be also considered in the estimation. Sending children to higher school might be defined as significant decision for a household, which might require both parents to discuss it thoroughly.

Therefore, it can be assumed that most decision is not unanimously come from the head of the household alone.

There is no government policy which is able to directly influence risk preferences of an individual, let alone whole population. Nevertheless, there is a proof that risk preferences can vary over time and the variation is indirectly influenced through the change in socio-economic environment that originate from government policy. Tanaka and Yamano (2015) have made some suggestions to drive less risk averse individual to spend more in children's education; make schools a safe place to study, minimizing risk when travelling to school. Moreover, it is also important to teach the parents how important is the investment in children education. Explaining about possible future return of education may also diminish the unwillingness to spend for impatient individual.

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