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A Canonical Analysis on the Relationship between Financial Risk Tolerance and Household Education Investment in Sri Lanka[1]

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Abstract

This paper was aimed at examining the relationship between risk tolerance behavior and the education investment of families in different social sectors, i.e. urban, rural, and estate, in Sri Lanka. At the initial step, the study used Binary Logistic Regression for identifying the significant variables for financial risk tolerance and also for household investment on education. Having identified the two sets of variables for each domain, the second step was to apply the Canonical Analysis in order to examine the association between risk tolerance behavior and education investment. The data for the study was obtained from a sample survey conducted in six Divisional Secretariat Divisions (DSDs) of three districts in Sri Lanka. The sample was selected considering the social sectors as strata, using multi-stage sampling technique joined with cluster sampling. The study found that 'social sector' and 'education of household head' were the main contributors to 'household investment on education'. It revealed that when the 'social sector' changes from urban to rural and rural to estate there is a tendency of households to decrease the share of expenditure on education. However, the 'education level of the household head' had s significant positive impact for the investment in education. It also found that 'income quartile, decision maker', 'income diversification', and 'financial literacy' positively contributed to 'risk tolerance behavior'. However, the findings show that financial risk tolerance decreases with the distance of households to a financial institute. The canonical relationship shows a negative association between 'income quartile' and the 'social sector' and the 'income quartile' improves with the change of the 'social sector' from estate to rural and rural to urban. It also revealed that 'income quartile' was positively associated with the 'education of the household head'. A primary conclusion can be arrived at that income and spatial related attributes are crucial in determining the impact of risk tolerance in household education investment. In addition, the study revealed that risk tolerance and, in turn, the tendency to invest in education increases with the change of gender from female to male. Therefore, it suggests that gender related attributes are also important in the financial risk tolerance and education investment.

Keywords: Binary regression, Canonical analysis, Education investment, Risk tolerance, Social sector

*JEL classification***:** C51, D14, D81, E21, I28

Many economists have considered education expenditure as an investment. The pioneering Economist, Smith (1776) had clearly stated in the '*Wealth of Nations*' that the skills acquired through education is a form of fixed capital that has an earning power. Marshall (1890) in '*Principles of Economics*' reiterates that 'the most valuable of all capital is that invested in human beings' (p.564). After a long delay, Schultz (1961) created a revolution by introducing his human capital theory which directly mentions that investment on education as another form of capital. Since then, the idea that education expenditure is an investment in human beings that transforms labor into valuable human capital became a popular and widely used concept in development economics and many academic applications.

Even if education is provided either by the public or private sector, the demand for education has arisen at family level by allocating a part of family expenditure for the education of children. However, the family resource allocation was not under the area of economics until Becker addressed this issue in 1973. He, for the first time, incorporated the 'family economic unit' with the human capital theory for analyzing the intra-family resource allocation behavior. After the initiation of this new domain of economics, Michael and Becker (1973), Leibowitz (1974), Becker (1981), Becker and Tomes (1986a, 1986b), Behrman, Pollak and Taubman (1995) and others developed and analyzed the family resource allocation as a family production model. Under this analysis, the allocation of family expenditure on education of children is also taken into consideration.

Rational parents choose to enroll their children in school since they deem that schooling is an investment that would generate benefits both to the child and to the parents in the future. However, the decision of household expenditure allocation on education can be affected by two kinds of economic factors. First, household expenditure on children's education is affected by household economic attributes such as household income, parents' education, household size, number of dependents, etc. Second, as an investment, the expenditure on education can be affected by risk attitudes. This rationale is arguable on two main reasons. First, when the education is freely provided by the Government, there is no risk to be taken at the household level. Second, investment in education does not involve a risk attitude when it is aimed for social returns like social status or social recognition. However, each of these arguments has counter arguments. Even if the education is freely provided by the Government, unless the households spend a substantial percentage of household income for children's education in the form of travelling expenses, uniform, private tuition, etc. children cannot successfully engage in education. Then again, even if some parents can invest in education just for social returns, the point that whether such investments are influenced by risk attitudes or not can practically be measured using well-designed indicators to measure the risk attitude. In case of households that the purpose of investment is totally social returns, the indicators would show a lower risk attitude while it would be vice versa for the other households. Hence, it can be argued that education expenditure even at primary level can

involve a risk attitude of parents. This argument shows that education expenditure is, on the one hand, associated with household characteristics while, on the other, is associated with risk attitudes.

Sri Lanka is a country where there is a strong family basis and a family works as the smallest economic unit that earns income and allocates expenditure among its members for different purposes. In addition to the freely provided education service of the Government, parents spend on education of children until the end of their bachelor's degree. Families in Sri Lanka represent different social sectors namely urban, rural and estate sectors while the characteristics of the households are also fairly different between the sectors. The expenditure allocation of the families in each sector is expected to have an association with family socio-economic characteristics and also the risk attitudes. This study focuses on the association between household education investment and financial risk tolerance which can affect investment.

The Problem Statement

Previous studies show that household education expenditure is associated with socio-economic characteristics of families or households (Chandrakumara, 2012; Huy, 2012; Tomul, 2008). Moreover, investing in children's education by households can involve a risk preference (Brown et al., 2012; Hartog et al., 2004; Huebener, 2012). The extent of the risk tolerance of households, especially of household heads, can affect the share of household expenditure that they allocate on children's education. The degree of association between risk tolerance and the share of education expenditure of households can also differ between different social sectors such as urban, rural and estate when it is analyzed in the context of Sri Lanka. As such, this study attempts to solve the problem of how far the household investment on the education of children is associated with risk tolerance behavior of households, vis-à-vis different social sectors of the economy.

Aim and Objectives of the study

The aim of the study is to identify whether there is an association between risk tolerance of parents and the share of household expenditure on education in different social sectors in Sri Lanka. The study bases on the following specific objectives in order to achieve the aim:

1. To recognize the factors associated with education expenditure of households in the different sectors of Sri Lanka.
2. To investigate how far risk attitudes are overwhelmed with the education expenditure of households.
3. To identify whether there is an association between socio-economic factors affecting the share of education expenditure of households and the risk tolerance behavior of parents.
4. To draw implications for the improvement of education in all social sectors of Sri Lanka.

<center>**Methodology**</center>

The study was totally dependent on the quantitative method of analysis which was designed under the positivist approach. This section presents the methods that were employed to examine the association between risk tolerance behavior and education investment of households. It includes the measurement of variables, methods of analysis and the data base of the study.

Study Area and the Sample

Sampling was carried out with the objective of covering three main social sectors, urban, rural and estate, as classified by the Department of Census and Statistics of Sri Lanka[2]. The sample was selected from each of these sectors, considering them as strata, using multi-stage sampling technique connected to cluster sampling. Three districts and six Divisional Secretariat Divisions (DSDs) were chosen for data collection. This was done after considering the distribution of urban, rural and estate populations residing at divisional basis. Selecting 12 Grama Niladhari Divisions (GNDs)[3] on random basis from each DSDs, 100 households were randomly selected from each GN division with the aim of collecting data from approximately 100 households. It should be noted that the number of observations in each sample was not proportionate to the population and considered as disproportionate random sampling method since this method was perceived as advantageous as it allows for comparisons across sectors.

The Questionnaire Survey

The survey mainly focused on how the financial risk tolerance behavior of households affect when they invest in education of their children with special emphasis on different social sectors in Sri Lanka. The survey questionnaire was designed based on the questions of previous surveys as well as the logically developed questions. The questionnaire, being relatively similar to the questionnaire used by OECD for measuring financial literacy (OECD INFE, 2011), employed a structured response question format. The questionnaire basically tried to cover the key areas of investment risk tolerance of individuals who takes education decisions for their children. It was also expected to collect detailed information about the respondents' personal attributes so as to identify which groups of people had better and worse levels of risk tolerance for investing in education.

Measurement of Variables and Method of Analysis

The statistical analysis comprised of two main steps. First, two separate regressions were performed in order to extract the underlying factors of the relationship between socio-economic variables and the risk tolerance behavior of households (Model 1). At this step another regression was carried out for identifying the relationship between

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[2] Area governed by either Municipal Council (MC) or Urban Council (UC) is considered as the Urban Sector while the Estate Sector includes Plantation areas, which are more than 20 acres of extent and having not less than 10 residential laborers. The Rural Sector consists of the residential areas, which do not belong to the urban sector or the estate sector (Household Income and Expenditure Survey - 2012/13, p.4. Department of Census and Statistics of Sri Lanka, 2013)

[3]Grama Niladari Division is the smallest unit of public administration in Sri Lanka.

<center>4</center>

education investment and socio-economic variables (Model 2). Second, a canonical correlation analysis was performed in order to determine the magnitude of the relationships that would exist between financial risk tolerance behavioral variables and education investment-related variables.

Household risk tolerance behavior – Model 1

There are some studies that attempted to identify the association between socio-economic-demographic factors and financial risk tolerance. Some studies have used subjective and objective measures of risk tolerance to investigate the relationship between various socio-economic-demographic attributes. Literature reveals different kinds of measures of risk tolerance under the two main categories, subjective and objective measures of risk tolerance (Hanna & Chen, 1997). The subjective risk tolerance is often articulated as an attitude towards risk and is simpler to measure than the objective risk tolerance since it assesses the actual quantifiable risks. This study adopts the method of subjective risk tolerance for measuring the risk tolerance of household decision makers regarding education investment. The risk tolerance was measured based on each household's response obtained for the survey questions that inquired how much financial risk that the households were willing to tolerate or accept.

Financial risk tolerance was measured with the help of a likert scale. Risk tolerance levels were the indicators of an individual's weight for his response towards the question he/she was offered. Risk preference information was obtained from a household survey which was specially focused on the education investment of the respondents as at the date of questionnaire survey in December 2013. The survey selected 986 sampling units representing three main social sectors urban, rural and estate using multi-stage sampling technique that was based on cluster sampling.

The survey consisted of questions for risk tolerance which was mainly designed based on a previous research while a format of structured response for the questions was used. The following were the questions that were used to obtain the response to risk tolerance of the respondents.

1. Which of the statements come closest to the amount of financial risk that you and your spouse/partner are willing to take when you make an investment? (Answer options: 4 = Take substantial financial risks expecting to earn substantial returns, 2 = Take above average financial risks expecting to earn above average returns, 3 = Take average financial risks expecting to earn average returns, 4 = Not willing to take any financial risks. The above are the same questions suggested by Grable and Lytton (1998).

However, Roszkowski and Grable (2005) argue that having clients assessed themselves may be beneficial when financial advisers are assessing risk tolerance. The following question, no. 2, was also included in the questionnaire since it is notable when considering the most predictive power for risk tolerance assessment in an analysis of clients' self-ratings.

2. What degree of risk have you assumed on your investments in the past? (Answer options: 1 = very small, 2 = small, 3 = medium, 4 = large, 5 = very large).

Furthermore, the study used a multidimensional financial risk tolerance scale developed and suggested by Grable and Lytton (1999) in order to examine the risk tolerance behavior in terms of the answers obtained to the following two questions.

3. In general, how would your best friend describe you as a risk taker? (Answer options: 4= A real gambler, 3 =willing to take risks after completing adequate research, 2 = Cautious, 1 = A real risk avoider).

4. When you think of the word "risk", which of the following words comes to mind first? (Answer options: 1= Loss, 2 = Uncertainty, 3 = Opportunity, 4 = Thrill).

However, the dependent variable for risk tolerance was constructed using the answers obtained to the above four questions on how much risk they were willing to take. The responses were incorporated into a composite index of risk tolerance. In order to place respondents in the appropriate risk tolerance categories, answers were given a weight according to the riskiness of the response. Higher points designated a higher level of risk tolerance while lower points were for lower level. Finally, total scores of the measure of risk tolerance were calculated for each respondent based on the weights multiplied by the individual item scores.

The socio-economic-demographic factors suggested by the literature were incorporated with some logically relevant factors which are needed to examine on how these characteristics influence a person's willingness to take risk on investment decisions of education. Financial risk tolerance index was used as the dependent variable while five independent variables were considered a hypothetical association. For a household 'I', the total risk tolerance function can be written as:

$$V_i = \alpha + \beta z_i + \mu_i \qquad (1)$$

Where, 'V_i' is the risk tolerance of the ith household. It is the composite index from 0 to 100 values; z_i is a vector of other household characteristics such as household income, income diversification, financial decision maker, financial literacy index, (A composite index was constructed in order to represent the financial literacy) and distance to the nearest financial institute from home. Parameters were 'α' and 'β' while the error term was μ_i.

Descriptive statistics were calculated for the risk tolerance index and the variables relating to the socio-economic-demographic characteristics of respondents. The regression analysis was used in order to estimate the impact of each variable and to select the significant variables for the next step, canonical analysis. The effects of socio-economic-demographic variables upon financial risk tolerance of respondents were investigated using Binary Logistic regression analysis.

Household investment on education–Model 2

This analysis takes the budget share of households on education as the education investment. In order to identify the relationship between educational investment and the household socio-economic factors, the Binary Logistic analysis was used. The education investment for i^{th} household was formulated as follows.

$$w_i = \alpha + \beta \ z_i + \mu_i \qquad (2)$$

Where, 'w_i', dependent variable, is the education investment of the ith household which was also a dummy with dichotomous values 0 and 1. The dichotomous values were formulated with the help of the annual average national education expenditure as a percentage of the budget that was nearly 3 percent. Households with education investment above 3 percent of the total household expenditure were taken as '1' while '0' represented the households below that percentage. 'z_i' is a vector of other household characteristics such as 'gender' of household head, 'age', 'civil status' (married, other), 'education' (not attended school, primary, secondary and tertiary), 'occupational status'(agricultural, government, private, business), 'number of dependents in the household' (below 18 years), 'income quartile', 'income diversification' (number of income sources), and dummy variables to capture the settlement type, 'urban', 'rural' and 'estate' while the error term is 'μ_i'. The parameters, 'α', 'β', and 'φ' were the parameters to be estimated.

The dependent variable of the Binary Logistic model was constructed based on the macro level share of education expenditure, which has been nearly 3 percent of the Gross National Output as an annual average during the past decade. The respondents whose household expenditure share on education was below 3 percent were denoted by '0' while the respondents above '3' were denoted by '1'.

Investing in education at household level and its relationship with risk tolerance

The main analysis of this study was focused on identifying the determinants of household investment on education in different social sectors of the country vis-à-vis the risk tolerance behavior of households. This relationship was analyzed using the canonical correlation analysis that comes under multivariate analytical technique. This method was used in order to compare risk tolerance and the investment of households on education. Canonical correlation analysis was used for explaining the relationship between two sets of variables. Given the two sets of variables in Model 1 and Model 2, the goal was to find linear combinations of 'V_i' and 'W_i' so that the correlations between the linear combinations could be found.

A Review of Selected Literature

Even if the literature on the analysis of socio-economic characteristics that affect household investment on education is satisfactorily high in the context of developing countries, the attempts which have been made to analyze the influence of risk on education investment decisions are not sufficient. This review is organized under three sub-topics, namely, household socio-economic attributes associated with household education investment, the influence of risk

attitudes on household education investment, and an overview of the education and socio-economic background in Sri Lanka.

Household socio-economic attributes associated with household education investment

Household income can be found as one of the determining factors of education of children at household level. Evidence from many researchers reveals that relatively wealthy households invest more in human capital, earn high incomes and remain wealthy. In contrast, the poor are unable to invest in human capital, continue to earn low incomes, and remain poor (Maldonado et al., 2003; Nguyen, 2002; Ermich & Francesconi, 2000, 2002; Appleton et al., 1990; Tembon & Al-Samarrai, 2004; Aakvik et al., 2005).

Canagarajah (2001), investigating on why children of school age do not complete the obligatory 9 years of education found that unaffordable cost of schooling accounted for 30 percent while working either at home or in the labor market was responsible for about 16 per cent of that influence. Some studies reveal that in many countries, the bulk of the children who are not enrolled in primary education are from the poor (Filmer, 2000; Filmer & Pritchett, 1980). Children in better-off families get more chances to enroll in better schools by way of spending more in tuition and obtaining better results (Nguyen, 2002; Handa, 1996). Moreover, some researchers have pointed out that household income shows an association with their residential area and the access to education as well. The dwellings of poor families are mostly concentrated in remote areas and poorer regions with less education facilities while the rich families live in areas with more facilities (Nguyen, 2002). Thus, the children in such remote areas have less access to education. This would affect education investment to be low in such social sectors.

Some researchers have directly taken 'household expenditure' as a good indicator of the household economic position. Findings of Tilak (2002a, 2002b) regarding education and education expenditure unveil some important facts and he reveals that the average household proportions of educational expenditure changes from 5 to 10 per cent of total household expenditure. However, if the low income families continue their children's education despite their low income, their relative share on education becomes high compared to high income families. This means that low income families have to educate their children sacrificing even the basic needs of the members of their household.

Ahmad (2003) also found a more complicated relationship between household income and child education. According to him, there is a circular relationship between education and the level of income. On the one hand, low level of education may force the families to engage children in low-productivity activities, and, therefore, remain in poverty. On the other hand, families make low investments in education due to their poverty. Thus, the cause and effect interchanges in a circular manner. According to him, the enrolment of poor children at secondary education is much lower than the general level. In addition, he pointed out that the household income had indirect effects on the demand for education. Poor households are likely to have a low demand for education. He also reveals that low-

income households face a problem of higher opportunity cost of sending their children to school due to the potential of using them in economic activities.

Some researchers reveal that the level of household income has a gender-related impact on the education of children. Tembon and Al-Samarrai (2004) reveal that even if the household wealth is generally high for the families whose children are attending school; it is especially higher for the families whose girls are attending school. This means that the household income has an association with children's education and also the gender of children in education.

There are also some studies that show that the women's income in families tends to increase the education of children (Folbre, 1986). Some of these studies show that with the increase of mothers' contribution to the total household income, her bargaining power within the household increases and, in turn, it favorably affects the household resource allocation in favor of educating the children.

Wodon (1999) and others reveal that the provision of financial support to poor families makes a significant negative effect on children's labor force participation, and a strong positive effect on the probability of schooling. Ravallian and Wodon (1999) also find that a stipend with a value considerably less than the mean child wage was enough to assure nearly full attendance in school among the poor children. This implies that household income has a positive relationship with school attendance and a negative relationship with the provision of child labor. Therefore, it seems that all these changes should have an influence on the household education investment as well.

Mehta (2004), Sawada and Lokshin (2000) suggest that land ownership shows a negative relationship with the schooling enrolments of children while the capital ownership shows a positive relationship since they can substitute 'capital' for 'child labor'. As far as the cultivation of land becomes the main source of living for the poor, parents, particularly small landholders, use their own children's labor for farming. Moreover, Children in poor families become less regular while the richer families can send their children to school on a more regular basis. This evidence shows that it is not only the household income, but also the social sector, which can remain in the form of rural, urban or estate etc., can have an association with the education of children.

Meanwhile, there are studies that support the argument that household income is not a significant factor in determining the education of children within the household. For example, Curtis and Phipps (2002), Blau (1999) and Dooley et al. (1998) show evidence of not having a significant relationship between household income and child well-being that can happen as a result of education. They point out that the level of household income is not a significant factor in determining the level of education of children. As such, it seems that there is no perfect consensus in the evidence among the different sources with regard to the effect of household income on children's education.

Parents' occupation is another household attribute that has been found by some researchers as a factor influencing the household education expenditure. Behrman and Taubman (1989) find that having a father who is a professional or a manager rather than an unskilled worker increases a child's education in comparison to the children of clerks or salesmen. Athurupane (1997) finds that the occupation of parents significantly affects children's schooling and the demand for quality. A father in an upper-class occupation positively influences the demand for education while a father in low level occupations has a negative influence. Ranasinghe (2004), classifying occupations into several categories, reveals that more than 50 per cent of the children whose fathers' occupations are legislators, senior officials, managers, and professionals and whose mothers have a university degree, have reached the highest level of the education. Furthermore, he finds that such children have a much higher probability to continue schooling and complete higher levels than the children whose fathers are in minor occupations. Acevedo (2002) also points out that 'sector of occupation' of the household head has an impact on both the work and the education of children. The children of those who engaged in the agricultural sector spend more time for work in comparison to the children of those who engaged in other industries. This evidence again highlights the significance of the social sector of families in the determination expenditure on education.

King and Bellew (1989) reveal two noteworthy results on the impact of parents' occupation on children's education. First, children of parents holding white collar jobs tend to have more years of schooling compared to the children of farmers. Second, children of mothers who are not employed, especially in farming, tend to have more years of schooling. Ermisch et al. (2002) find that parental joblessness makes a substantial negative influence on children's educational progress. At the same time, some researchers find situations that mothers' employment has a negative association with children's education. Ermisch and Francesconi (2000) find that mothers' full-time employment has a negative and significant effect on the education of the children of a younger age. Aakvi et al. (2005) also find that the effect of mothers' outside work is negative for sons though it is somewhat vague for daughters. However, Haveman et al. (1991) identifies that the negative impact of the absence of a mother at home on children's education is offset through the positive influence of the additional resources contributed by mother. This means that the adverse effect of parents' absence at home is, to some extent, counterbalanced when the income earned by the mother is spent on children's education.

According to the previous studies, the level of education of parents is another factor that affects the share of household expenditure on education. For example, Chernichovsky (1985) points out that the most significant factor that determines schooling of children is the level of education of the person heading the household. More educated parents have a tendency to enroll their children in school, keep them longer in school and, finally, get a higher level of education compared to others. Acevedo (2002) also reveals that higher education of household heads and spouses increases the probability of school attendance and reduces the probability of child labor. Aakvik et al. (2005) also find

that having a father or mother with a college degree increases the probability of a child having a good college degree. Giannelli and Monfardini (2000) find that when fathers are relatively educated to a higher extent, , there is a significant negative influence on the likelihood of their children sacrificing their education at an early age for work. Many other researchers have found that parents' education has a significant positive impact on the education of children (Filmer, 2000; Athurupana, 1997; Vella, 1994). This is because the educated parents have an inclination to value the education of their children more than the parents who are less educated. Moreover, educated parents have the capacity to help their children so as to continue schooling more effectively.

Some studies show that the demand for education of children has an interaction between gender and the education level of children and parents as well. Most of the researchers are in the consensus that female participation in education is lower compared to males (Roussel, 2000; Canagarajah & Coulombe, 1997; Sawada & Lokshin, 2000; Bellew & King, 1989, 1991; Sinnathambi, 2004). In most instances, it is pointed out that the custom of seclusion of women and the negative perception of parents on female education as the major explanation for the gender gap in education. If this is valid, the share of education expenditure in families with more female children can be lower than that of others.

Some researchers who analyzed the impact of gender on education of children further show that mothers' education is more important for both male and female children's education (Hossain, 1990; Haveman & Wolfe, 1995; Ranasinghe, 2004). Evidence is also available to prove that the father's education is more important for children's education than that of mothers (Gang, 1996; Butcher and Case, 1994; Vella, 1994). In addition, some researchers show that the mother' education is more important for female children whereas father's education is more important for male children's education (Millimet & Racine, 2002; Handa, 1996; King & Bellew, 1989). Meanwhile, Binder (1998) finds that the effect of the father's education on children's education is not always equal with that of the mother. Mother's schooling up to six years and father's schooling beyond six years has been found to be statistically positively significant according to him. In contrast to the above evidence, there are some studies that reveal that the mother's education is negatively related to the education of children (Jimenze et al., 1988). This result may be a result of the fact that well-educated mothers have a tendency to work and are less available at home. Therefore, it is evident that there is no consensus among the researchers to show which is more important, the education of the mother or the education of the father. However, the evidence imply that the mother's level of education and the father's level of education, in interactions with some other attributes, can differently act on determining the households share of expenditure on education.

Household demographic factors such as household size, number of dependents, number of elder siblings, number of younger siblings, etc. also have been taken as determinants of the share of household expenditure on education by some researchers. They reveal that the household size has a negative impact on child-schooling. It

implies that with the increase in household size, household resources available per child, especially, the household expenditure reduces (Chandrakumara, 2012) (Giannelli & Monfardini, 2000; Vella, 1994; Berhman & Taubman, 1989; Stafford, 1987; Butcher and Case, 1994; Knodel and Wongsith, 1991). Furthermore, some researchers show that the negative effect of the household size on schooling is higher for girls compared to that of boys (Millimet & Racine, 2002). This can happen when household expenditure is allocated in favor of male children's education which can also be possible when the parents' income and education is low.

Meanwhile, counter to the above evidence, some researchers identify a positive relationship between household size and children's education. The larger the number of children in a household, the greater the probability that they enroll in school and higher the level of education they reach. Such a relationship can be created due to a number of reasons. For example, when the number of children of a household is high, older siblings help the younger siblings in different ways. In addition, when the number of household members is high, the average hours of demand for child labor, within the household, decreases (Chernichovsky, 1985). Chandrakumara (2012), Stafford (1987), Binder (1998) also expounded that the presence of older siblings for a child makes a positive influence on the education of younger siblings. For example, the cognitive skills of lower-aged children are enhanced due to the association and influence of older siblings who are rich in cognitive skills. Hossain (1990) identifies that when the number of siblings increases, families receive economies of scale in financing child education by way of decreased average education expenditure per child. On the whole, evidence show that household demographic factors can have a significant impact on the household expenditure on education.

Finally, the evidence is important to understand that different socio-economic factors can have a direct or indirect relationship with the share of household expenditure on education.

Factors affecting the risk tolerance in education investment

The literature does not show a large number of studies which have been focused on the factors affecting the risk tolerance of household education investment. However, the available studies reveal that there are some different socio-economic factors which are responsible for risk attitudes and risk tolerance of individuals and households when they invest in education.

Athanassiadis (2011) analyzed on economic returns and risk investment in education drawing upon data from fifteen European countries for the period 2005-2007. He used macro data for the analysis and found a risk-return trade-off regarding the investment in education. Even though he does not explain more about this trade-off, he implies that, usually, a higher risk is associated with higher returns. However, there is no guarantee to have higher return for the investment. He similarly faces a higher risk of the possibility of higher losses. Therefore, any form of investment, including education, can have a risk attitude which can affect the volume of investment. However, such an analysis

should incorporate socio-economic attributes as well when considering especially the school education investment in developing countries.

Collard (2006) reviewed the investment behavior of individuals and extracted some important findings on how decisions are made under risk, albeit it is not directly related to education investment. He mentions that attitudes to risk depend on a wide variety of factors such as age, income and wealth, gender, marital status, personality, educational attainment, and level of financial knowledge and experience. He reveals that there are fairly consistent evidence to suggest that women are more risk-averse than men when it is judged in terms of attitudes and behaviors in relation to investment decisions. He further mentions that according to some studies, factors such as marital status, wealth and income play a bigger role than gender when explaining the attitude differences towards risk. He also point out that attitudes to risk changes over time. The findings of Collard regarding the investment risk cannot be disregarded when analyzing the risk tolerance involved in any kind of investment decisions of individuals.

Conley and Glauber (2005), investigating on parental educational investment and children's academic risk, arrive at some interesting findings. They found that increased sibship size has a negative effect on second-born boys' educational outcomes, at least when it is measured through private school attendance and grade repetition. Having three or more children in the household, compared to just two, reduces second-born boy's likelihood of private school attendance according to their calculations, although there are variations in the degree of occurring between different social sectors. This result is helpful to understand that with the increase in the number of children in a household, there is a possibility for having less investment for the education of younger children. However, in a situation that all children attend public school/s, a possibility of sharing the investment almost equally, depending on the needs, can be expected. When a family invests on more than one child's education it can also be hypothesized that the risk of education investment can be minimized since at least one child would be successful in returns to education.

Judd (2000) examined two human capital assets pricing models through which argued that the human capital return premium should be largely determined by its systematic risk. His results suggested that the return to education is greater than the assets which are considered to have a similar risk. As such, education becomes a sector of underinvestment. He also finds that the conventional approaches to portfolio analysis need to be modified in order to integrate human and physical capital investments. He further mentions that even if one can alter financial investments in response to new information, education and training are not of such. According to this paper, it can be understood that it is not only the risk on returns, investments in education has two other risks; risk of inalterability in response to match new situations and the risk of extreme illiquidity.

Koerselman and Usitalo (2013), conducting a research on risk and return of human capital investments, found that university education increased the discounted lifetime disposable income compared to vocational high school. They found that equivalent lifetime earnings are about twice as large for university graduates as for vocational high

school graduates. However, the difference between vocational high school graduates and those with compulsory schooling qualifications are much smaller. They further mention that this difference is mainly due to the non-employment risk and not because of differences in earnings. Therefore, this study is important to understand that the risk in investing in education is caused not only by earning differences but also by the availability of jobs for the qualifications earned through the investment in education.

Finally, it seems that although the literature on risk of education investment is still underdeveloped, the available studies indirectly reveal some important views on the concepts and variables that one can take into account when conducting a scientific inquiry on risk behavior and education investment.

An overview of education and socio-economic background in Sri Lanka

Most of the schools established in Sri Lanka during the British colonial period were limited to the privileged class while the education, during this period, appeared to be one of the major sources through which inequalities were created. This system underwent a revolutionary change with the implementation of the recommendations of the 'Kannangara Report' in 1943 through which education was made free for all from kindergarten to the university level (Jayaweera, 1996; Silva, 1998). Since then, English became the second language through which anyone can study if they are willing to do so. In line with the new trend, the government established 'Central Colleges' all around the island to teach students either in Sinhalese or Tamil media making available the provision of education to all in their mother tongues. Since then, the education system underwent some changes and helped uplift socio-economic indicators of the country to a higher level.

The system of education so far developed is structured in five main levels or stages: (i) primary education, (ii) junior secondary education, (iii) senior lower secondary education – O/L, (iv) senior higher secondary education – A/L, and (v) tertiary education. Primary education includes six years from Grades one to five while the students are to sit for a scholarship examination at the end of this level. The students who are identified as having exceptional skills are moved into better schools especially situated in main cities of the country. The junior secondary education continues for 4 years from Grade 6 to Grade 9. Education for all in Sri Lanka is compulsory up to end of this stage (Grade 9) and thereafter they can choose whether to continue education or not. Senior Secondary Education continues for 2 years from Grades 10 to Grade 11 and at the end of this stage students are to sit for the GCE Ordinary Level Examination. They must pass this examination in order to continue education. Those who get through from the GCE Ordinary Level Examination can follow the study programs of the GCE Advanced Level Examination for another 2 years that consists of Grades 12 and 13. This level is ended with the examination (GCE Advanced Level) through which successful students can continue to tertiary level within the higher education system in Sri Lanka or outside.

As a result of societal need and government interference, education investments in the country increased significantly and hence the number of schools as well as the number of teachers and students grew year by year. By 2006, the public sector that dominated the education service accounted for 93 per cent of schools and 95 per cent of student enrolments in government schools. The public sector accounted for approximately 10,006 schools that served close to 3,942,327 students, all around the island. The number of teachers of all categories including graduate teachers exceeded 187,000 (The World Bank, 2007). The teacher-student ratio which stands at 1 to 19 is significantly high compared to early years of independence. In the past two decades, the government expenditure on education as a percentage of the total budget expenditure has been nearly 10 per cent while it was nearly 3 as a percentage of GDP. In addition to the public schools, 93 private schools and 658 pirivenas[4] served for about 160,000 students by 2006 (CBSL, 2007). A number of international schools are also engaged in the market for education service. This wide-ranging school infrastructure is available for the parents to send their children and invest in their education with the purpose of transforming them to valuable human capital assets. The education in Sri Lanka and the relevant statistics have not been undergone for major changes after 2006.

However, even if the educational facilities for the students in Sri Lanka are provided at the cost of the Government, the parents also spend a substantial amount from their household budget as additional expenses involved in the schooling of children. This additional investment mainly includes expenses for private tuition, transport and transaction cost, school equipment, uniforms and costume, etc. The quality of education that they obtain mainly depends on the amount of additional expenses. As such, even if the opportunity cost of sending children to schools are not taken into account, parents have a direct financial cost involved in the education of children at all levels of education.

Table 1:

Average Monthly Expenditure and Household Expenditure on Education by Survey Period

Survey period	Mean household expenditure per month (LKR)	Expenditure on education (LKR)	Percentage of average monthly household expenditure on= education
2012/13	40887	1430	3%
2009/10	31331	1018	3%
2006/07	22952	632	3%
2005	19151	473	2%
2002	13147	315	2%
1995/96	6525	128	2%
1990/91	3905	66	2%
1985/86	2079	29	1%
1980/81	1232	17	1%

Source: Household Income and Expenditure Survey - Department of Census and Statistics - Sri Lanka, 2013.

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[4] 'Pirivena' is an educational institution managed under the administration of Buddhist monks especially for ordained priest students.

A survey conducted by the Department of Census and Statistics (2013) disclose the situation with regard to household expenditure on education in Sri Lanka. The report shows that, during 1980–1985, on average, households spent 1 percent of monthly household expenditure on education. This share increased up to 2 percent by 1990 – 2005, and again up to 3 percent by 2006 (See Table 1).

Table 2

Average monthly expenditure and household expenditure on education by sector

Household expenditure (LKR)	2006/07				2009/10				2012/13			
	Total	Urban	Rural	Estate	Total	Urban	Rural	Estate	Total	Urban	Rural	Estate
Household expenditure (monthly average)	22952	35274	21440	13456	31331	44928	29423	23988	40887	59001	37561	29779
Expenditure on Education	632	1069	581	254	1018	1814	918	382	1430	2772	1192	459
Percentage of average monthly household expenditure on Education	3%	3%	3%	2%	3%	4%	3%	2%	3%	5%	3%	2%

Source: Household Income and Expenditure Survey - Department of Census and Statistics - Sri Lanka, 2013.

Table 2 provides how the share of household education expenditure varies between the three social sectors, urban, rural, and estate, in Sri Lanka. It shows that the average monthly household expenditure is lower in the estate sector compared to the urban and rural sectors. This figure can be expected to vary in a wider range if the expenditure at the household level is taken into consideration.

Results

The results of the study are presented below in two steps as pointed out in the methodology. First, the results of the two Binary Logistic regression models, the risk tolerance behavior model in the left side panel and the education investment model in the right side panel, are presented (Table 3).

Income quartiles 1 and 2 have not been significant to have an association with risk tolerance behavior. However, 'income quartile' 3, being statistically significant at $p<0.01$ level, shows a positive relationship with risk tolerance. This means that the highest income quartile is better in the sense of taking risk. The variable, financial decision maker, shows two significant levels, namely 'husband' and 'husband and wife' while the remaining level 'wife' has not been significant. Furthermore, it shows that taking decisions together with wife is stronger than when taking decisions only by husband. In addition, the variables, 'income diversification', 'distance' and 'financial literacy index' have been significant at * $p<0.1$, *** $p<0.01$ and *** $p<0.01$ levels respectively.

The right side of Table 3 shows that 'level of education', 'sector', 'gender', 'age', and 'number of dependents' are significant in determining the education investment behavior of households. Three levels of education, 'primary', 'secondary' and 'tertiary' have been significant respectively at * $p<0.1$, *** $p<0.05$ and *** $p<0.01$ levels while 'no schooling' is not in the equation. The variable, 'sector' (social sector) shows a decreasing share of expenditure on

education when it comes to 'urban' and 'rural' sectors from the reference level, 'estate' sector. Even a small amount of expenditure of the estate sector households for education becomes a higher percentage compared to the households in the urban and rural sectors because of their small size of income. The next variable, 'gender' shows that 'male' has been positive when 'females' are take as the reference category. It also shows that investment in education as a share of household budget decreases with the age of the decision maker. Finally, it shows that expenditure share for education increases with the number dependants of a household.

Table 3
Results of the Binary Logistic Regression - Household risk tolerance behavior and education investment

Household risk tolerance behavior		Household education investment	
Explanatory variables	Model 1	Explanatory variables	Model 2
Constant	-2.487***	Constant	1.108***
	(.349)		(.667)
Income Quartile (Reference : Income Q1 Lowest)		Education (Reference : Not attended school)	
Income Q2	0.076	Primary	.443*
	(.241)		(.422)
Income Q3	0.349	Secondary	.540**
	(.270)		(.409)
Income Q4	1.176***	Tertiary	1.155***
	(.361)		(.466)
Financial decision maker (Reference: Wife)		Sector (Reference : Estate)	
Husband	.709**	Urban	-.929***
	(.121)		(.276)
Husband and Wife	.890***	Rural	-.875**
	(.168)		.(297)
Income diversification	.840*	Gender (Compared to Female)	
	(.132)	Male	.368***
Distance	0.0062***		(.182)
	(.002)	Age	-.018***
Financial literacy Index	.042***		(.007)
	(.349)	No. of Dependents	.183***
			(.089)
Observations	680	Observations	680

 t-statistics in parentheses *** p<0.01, ** p<0.05, * p<0.1
Source: Author constructed

Canonical Correlation Analysis

At the second step, Canonical correlation analysis was performed, exploring the relationship between two sets of variables, the determinants of household risk tolerance behavior, and the determinants of household investment in education (budget share of education). This analysis seeks the weighted linear composite for each variate (two sets of variables or two models) to maximize the overlap in their distributions.

Table 4 shows the overall multivariate tests for dimensionality. The canonical correlations show how much variance of the dependent variables is explained by the dimensions. This model shows that there are five canonical dimensions of which only the first three are statistically significant. The first test of dimensions that tested whether all five (5) dimensions combined were significant, found that it was significant. The second test of dimensions that tested whether dimensions 2 to 5 combined were significant also found that it was significant. The third test of dimensions that tested whether dimensions 3 to 5 combined were significant found that it was also significant. However, it was found that fourth and fifth tests were not significant. Therefore, it reveals that dimensions 1, 2 and 3 must each be significant.
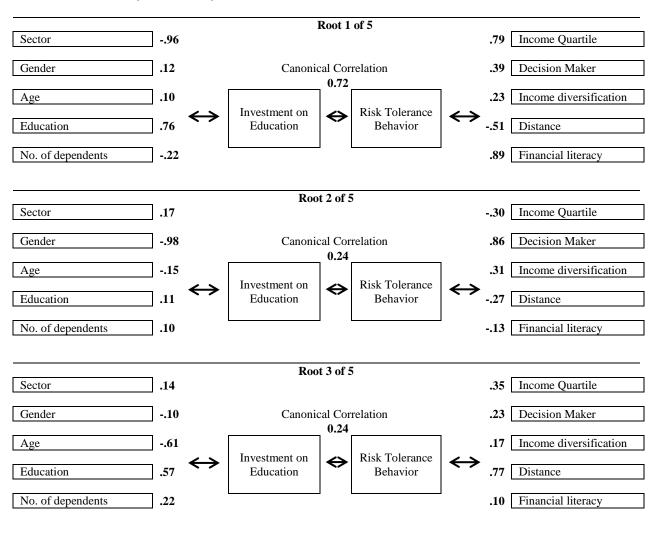
Table 4
Tests and correlations

Effect… Within Cells Regression					Panel A
Multivariate Tests of Significance (S = 5, M = -1/2, N = 334)					
Test Name	Value	Approximate F	Hypothesis DF	Error DF	Significance of F
Pillais's	.61875	19.03738	25.00	3370.00	.000
Hotellings's	1.19332	31.90459	25.00	3342.00	.000
Wilks's	.43297	25.17751	25.00	2490.44	.000
Roys's	.52206				

Eigenvalues and Canonical Correlations					Panel B
Root No.	Eigenvalue	%	Cumulative %.	Canonical Correlation	Squared Correlation
1	1.09233	91.53689	91.53689	.72254	.52206
2	.05964	4.99802	96.53491	.23725	.05629
3	.02861	2.39720	98.93211	.16677	.02781
4	.01243	1.04159	99.97370	.11080	.01228
5	.00031	.02630	100.00000	.01771	.00031

Dimension Reduction Analysis					Panel C
Roots	Wilks λ	F	Hypothesis DF	Error DF	Significance of F
1 TO 5	.43297	25.17751	25.00	2490.44	.000
2 TO 5	.90592	4.21259	16.00	2050.58	.000
3 TO 5	.95995	3.07778	9.00	1635.62	.000
4 TO 5	.98741	2.13793	4.00	1346.00	.074
5 TO 5	.99969	.21154	1.00	674.00	.646

Canonical correlation reflects the percentage of variance in the dependent canonical variate explained by the predictor canonical variate. The result indicates a highly significant function (p < .000) and provides the proportion of total variability not explained, i.e. it is the converse of the squared canonical correlation. The key statistic indicating whether or not there is a relationship between the criterion and predictor variables is the significance test for Wilks' lambda. Wilks' lambda, being the proportion of the total variance scores not explained by differences among the groups, shows about 43% of the variance which has not been explained by group differences. Wilks' lambda test statistic is used for testing the null hypothesis that the given canonical correlation and all smaller ones are equal to

zero in the population. Each value can be calculated as the product of 'financial risk tolerance' for the set of canonical correlations being tested. In this analysis, the canonical correlations are 0.722, 0.237, 0.166, 0.110 and 0.017 so the value for testing all five of the correlations are zero is $(1- 0.722^2)*(1-0.237^2)*(1-0.166^2)*(1-0.110^2)*(1-0.018^2) = 0.43297$.

Figure 1

Canonical correlation of likelihood of risk tolerance behavior and investment in education

Root 1 of 5

Left variable	Loading		Right variable	Loading
Sector	-.96		Income Quartile	.79
Gender	.12	Canonical Correlation 0.72	Decision Maker	.39
Age	.10		Income diversification	.23
Education	.76	Investment on Education ↔ Risk Tolerance Behavior	Distance	-.51
No. of dependents	-.22		Financial literacy	.89

Root 2 of 5

Left variable	Loading		Right variable	Loading
Sector	.17		Income Quartile	-.30
Gender	-.98	Canonical Correlation 0.24	Decision Maker	.86
Age	-.15		Income diversification	.31
Education	.11	Investment on Education ↔ Risk Tolerance Behavior	Distance	-.27
No. of dependents	.10		Financial literacy	-.13

Root 3 of 5

Left variable	Loading		Right variable	Loading
Sector	.14		Income Quartile	.35
Gender	-.10	Canonical Correlation 0.24	Decision Maker	.23
Age	-.61		Income diversification	.17
Education	.57	Investment on Education ↔ Risk Tolerance Behavior	Distance	.77
No. of dependents	.22		Financial literacy	.10

Source: Author constructed.

Correlations obtained are presented in Figure 1 for an uncomplicated interpretation of results. It shows that the correlations between the two sets of variables are 0.72 for root 1, 0.24 for root 2 and 0.17 for root 3. These indicate statistically significant correlations between the two constructs, accepting that there is a significant correlation between 'risk tolerance behavior' and the 'investment in education'. Two sets of variables shows a strong relationship when all dimensions (roots) are taken together and it gradually declines from 0.72 to 0.17 when the dimensions are reduced from 5 to 3.

An interpretation of the correlations (factor loadings) between the canonical variables and the dependent variables, which represents latent factors, provides crucial economic insights. The factor loadings of 'income quartile', 'decision maker', 'income diversification', 'distance', and 'financial literacy' to the canonical correlation 0.72 are 0.79, 0.39, 0.23, -0.51, and 0.89 respectively. On the other hand, factor loadings shown in the right hand side of the figure indicate how much of the variation in the dependent variables is explained by the independent latent factors. It shows that factor loadings of 'sector', 'gender', 'age, 'education', and 'number of dependents' are respectively -0.96, 0.12, 0.10, 0.76, and -0.22. The root 2 of 5 and the root 3 of 5 also can be understood in the same way as above.

The interpretation used in this study was somewhat similar to the pattern introduced by Sherry and Henson (2005). The canonical correlation analysis was conducted using five investment risk tolerance variables as predictors of the five household education investment variables to evaluate the multivariate, the shared multivariate relationship between the two sets of variables. The analysis obtained three functions with squared canonical correlations (Rc2) of .522, 056 and .027 for each successive function. The full model across all functions was statistically significant using the Wilks's λ = .432 criterion, F (25, 2490.44) = 25.17751, p<.000. Wilks's λ represents the variance unexplained by the model and, thus, 1-λ means the full model effect size in an r2 metric. Accordingly, for the set of three canonical functions, the r2 type effect size was .567, which indicates that the full model explained 57 percent of variance shared between the variable sets.

The dimension reduction analysis obtained by the analysis was made use for testing the hierarchal arrangement of functions for statistical significance. The full model and also the functions, 2 to 5 and 3 to 5 were statistically significant, F(25, 2490.44) = 25.178, p<.000, F(16, 2050.58) = 4.213, p<.000, and F(9, 1635.62) = 3.078, p<.000 respectively. Functions 4 and 5 did not explain a statistically significant amount of shared variance between the variable sets, F (4, 1346.00) = 2.138, p<.074 and F (1, 674.00) = 2.138, p<.646.

From Rc2 effects obtained for each function, only the first three functions were considered and respectively represented 52 percent, 5 percent and 2 percent of shared variance. The other functions only explained 1 percent and .03 percent, respectively, of the remaining variance in the variable set after the extraction of the first three functions.

Table 5 presents the standardized canonical function coefficients and structure coefficients for Function 1 and 2. The squared structure coefficients (rs2) and the communalities (h2) are also given for the three functions and each variable. When considering function 1 coefficients (squared structure coefficients), it shows that relevant criterion variables, 'sector', 'gender', 'age', 'education of householder' primarily contributed to the synthetic criterion variable while the contribution of the 'number of dependents' was secondary. These attributes related to investment in education also tended to have larger canonical function coefficients. The result so obtained shows the multicollinearity that these variables had with the other criterion variables.

The predictor variable set in Function 1shows that all variables, except 'distance', positively contributed to the predictor synthetic variable. 'Financial literacy' and 'income quartile' were the primary contributors while the secondary contributors were 'decision maker' and 'income diversification'. However, the contribution of 'distance' to the synthetic predictor was negative. According to this function, 'income quartile', which is the dominant predictor, shows a negative association with the 'sector' and a positive correlation with the 'education of householder'. Furthermore, the dominant variable, income quartile, was negatively associated with sector and positively associated with the 'education of householder'. Based on the nature of these variables, this function is labeled by this study as 'income-spatial function'. This seems appropriate since all leading factors of both predictor and criterion sets, i.e. 'sector', 'education of householder', income quartile', and distance' are closely related to income and spatial attributes.

Table 5
Canonical association of financial risk tolerance and investment in education

Variables	Function 1			Function2			Function 3			
	Coef	r_s	$r_s^2(\%)$	*Coef*	r_s	$r_s^2(\%)$	*Coef*	r_s	r_s^2	$h^2(\%)$
Sector	-0.79	<u>-0.96</u>	92.16	-0.05	-0.18	3.23%	0.70	0.15	2.23	<u>97.61</u>
Gender	0.09	0.12	1.45	-1.01	<u>-0.98</u>	96.93	0.14	-0.10	1.02	<u>99.40</u>
Age	0.01	0.10	1.00	0.01	-0.15	2.33	-0.41	<u>-0.61</u>	37.36	40.70
Education	0.26	<u>0.76</u>	58.13	0.06	0.11	1.22	0.99	<u>0.58</u>	33.09	<u>92.44</u>
No. of dependents	-0.13	-0.22	5.06	-0.14	0.10	1.10	0.33	0.23	5.12	11.28
R_C^2			**52.20**			**5.63**			**2.78**	
Income quartile	0.43	<u>0.79</u>	62.71	-0.06	-0.30	9.02	0.57	0.35	12.51	<u>84.25</u>
Decision maker	0.05	0.39	15.17	0.87	<u>0.86</u>	74.32	0.28	0.23	5.08	<u>94.57</u>
Income diversification	-0.05	0.23	5.38	0.42	0.31	9.92	0.09	0.17	3.00	18.30
Distance	-0.26	<u>-0.51</u>	26.44	-0.29	-0.27	7.55	0.93	<u>0.77</u>	59.67	<u>93.66</u>
Financial literacy	0.61	<u>0.89</u>	78.95	-0.31	-0.13	1.77	-0.02	0.07	0.51	<u>81.23</u>

Note. Structure coefficients (r_s) greater than |.45| are underlined. Communality coefficients (h^2) greater than 45% are underlined. Coef .= standardized canonical function coefficient; r_s = structure coefficient; r_s^2= squared structure coefficient; h^2 = communality coefficient.

Moving to Function 2, the coefficients in Table 5 suggest that the only criterion variable of relevance was gender (rs = -0.98) even though it was inversely related. Among the other variables, sector, and age also show negative signs. According to this function, decision maker was the dominant predictor alone with a positive coefficient for income diversification. It can also be seen that decision maker is negatively related for gender, sector and age and positively related with education and no. of dependents. Based on the nature of these variables, this function is labeled by this study as 'gender dominant decision making function'.

Conclusions

The aim of the study was to pursuit how far the household investment on children's education is associated with the risk tolerance of parents, vis-à-vis socio-economic attributes related to each of the two. The study recognized that 'income quartile', 'decision maker', 'income distribution', 'distance', and 'household literacy have a significant (canonical) association with the risk tolerance while 'sector', 'gender', 'age', 'education', and 'no. of dependents' were associated with household investment in education.

The variables, 'sector' and 'education of household head' were the main contributors to 'household investment on education'. When the sector changes from urban to rural and rural to estate there is a tendency to decrease the household share of education expenditure. This is possible since the expenditure share of the households in the rural sector is substantially high compared to their lower level of expenditure (and income). The same situation can be witnessed in   households sin the estate sector compared to that of the rural sector. However, the 'education level of the household head' has a significant, positive effect on the investment in education.

It also shows that 'income quartile, decision maker', 'income diversification', and 'financial literacy' positively contribute to 'risk tolerance behavior'. In contrast, distance shows a negative contribution in a way that financial risk tolerance decreases with the distance. The canonical relationship, showing a negative association between income quartile and the sector, suggests that income quartile improves with the change of the sector from estate to rural and rural to urban. This means that the relative poverty level is highest in the estate sector even if the income share of the expenditure is high. However, the 'income quartile' positively associates with the 'education of the household head' so that the education level of the household head increases with the income quartile. Among many of the conclusions of this study,   the fact that income and spatial related attributes are crucial in determining the impact of risk tolerance in household education investment can be identified as a primary conclusion.

In addition to the income-spatial attributes, the study reveals that risk tolerance increases with the change of gender from female to male and, therefore, increases the tendency to invest in education. Therefore, it shows that gender related attributes are also important in financial risk tolerance and education investment.

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