UNIVERSITY OF CAPE COAST

RISK PREFERENCE AND CHILD LEARNING OUTCOMES: A STUDY ON GHANA

BY

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DECLARATION

Candidate's Declaration

I hereby declare that the whole content of this thesis is original to me and that no part of it has ever been used to fulfill the requirements for another degree at this university or anyplace else.

Candidate's Signature: …… Date: ……

Name: John Mefful

Supervisor's Declaration

I hereby attest that the thesis' preparation and presentation were supervised in accordance with the criteria set by the University of Cape Coast for thesis supervision.

Supervisor's Signature: …… Date: ……

Name: Dr. Jacob Nunoo

ABSTRACT

Although human capital investment increases the success rate of labour market participation and offers future welfare security for parents, empirical studies have established that it is a risky venture. Consequently, the risk preference of funders is pivotal in determining the optimal allocation of household's scarce resources in educational investment. However, several studies that focused on improving education in Africa failed to consider the role of parental risk preference in achieving quality and equitable Education for all children, which is key to bridging the literacy and numeracy skills gap that exist in Africa. Against this backdrop, we leveraged the seventh round of Ghana Living Standard Survey data to explore the relationship between parental risk preference and child learning outcomes. The instrumental variable estimation technique was employed to solve the endogeneity problem associated with the two variables. We found that parental risk preference is a significant determinant of learning outcomes of children in Ghana given that children from risk loving homes have better learning outcomes. In addition, risk loving homes have better learning outcomes for girls and children in public schools. Further, children from risk-loving female headed households have better learning outcomes compared to children from risk-loving male headed households. Finally, risk loving household heads spend more on the education of their children than risk averse household heads. We therefore recommend that policy makers stakeholders need to implement programs induce risk loving attitudes in parents.

KEYWORDS

Ghana, Learning outcome, Risk preference, Risk loving, Risk aversion

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DEDICATION

To Grace Amoafo, my mother; Ebenezer Mefful, my senior brother; and to John Mefful (Snr), my late dad.

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CHAPTER ONE

INTRODUCTION

The primary concepts in the study are introduced in this chapter. This chapter consists of background to the study, problem statement, purpose of the study, objectives, research questions, research hypothesis, significance, delimitation, limitation, and organization of the study.

Background to the study

The effect of education on productivity, growth, and development has long been proven and accepted scientifically by scholars as a unique capital in economic systems (Grant, 2017; Kampelmann et al., 2018). As "the store of skills, abilities, and other productivity-enhancing qualities" (Becker, 1975; Wagner, Joder, & Mumphrey, 2003); World Economic Forum, 2016), education is vital to the human capital development of nations. It boosts the productivity of workers and enables economies to improve the value chain of production beyond manual labor. At the national level, the stock of skills a nation possesses have significant impact on its industrialization ability and growth rate (Eichhorst et al., 2015). Its distribution is also key to the degree of intergenerational social mobility and, hence, a major determinant of poverty and inequality (Burgress, 2016; Gregg, 2017). Further, education serves as the foundation of long-term economic growth (International Institute for Applied Systems Analysis, 2008; Grant, 2017).

According to Burgress (2016), the multifaceted benefits of education are not limited to only national development; they transcend the quality of life of individuals and hence a key determinant of the higher income levels (Borjas, 2013; Lee et al., 2015; Murakami & Nomura, 2020). It further

impacts the quality of health, family structure, intellectual fulfillment, and other facets of a successful life, and also serve as an insurance cover to households on retirement (Rajasenan et al., 2013; Daniele et al., 2014; Hahn & Truman, 2015; Burgress, 2016; Zajacova & Lawrence, 2018; OECD, 2022; Shadieva et al., 2022). Woessman (2015) asserted that being oblivious to the role of education in a country's development will be hazardous to the future prospects of generations, leading to increased poverty, inequality, social exclusion, crime rates, and a weakened social security system (Abdullah et al., 2015; Tamim & Tariq, 2015; Hofmarcher, 2021). However, providing education comes at a cost, both financial and productive time (opportunity cost).

According to the OECD (2014), in 2011, member countries of the OECD spent more than 6% of their GDP on education, which constituted about 13% of the overall public spending in the OECD. Data from the World Bank revealed that Ghana's expenditure on education as a percentage of GDP was about 8.14% (2011) and 8.0 (2012), which were the highest in the history of Ghana. However, it declined to 3.89% (2018). Addai's (2022) study on the factors influencing education spending in Ghana found that households spent about 52.1% of their income on basic education. However, the cost associated with education is not only monetary. It is also time-consuming, and consistent with economic theory, pursuing education is associated with an opportunity cost just like any normal good (Jorgenson & Fraumeni, 1992; Frempong & Stadelmann, 2021). The time households and individuals spend on education could be supplied to employers to generate additional income, and putting a child to school also implies losing an immediate supplementary income that

could be gained from child labor (Lillard & Willis, 1997; Tripathi, S. (2010); Issahaku et al., 2023).

In 2019, the National Center for Education Statistics in the United States reported that students spend, on average, about 30 to 45 hours per week in school. Parents, on the other hand, spend between 2 and 3 hours per day on average to assist their children with school activities (Noel et al., 2016), aside the stress they go through worrying about the success of their children's education (Burgess, 2016). However, returns on investment in education are only reaped in the long run, and people who lack patience and foresight may be discouraged from making such investments due to the associated costs (Psacharopoulos & Patrinos, 2018; Marconi, 2018; Nurrachmat & Sastiono, 2022).

Despite the various costs associated with education, investment in education is not risk-free (Belzil & Leonardi, 2013; Tabetando, 2019; Aren & Hamamci, 2020). The returns reaped from such human capital investment depend on the abilities and motivation of the student to be successful academically and the presence of good governance (in both public and private sectors), which leads to more decent job creation. Parents may not have a full understanding of the abilities and motivations of their children and the success of the future labor market as well. Consequently, the high level of graduate unemployment, which some studies have attributed to skills mismatch, may deter parents from funding the education of their children or force them to consider other forms of education instead of formal education (Baah-Boateng, 2015; Ampong, 2020; Arthur-Holmes et al., 2022; Adjei & Baah-Boateng, 2023). Further, schooling is associated with physical risks stemming from

schooling activities, poor infrastructure, and poor road network (Harmon et al., 2018; Zagel, 2018; Jagnoor, 2020; Rahman et al., 2020).

In rural communities, the presence of wild animals may discourage parents from sending their children to school (Portwig, 2018; Tanaka & Yamano, 2015; Mensah, 2016). In addition, long distance and the lack of safe transport to and from school open children up to attacks such as kidnapping, sexual harassment, and rainstorms, among other hazards (Afoakwah & Koomson, 2020; Nunoo et al., 2023). Under such conditions, risk-averse parents may delay enrolling their children in school or reduce the attendance rate of their children, unlike risk-loving parents, whose higher utility for risk will cause them to spend more, enroll their children in school, and ensure the conventional school attendance rate is met. Research has shown that early school enrollment improves a child's literary skill acquisition and grade attainment, whereas delayed enrollment distorts the smooth progression of a child through primary education (Chen, 2015). When constrained financially, only risk-loving parents may be willing to fund their children's education with loans.

Palacios-Huerta (2003) revealed that the return on higher education per unit of risk in the U.S. was between 5 and 20% higher than those from risky financial assets, which is consistent with economic theory: the higher the risk associated with an investment, the higher the expected returns to compensate for the time value of money. Contrary to risky financial assets, which can have their risk lowered by diversifying a portfolio, investing in education is associated with a higher level of risk, and there is no proven approach to lowering that risk (Tabetando, 2019; Hartarto, 2023). Accordingly, a person's

choice of human capital investment directly influences the kind of work they do after graduating from college. If job dynamics change, an individual's skills are likely to become obsolete, and the returns on skills can fall. Since returns on human capital investment are risky and cannot be diversified, the risk preferences of individuals certainly influence their decisions regarding the choice of educational path and the optimum allocation of resources for investment in education (Bowen et al., 2015; Frempong & Stadelmann, 2021). In the face of uncertainty regarding future returns on education, relative to risk-loving parents, risk-averse parents are more likely to choose or encourage their children to pursue a relatively less risky educational path (which takes a short time and demands fewer abilities).

As disclosed by Frempong and Stadelmann (2021), if future returns on education were assured, the total utility households derive from investing in education would be higher. However, since future returns on education are not assured, the risk preference of households determines the level of utility they derive from investing in education. Risk-loving household heads will derive higher utility from investing in education compared to risk-averse household heads if future returns are uncertain. Given that investment in child education encompasses spending money as well as quality time on child schooling, risk loving parents will be more likely to spend on child education and this expenditure will propel the children to perform well academically. As argued by of Liu & Zhang, (2020); Park & Kim, (2020); Xiao, C., & Selvaratnam, D. (2023) expenditure on child education improves learning outcomes. In addition, investing time in children's school activities has an opportunity cost linked with it: the lose extra income that could be earned from working

overtime, and also, missing potential market opportunities that could have been exploited. Muller (2018); Cosso, Suchodoletz, & Yoshikawa (2022) have argued that spending quality time with children and getting involved in their school activities improves their academic performance. This investment, however, is more likely to be made by parents who have lower utility for immediate satisfaction.

Risk preference is therefore pivotal to achieving Sustainable Development Goal (SDG) number 4, which demands inclusive and equitable quality education and the promotion of lifelong learning for all. The low quality of educational systems in developing countries like Ghana magnifies the risk associated with investment in education, and hence risk-averse parents may be discouraged from funding child education, supporting the child with school activities (homework), or encouraging them to take on higher education. This could explain why available data shows a sharp decline in secondary and tertiary school enrollment and an increased dropout rate as well as rising learning poverty (UNESCO, 2019; World Bank, 2019). According to UNESCO, 2019; World Bank, 2019; Koomson & Afoakwah, 2023, about 80% of children between the ages of 10 and 12 in developing countries are unable to read and write simple sentences in English. The situation is worst in Sub Saharan Africa, as about 87% of the children in same age category are unable to read and write, and articulated by Afoakwah (2023), poor learning outcomes contributes to the issue of school dropouts.

Further, sections 4.2 and 4.3 of SDG4 also emphasize equal access to quality education (primary, technical, vocational, and higher education). However, some empirical studies have shown that risk-averse parents consider

the expected future returns on investing in male children to be higher than those for female children and hence increase their investment in male child education beyond the primary level relative to female child education (Ringdal & Sjursen, 2017; Ryan et al., 2017; Sovero, 2018). Moreso, aside sex of child disparities, location, and type of school disparities also continue to persist with children in urban, and private schools having better learning outcomes relative to their counterparts. In developing countries, Muschkin, Ladd, Dodge, and Bai (2020): Psaki, Haberland, Mensch, Woyczynski, and Chuang, (2022) have attributed these disparities to low investment in rural and public schools which could be the effect from the risk attitudes of parents, and it serves as a hindrance to achieving SDG 4. Therefore, to successfully achieve SDG4, the risk preference of parents needs to be considered in all forms of policy frameworks.

Household heads in developing countries engage in strategic decisions in terms of investing in the human capital development of their children based on the expected future returns from them (Pogue et al., 1977; Becker et al., 2016; Mu & Du, 2017). This suggest that investment in child education in developing countries are viewed as old age insurance cover. As such, the quality of old age life an individual will enjoy depends on the quality of children he/she has. Therefore, estimating the factors that influence decisions regarding human capital investment without considering the risk attitudes of parents will lead to biased results (Dohmen et al., 2010).

Statement of the problem

Several policies and programmes like Universal Primary Education (FUPE) policy, which necessitated the 1961 Act (Act 87); the Capitation Grant

(CG); the Complementary Basic Education (CBE) programme; the School Improvement Grants (SIG) which was a subset of the Ghana Secondary Education Improvement Project (SEIP); the Teacher Training and Professional Development (TTPD) programme; the Vision 2020 plan which emphasized the free Compulsory and Universal Basic Education (fCUBE); and the Free Senior High School (FSHS) policy were designed to increase school enrollment rate whilst reducing school dropout rate by making education affordable, accessible, and compulsory at the primary level. Some of the interventions focused on developing teachers as well.

Although some level of success has been achieved from these interventions, typically the school enrollment rate, school dropout, and poor learning outcomes are still issues of concern. Arthur et al. (2020) revealed that about 39% of children dropped out of primary school, with the number increasing to about 53% at the secondary level. The 2016 National Education Assessment report on Ghana further indicated that at the lower primary levels, only a third achieved proficiency in numeracy and less than half of them had reading proficiency in both English and Ghanaian languages. This suggests that the rate at which education investment is converted into human capital development is very low in developing countries (Muralidharan et al., 2019), including Ghana, and poses a challenge to achieving SDG 4 and Agenda 2063 of the African Union.

Several empirical studies have attributed the rising learning poverty to factors such as NHIS subscription (Kofinti et al., 2022); poverty and loss of confidence in education (Imoro, 2010; Koomson & Afoakwah, 2023); child labor (Heady, 2000; Frempong & Stadelmann, 2021); underdeveloped school

infrastructure (Chowa et al., 2015); and distance traveled to and from school and teacher absenteeism (Afoakwah & Koomson, 2021; Nunoo et al., 2023). Glick and Sahn (2000) also attributed the increasing rate of school dropouts in developing economies like Ghana to the difficulties graduates face in securing jobs. According to Ampong (2020), it takes an average of about two years for half of all graduates to find jobs, with the number increasing to three-fourth in the fourth year. The 2021 Population and Housing Census also disclosed that youth unemployment is about 13.44%. Given these conditions, the perceived risk associated with investment in education increases and is likely to have a significant impact on a child's education. However, existing empirical studies have failed to consider the role parental risk preference play in influencing child learning outcomes in Ghana. Almost all studies on risk preference and education are based on advanced countries like Italy, Germany, USA, and Mexico (Brown et al., 2006; Mu & Du, 2015; Strobl, 2017; Sovero, 2018). To the best of my knowledge, similar studies on African countries are scanty (Tanaka & Yamano, 2015).

Purpose of the study

The purpose of the study is to examine the effect of the risk preference of parents on child education in Ghana.

Objectives of the study

Specifically, the aims of the study are to:

1. examine the effect of parental risk preference on child learning outcomes;

2. explore the potential mediating role of total household expenditure on education as a pathway through which parental risk preference improves child learning outcomes.

Research hypothesis

The study is steered by the hypothesis below:

1. H_0: Parental risk preference has no influence on child learning outcomes
2. H_0: Total household expenditure on education is not a pathway through which parental risk preference improve child learning outcomes

Significance of the study

This study contributes to the literature on human capital development by investigating the risk preference of household heads and its effect on child learning outcomes in the context of Ghana. Findings from this study will be beneficial to policymakers as they can be used to influence the decisions of parents regarding investing in the education of their children by regulating tuition fees and providing financial aid to students. In addition, the study will assist parents in making the right choice of educational investment based on their level of risk preference. Further, based on the findings of this study, the government can influence the labor market to produce more highly educated and skilled workers by creating more jobs and guaranteeing highly educated individuals decent and well-paying jobs in the future. This will reduce the perception that education is associated with high risks, and parents will be incentivized to ensure their children are well educated. This policy is expected to have a substantial impact on the nation's overall investment in human

capital development. Findings from this study will help achieve SDG4 from subsections 4.2 to 4.6.

Delimitations of the study

The study focuses on the risk preferences of parents alone without considering the risk preferences of children. Also, the risk preference of parents is measured using the investment choice question in the GLSS7 survey dataset. The study also focused on only learning outcomes that measure functional skills; ability to read, write, and do simple mathematical calculations.

Limitations of the study

The study used only one wave of the Ghana Standard Living Survey data; a cross-sectional data collected in the 2016/2017 period. As such we could only establish causality at a point in time.

Organization of the study

The study is organized into five chapters, where Chapter 1 deals with the introduction, background to the study, statement of the problem, purpose of the study, significance of the study, delimitations, limitations, and organization of the study. Chapter 2 is a comprehensive review of relevant literature in both theory and empirics. In Chapter 3, the methodology of the study is examined, while Chapter 4 deals with results from the model estimations and discussion of results. The study concludes with Chapter 5, summary, conclusion, and recommendations.

CHAPTER TWO

LITERATURE REVIEW

Introduction

The study seeks to investigate how the risk preference of household heads influences the learning outcomes of children. We started this section with a review of the theories that underpin the study, followed by an empirical review of relevant literature. The empirical review is put into two categories, namely, risk preference and education, and other factors that influence education.

Theoretical review

This study reviewed 2 relevant theories that underpin it. Specifically, we reviewed human capital and prospect theory as the primary theories underpinning the study.

The Human capital theory

Becker's human capital theory in 1975 serves as the study's primary theoretical underpinning. Traditional labor economics considers human capital as the set of abilities or traits possessed by workers that make them more productive, and as postulated by Becker (1975), people increase their productive capacity by investing in higher education and skill acquisition. Education and training improve a person's knowledge, competencies, abilities, and other innate qualities that enable her or him to become more functional and contribute to the development of society. Eventually, the improvement in functionality and productivity leads to good governance and health outcomes. Thus, the human capital theory gives a trajectory of how education results in higher future wages. Education and training improve abilities; abilities

enhance productivity, and then enhanced productivity commands the reward of higher wages (Becker, 1964; Mincer, 1974). Further, it asserts that older people have more experience from years of accumulated education and, as such, have higher earnings relative to younger people. Age, therefore, has an indirect positive correlation with income through education.

According to Fitzsimons (1999), the human capital theory originated in the reign of the classical economists in 1776. The theory gained eminence and was recognized as one of the key resources to drive economic growth (Schultz, 1961). In modern economics, Schultz noted that spending on human capital is not a component of consumption but rather a form of investment that yields returns in the future. In the same year, Weisbrod came up with the first framework to measure the value of human capital, drawing on the measure of value attached to assets. However, Becker and Mincer from the University of Chicago made the first use of human capital theory in modern economics.

Becker documented two variants of human capital investment that affect earnings. The first variant is schooling, and the second is on-the-job learning. The core principle underpinning Becker's theory of human capital is that the learning capabilities of people are directly comparable to other resources used in the production process (Lucas 1988, 1990). Education is therefore the primary tool for human capital accumulation, and the end product of using human capital effectively is the benefits that accrue to the individual, the organization, and society in general (Schultz 1961). Oluwatobi and Ogunrinola (2011) added that understanding the human capital theory gives governments a good urge to make public expenditures in education. Haley (1973) noted that there are three streams of viewpoints in the literature

concerning human capital theory. The first stream considers the individual aspect, whereas the second stream is based on human capital and its accumulating process, and the third has a production-oriented perspective.

Although Robert Solow commended Becker for his tremendous contribution to development economics, he concluded the commendation with critiques (Weiss, 2015). Robert Solow criticized Becker for not accounting for the risks associated with human capital investment and the non-monetary components of human capital investment.

Production Function of Education

Scholars have modeled the production function of education similar to the production function of firms but with different explanations (Hanushek, 1986). There is a deterministic link between the inputs and outputs of education, and it is explained by technology. Inputs in the production function of education have been measured in different ways by scholars. However, most of them consider the inputs as household characteristics, community characteristics, child abilities, and school characteristics like wages for teachers, size of class, and the ratio of students to teachers. Similarly, the output has mainly been viewed as test scores or educational attainment (Fleischhauer, 2007).

Woessmann and Bishop (2002) likened the production function of education to a Cobb Douglas production as follows:

$$Q = AE^{\alpha} (IR)^{\beta} \; where \; \alpha + \beta < 1 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

The model treated students as homogenous so that all variables related to students are aggregated for the entire student populace. According to their study, three main inputs contribute to an observed educational outcome. They

are: child ability, represented by A; efforts exerted by the child, represented by E; and an effective combination of resources, denoted by IR. Child abilities are not limited to only innate abilities; they also account for family history, household characteristics, and previous educational background. A is therefore exogenously determined. Efforts exerted by a child in school, on the other hand, refer to the motivation to study and the time devoted to learning and attending school. Though mostly unobserved, efforts by children to succeed in school have been considered a key element in the production function of education. The effectiveness of resource combination also refers to the skills and knowledge teachers have to teach as well as design curriculums to ensure a child gets a full understanding of the knowledge shared in the education process. It also refers to how investments are made in school facilities to make teaching and learning appealing to bring out the best in a child. IR is exogenously determined by the school's management.

In 2011, Todd and Wolpin also viewed the production of education as a cumulative process of combining inputs from the past and present with the abilities of a child (mental capacity) to produce a particular educational outcome. By denoting the achievement of child i belonging to household j at age a, as A_{ija}, the vector of all inputs invested in the child from any time till age a, as Z_{ija} (a), and the mental capacity of the child as μ_{ij}, the production function is given as

$$A_{ija} = A_a \left(Z_{ij}\,(a), \mu_{ijo}\right) \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \quad (2)$$

They, however, extended equation 2 to include observable characteristics of the household a child belongs to and other community and school

characteristics. They assumed the production function was linear in parameters to be able to empirically estimate the model.

Prospect theory

We leverage the prospect theory to make an extension of the production function of education theorized by Todd and Wolpin (2011) to include the risk preference of household heads, which is an element that most studies have ignored. The study postulates that if future incomes are certain, compared to risk-loving household heads, risk-averse household heads will invest in the education of their children, which will translate into favorable educational outcomes. On the other hand, if returns on education are not certain, risk-loving household heads will rather invest in the education of their children for better educational outcomes.

The prospect theory postulates that in decision-making, economic agents view outcomes as gains and losses in comparison to a pre-selected choice as a reference point rather than the final state of wealth. Decision-makers tend to be risk-averse towards gains and risk-loving towards losses (Wang et al., 2020).

In 1979, the prospect theory was propounded by Kahneman and Tversky to show that, in general, investors are not rational at all times. Prospect theory challenges the proposition made by the expected utility theory that investors make rational decisions (Levy & Levy, 2002). Information asymmetry and the differences in the traits of individuals make them process the limited information available in diverse ways based on subjective probability and value. Kahneman and Tversky (1979) therefore argued that investors will most of the time deviate from the rational expectation theory as

established by traditional economics. This deviation proves the irrational nature of investors. However, the irrationalities can be explained by introducing psychology into economics. According to Wan (2018), the combination of economics and psychology gives prospect theory a solid theoretical basis. In the cognitive domain, the theory highlights three biases regarding investor risk preference.

The first is representative bias, which asserts that individuals try to understand new businesses based on the characteristics of an old business they know. Thus, people compare new businesses with old ones and, by so doing, determine the characteristics of the new business. The second is the availability bias, which arises from the bounded operation of people's cognitive abilities. The ability of people to access information is limited; hence, in the course of making decisions, people give attention to information that can be easily accessed and miss other important information that can improve the process of decision-making. Finally, the anchoring effect is the third bias. People use reference points such as past experience or current situations as the basis for making decisions when processing information. Individuals are open to taking risks in order to avoid losses, even if the value assigned to the expected outcome is not desirable. Therefore, the attention of people is mostly on the reference point, and it influences their judgment.

According to Wan (2018), the biases are associated with three effects, namely the certainty effect, the reflection effect, and the isolation effect. Regarding the certainty effect, people tend to be risk-averse when making decisions in the face of profits by assigning higher weights to results that are certain or have been confirmed. Kahneman and Tversky (1979) conducted an

experimental study, and the results revealed that rational decision-makers neglect incomes that cannot be determined and assign higher weights to incomes that are confirmed (Kahneman & Snell, 1990; Olsen, 1997; Shapira, 1995). Thus, when choosing between a low income that is assured and a higher income that has some level of probability of loss attached, risk-averse individuals assign higher weight to the low income that is assured and make that one their choice.

The second effect indicates that decision-makers reflect on the profit and loss attached to a particular decision before taking it (Laughhunn et al., 1980; March and Shapira, 1995). Regarding the same choice between low and high income, Kahneman and Tversky (1979) adjusted the loss attached to the higher income by reducing the probability, and also attached and increased the probability of loss to the low income. The results revealed that people reflect on the losses attached to options to choose from and choose the option that has a lower probability of loss. The value function reference point therefore leads to risk aversion, and the marginal value of gains and losses diminishes on either side of the reference point (Olsen, 1997).

The third effect also brings to light the notion that, in making comparisons between two choices, people make a first selection of the choice they prefer and keep that choice in mind while comparing it to the other. Hence, if decision-makers are concerned about failing relative to succeeding and have a specified financial goal in mind, selecting an option with larger variable returns will be the best (Benartzi et al., 1993; Thorley, 1995).

In effect, risk-averse household heads assign higher weights to results that are certain or have been confirmed. They make decisions by evaluating

the possible losses and profits associated with a particular investment choice before taking it. By assessing the market outcomes of graduates in the nation, household heads establish a reference point based on which they make investment decisions on children's education. Thus, if graduate unemployment is high, household heads will assign lower probabilities to favorable outcomes from investing in child education and will reduce their allocated resources to the human capital development of their children. Consequently, the support children need to succeed in school will be affected.

Synthesis of theories

We linked the prospects theory to the human capital theory of investment by drawing on the critiques of Robert Solow on Garry Becker's work to include the risk preference of household heads. We achieved this by employing the production function of Todd and Wolpin (2011), who argued that test scores are good predictors of labor market participation. To get the best out of their children, household heads invest in the human capital development of children to ensure they participate successfully in the labor market. This is done through schooling, which ensures children have acquired the skills employers need. Becker (1975) argued that the productive capacity of people is improved by higher education. However, the associated risk is high, as acknowledged by Robert Solow. Hence, household heads will be willing to fund the higher education of their children if the learning outcomes of their basic education are favorable.

Children having the ability to read and write in English or French at the appropriate age informs parents of their potential to succeed in the labor market. Risk-averse household heads will therefore increase the weight

assigned to investment in child education, and with a good governance system in place to ensure graduate unemployment is at its minimum, investment in child education will increase for the desired results to be achieved. Risk-loving household heads, on the other hand, will assign higher weight to favorable future market outcomes due to their higher utility for risk, thereby increasing investment in child education even when graduate unemployment is high.

Empirical review

We provide a review of empirical works that are in line with the study. This section specifically highlights the objectives, methodology, and findings of empirical studies on risk preference and child education. It also includes a review of other determinants of child education.

Risk preference and education

Several studies have investigated the crucial role education plays in human capital development as established by Becker (1995), which translates into economic growth and improvement in the livelihood of the educated (Astakhova et al., 2016; Kotásková et al., 2018; Psacharopoulos & Patrinos, 2018). However, human capital investment is considered to be highly risky (Belzil and Hansen, 2004; Belzil, 2007; Altonji et al., 2012; Greer, 2021), as it is associated with a lot of uncertainties in the form of future incomes and employment.

The panel study by Brown et al. (2006) on educational attainment and risk preference in the U.S. found an inverse relationship between educational attainment and the risk preference of parents. In addition, using child development supplementary data from 1997 to 2002, they concluded that the

degree of risk aversion exhibited by a parent or household head has a negative relationship with the academic performance of children.

Similarly, Belzil and Leonardi (2007, 2013) investigated how risk aversion influences schooling decisions in Italy using Italian panel data and found that risk-averse individuals have a lower probability of pursuing higher education. Further, increases in the school dropout rate and the decline in the rate of enrollment in higher education are attributed to risk aversion. This was further affirmed by Checchi et al. (2014), who observed that parents, the primary funders of children's education, respond to the uncertainties associated with the future prospects of their children, whose abilities and motivation to succeed are unknown. Focusing on Italy, their study explained that the disparities in the level of education of individuals in the country are due to the heterogeneities in their risk preferences; educational attainment decreases with risk aversion. Thus, higher level of risk aversion leads to decline in educational attainment, whereas lower levels improve educational attainment.

In 2018, Heckman and Montalto focused their study on USA and, with logistic regression, found evidence to support the argument that risk-loving greatly increases the likelihood of children enrolling in college. They further added that whereas females are more likely to enroll in higher education, children who live with only their biological fathers are less likely to pursue higher education due to a scarcity of resources, which makes human capital investments riskier.

On the contrary, Sovero's (2018) study on risk preference and child investment in the context of Mexico found that risk-averse mothers spend more on male children's education relative to female children. Estimating a

pooled OLS model, they noted that male children were better nourished, and expenditure on their learning materials, school fees, and transport was higher compared to female children. Moreover, risk aversion influences the secondary school track a child chooses (Wölfel & Heineck, 2012). Especially for female children, risk-averse parents encourage them to choose lower-track secondary schools. This is attributed to the perception that returns on investment in male child education are higher than female children, which is consistent with the study of Noel-Miller and Tfaily (2009). This suggests that risk-averse household heads will invest more in the human capital development of their children if future returns are certain and old-age security is assured due to the high risk associated.

However, Tabetando in 2019 argued that risk aversion has a positive correlation with child education investment. Further, the inverse relationship between educational investment and risk aversion, as observed by other scholars (Belzil, 2007; Belzil & Leonardi, 2013; Checchi et al., 2014; Heckman & Montalto, 2018; Sovero, 2018), is only true among poor households. Therefore, the hypothesis that risk aversion reduces investment in child education is partially true. Consistent with the findings of Tabetando (2019), Nurrachmat and Sastiono's (2022) investigation on the influence of risk aversion and spending on children's education in Indonesia revealed that risk aversion is only significant in poor households. They concluded using a two-period pooled OLS panel regression that although time preference has no bearing on the amount spent on a child's education, lower levels of parental risk aversion significantly lead to higher spending on children's education. In

periods of financial constraints, taking risks increases the probability of household heads applying for loans to finance child education.

According to Hartarto et al. (2023), the observed link between risk aversion and child education, which was measured using test scores, is only relational and not causative. This was observed after employing the two-stage least squares estimation method to solve the endogeneity problem detected in the model. However, the results revealed that risk aversion decreases the cognitive development of children. Thus, risk aversion has a strong inverse relationship with the ability of a child to perform well academically. They concluded that higher risk aversion is an obstacle to human capital development, especially in less developed countries.

The negative association observed between risk aversion and academic performance could be attributed to child labor, as noted by Frempong and Stadelmann in 2020, who studied risk preference and child labor in Ghana. From the estimations of linear probability and two-stage least squares models, they argued that, unlike risk-loving household heads, risk-averse household heads are more likely to send their children to work than to put them to school. Risk-averse people tend to be impatient, so they prioritize the short-term gains from child labor over any potential long-term financial security they might get from the labor market's favorable effects on their children. They concluded that whereas child labor is high among older children, the effect of risk aversion on child labor is higher in male-headed households relative to female-headed households.

Other factors that influence education

Afoakwah (2020) used Ghana Living Standard Survey data to study the relationship between women's bargaining power and the schooling outcomes of children in Ghana and found that women's bargaining power significantly reduces the probability of grade repetitions. Iddrisu et al. (2017) provided evidence from a series of logit model estimations to support the assertion that the gender of the household head and educational level play a significant role in the schooling outcomes of children. They noted that children from female-headed households are more likely to enroll in primary school relative to those from male-headed households. This is attributed to the greater value women place on their children's holistic development.

Energy poverty reduces the time children spend on academic work and school activities. Frempong et al. (2021) used the Ghana Living Standard Survey data to study the choice of cooking gas among households and its effect on child learning outcomes. They argued that the use of LP gas increases the time children spend in school and doing school-related activities. It reduces the hours children spend collecting firewood, which increases the time they spend on homework. Further, there is a marginal reduction in the number of hours children miss classes in households that use LP gas. Their findings are consistent with the study of Flunger et al. (2015), who utilized latent profile analyses to study the time children spend doing homework and their academic achievements over time. Thus, the reduction in energy poverty that can be achieved by households adopting the use of LP gas as cooking fuel has the potential to increase child learning outcomes.

Desalegn et al. (2021) articulated that school feeding programs have a direct impact on the academic performance of students. Their findings from estimating multivariable mixed effects negative binomial and linear regression models brought to bear that beneficiaries of school feeding programs have a mean difference of 2.4 points higher test scores relative to non-beneficiaries. It also improved school attendance and reduced dropouts. This is in conformity with the study of Metwally (2020), who established that in-school feeding programs have a positive impact on the academic performance of students. Similarly, a systematic review of nine schools revealed that hunger and undernutrition reduce a child's cognitive abilities and efficiency of learning (Wall et al., 2022).

In 2022, Koomson and Afoakwah postulated that financial inclusion has an influence on the learning outcomes of children. Their study used a two-stage least squares estimation technique to test this hypothesis, utilizing household data from the Ghana Living Standard Survey. The results showed that an increase in financial inclusion improves child schooling and learning outcomes. However, that improvement in learning outcomes favors female children and urban dwellers the most. Financial inclusion makes it possible for poor households to access funds to improve the welfare of their children. Typically, household heads that are financially included have a higher probability of reducing malnutrition in children (Arshad & Nawaz, 2020), and as established by other scholars, their cognitive skills are improved as a result.

Kofinti et al. (2022) also contributed to the determinants of child education among rural dwellers by measuring education and learning outcomes. Their findings after estimating a linear probability and a two-stage

least squares model revealed that subscribing to the National Health Insurance Scheme (NHIS) reduces expenditure on health and increases income allocated by households to spend on education. The increase in expenditure translates into improvements in child learning outcomes. However, based on child sex, their study discovered disparities in the learning outcomes of children in rural households in favor of male children, which confirms the findings of Wölfel and Heineck (2012), Sovero (2018), and Iddrisu et al. (2018). Meanwhile, Rashmi et al. (2022) suggested that the disparity could be attributed to the 828-rupee difference in household educational expenditure in favor of male children in primary school.

Distance traveled by students to school and teacher absenteeism have been found to be barriers to the cognitive development of children in Ghana, which is very significant to their academic performance. Nunoo et al. (2023) used the first two waves of the Ghana Socioeconomic Panel Survey data to investigate how teacher absenteeism and distance traveled by students to school affect their cognitive skills development. By using structural equation models, panel fixed models, and random effect models for estimation, they argued that teachers are the primary instructors of students; hence, their absence for about 12 days, together with the distance to school, reduces the test scores of students. According to Vuri (2010), distance to school negatively impacts school attendance, increases child labor, and improves the efficiency of child learning in school. Eventually, it influences the cognitive development of a child for improved academic performance.

Further, Cowan et al. (2023) used regression discontinuity to study how parents and children alter their schedules around the academic year and

found that, relative to fathers, mothers spend most of their time on children when school is in session. They have less eating and sleeping time, spend most of their time serving the emotional and psychological needs of family members, drive children to and from school, and spend less time exercising. Thomsen (2015) articulated that parents who spend significant time engaging their children in school and developmental activities improve their academic performance. However, their analysis was very significant among low-income households that spend not more than 20 minutes with their children on school activities. Similarly, Andrew et al. (2020) added that heterogeneities in the academic performance of children are inevitable since the time parents spend with children varies with household income..

Ntim (2013) studied the mismatch in the education of children by their sex in Ghana and found that socio-economic factors like low family income are very detrimental to the academic progression of children. It leads to learning difficulties, which increases the likelihood of children dropping out of school. Typically, in the case of female children, they turn to prostitution to fend for themselves and to support their families. They get pregnant along the way, and it kills their desire to go back to school. This is a contributing factor to the strong cultural mindset of prioritizing the education of male children over female children. The risk associated with investing in the education of a female child in such an instance becomes higher. Ahiakpor and Swaray (2017) also added that in rural Ghana, parents tend to invest more in the education of male children because the expected returns are higher. Male children are more likely to complete the learning cycle and participate in the labor market for

favorable returns relative to female children. However, female household heads do not exhibit this gender bias in terms of investing in child education.

Aside from the sex, age, education of a child, and other characteristics of the household, Rethman and Kim disclosed in 2015 that the education of a given child is influenced by the number of schoolchildren in the neighborhood and their level of education. They employed Ghana Cocoa Farmer's Survey data collected in 2006 to investigate the contributing factors of child involvement in schooling or labor. With a bivariate probit model, the study concluded that a neighborhood or household with a lower number of children attending school makes it less likely for a particular child to attend school. They are more likely to be involved in child labor. Alam (2015) also added that social and community factors are important elements that must be considered when policies are being implemented to improve learners' outcomes in rural communities.

In addition, the lack of inclusive educational resources, as found mostly among schools in rural communities, negatively impacts the school enrollment and performance of children with disabilities. Disability among children puts stress on household income as well as the productive time of household members. Due to the additional care required, parents with disabled children participate in the labor market at a lower rate (Vinck & Brekke, 2020), and single parents with low levels of education are socially disadvantaged compared to married parents (Vinck & Lancker, 2020). According to Huisman et al. (2005), the educational outcomes of children with disabilities are significantly impacted by poor family finances and a lack of resources at the school to support their education.

Synthesis of Empirical Literature Review

Generally, few studies have examined the risk preference and child education nexus, and they primarily examined the link between risk preference and (1) investment in child education; (2) educational attainment; (3) choice of school track; and (4) cognitive outcomes. Majority of the studies reviewed found a stastisically significant relationhip between risk preference and education. With focus on risk aversion, they found an adverse effect of risk preference on child education. Moreover, the existing studies mainly focused on advanced countries like the USA, Mexico, Italy, Indonesia, and Germany. Very few concentrated on low-income countries like Uganda and Nigeria, and in the context of Ghana, to the best of my knowledge, the present study is the first to investigate the link between parental risk preference and child learning outcomes. Further, the issue of endogenity has rarely been tackled in existing studies. Moreso, they have failed to empirically test the channels through which risk preference influence child learning outcomes, as well as examine the possible nuances that could arise from the type of school a child attends.

Chapter summary

This chapter reviewed several pieces of literature that are significant to the study. The first part of the review was based on theories that are relevant to the study, and the second part dealt with the empirical reviews. The primary theories, human capital and the prospect theory, of the study were reviewed together with the two production functions of education.

We found that most studies on labor economics were based on the human capital theory, which holds that people have capabilities that can increase productivity when improved. These capabilities are in the form of

skills and abilities that get improved through formal education and learning on the job. It signals the level of investment in human capital that has been made by an individual. Nonetheless, future participation in labor is not certain, which makes human capital investment risky. We leveraged the prospect theory, which proposes that decision makers make decisions based on subjective probabilities and the value they assign to a particular option, to extend the production function of education to include the risk attitude of household heads.

The review also revealed that majority of the studies on risk preference and the education of children were conducted in advanced countries.

CHAPTER THREE

RESEARCH METHODOLOGY

Introduction

The focus of the study is to investigate the role risk preference (RP) of household heads plays in the education of children. To achieve this aim, we employ econometric techniques in conformity with scientific approach to knowledge discovery. This chapter therefore discusses the research methodology used in the study. It explains the research design, data types and sources, and sample size. Further, it elaborates on the estimation techniques (theoretical and empirical econometric models), the explanation of variables used, post-estimation tests, and concludes with a summary of the research method.

Research philosophy and design

The foundation of this study is the positivist research paradigm, which is a school of science that rallies around the hypotheticodeductive approach to support quantitatively stated a priori hypothesis and derives functional relationships between dependent (outcome) and independent factors (Park et al., 2020). A positivist study's primary goal is to identify explanatory relationships that can be utilized to forecast study subjects and maintain control over them. The study seeks to investigate how parental risk preference influence child learning outcomes with an a prori expectation of risk loving having a positive relationship with child learning outcomes. We achieved the studies aim by quantitatively testing the hypothesis that parental risk preference has no statistical relationship with the learning outcomes of children. Hence the positivist research philosophy is the best for this study.

Further, Considering the problem, objectives of the study, and the nature of data used for the study, we relied on the quantitative approach and cross-sectional research design. It uses an econometric approach to test hypothesis and confirm associations between variables that have been measured quantitatively. It therefore has the ability to limit the biases that could be introduced by the researcher. We investigated the effect of parental risk preference on the education of a child.

Data type and sources

The study utilized the 7th round of the Ghana Living Standard Survey (GLSS7) data sourced from Ghana Statistical Services (GSS). The GLSS7 is a nation-wide dataset containing detailed information such as the demographic characteristics of the respondents, education, health, employment, time use, migration, housing conditions, and household agriculture for individual members and households. It uses the structured questionnaire approach, administered in a face-to-face interview format, to collect data. The survey used a two-stage sampling procedure. The first stage involved selecting the Enumeration Areas (EA) based on the 2010 Population and Housing Census, with probability proportional to the number of households (GSS, 2018). These EAs served as the main sampling units and were stratified according to the nation's administrative regions to represent each region's population. The second stage involved selecting a fixed number of 15 households using a systematic sampling method within each selected EA (GSS, 2014). As a result, 1,000 EAs consisting of 561 (56.1%) rural EAs and 439 (43.9%) urban EAs made up the primary sampling unit, and the number of households was 15,000

(8415 in rural areas and 6585 in urban areas). Overall, the survey response rate was 93.4%, translating into 14,009 households and 59,864 individuals.

Sample size

From the GLSS7 survey data, information on 8482 children within the age category of 11 and 17 years inclusive was obtained and merged with the 14009 households' information. We harmonized the data by dropping missing observations based on the learning outcome variable with the highest number of missing observations in order to build a composite variable of all the learning outcome variables in the data. This ensured we were able to estimate all the learning outcomes using the same sample size. 5101 observations in total were used for the study after merging and handling all missing observations.

Theoretical model

To investigate the effect of parental RP on child education, the study relied on the human capital theory by Becker (1975), which considers education as an investment in human resources, an input for production. Productive abilities that make up human capital can be produced and therefore have a production function. Following the work of Todd & Wolpin (2011), the study hypothesizes that a child's educational outcome—which is the result of the human capital production function—is the benefit reaped by a household head as a result of the continuous investment of scarce resources (time, money, and others) combined with child and school endowments. It follows that;

$L_{Outcomes_{ijRP\alpha}} = f_{RP}\left(HI_{ij}\,(RP,\alpha), CH_{ij}, SH_{ij}, \varepsilon_{ij}\right)$ …….. (3) is the production function for child learning outcomes, where $L_{Outcomes_{ijRP\alpha}}$ denotes the learning outcomes of child i belonging to household j whose head

exhibits a particular risk attitude and is α years old; HI_{ij} denotes the cumulative investment made in child i belonging to household j whose head exhibits a particular risk attitude and is α years old; CH_{ij} represents the characteristics of child i belonging to household j; SH_{ij} denotes school endowments of child i belonging to household j; and ε_{ij} is the error term that is orthogonal to the variables included in the model which captures the unobserved endowments, omitted variables, and measurement errors.

The RP, which is measured as a binary variable, is the primary variable of interest in this model. The model allows us to investigate whether the risk attitude of a household head contributes to the educational performance of a child. However, we hold the view that a risk-loving household is more likely to invest scarce resources in the education of a child, and this investment will translate into good academic performance for the child. Hence, children from risk-loving households are expected to perform better academically relative to children from risk-averse households.

Estimation technique

Marginal effect from the Probit model was used as the baseline model to evaluate the relationship between household heads, who are mostly parents, and the education of their children. The justification for using this approach is due to the binary nature of the dependent variables and the advantages they have over the Linear Probability Model (LPM) (Caudill, 1988; Than, 2010). Hower the probit estimation technique also becomes inefficient in the presence of endogeneity. Hence, we use the Instrumental Variable Probit (IV Probit) estimation technique to resolve the endogeneity issue, and that became our main model for discussion of results. In addition, the LPM and Two Stage Least

Squares estimation technique has been added to substantiate the chosen baseline and main models (i.e Probit and IV Probit). Despite the limitations of the LPM, it also offers some advantages; (1) it is faster to estimate, (2) easy to interpret the coefficients, and (3) its coefficients can be compared to those from the marginal effects produced by the probit models (Afoakwah et al., 2020; Afoakwah & Koomson, 2021; Frempong et al., 2021; Koomson & Afoakwah, 2022; and Kofinti et al., 2022). In this study, learning outcomes refers to child's ability to read, write, and do simple mathematical calculations, which are all binary variables. Hence to get a comprehensive overview of their academic performance, we generated a composite index of all the learning outcomes, which we termed the overall learning outcome.

Linear probability model (LPM)

LPM uses the Ordinary Least Squares approach to estimate binary dependent variables. Consider the child educational outcome variables expressed in equation 4

$$Yi = \begin{cases} 1 & with\ probability\ P \\ 0 & with\ probability\ 1-P \end{cases} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (4)$$

Where Y_i is a binary variable. Y = 1 is the ability to read and write text in English/French and Ghanaian language; and the ability to do simple mathematical calculations, and Y = 0, otherwise. We formulate the baseline model by parametrizing P, the probability of Y_i to depend on a vector of covariates, **X**, and **β,** a parameter vector of dimension K * 1 which measures the effect the covariates have on the probability of any of the dependent variable being true. The resulting conditional probability is;

$$Pi \equiv \Pr[Yi = 1|X] = F(Xi'\beta) \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (5)$$

$$1 - Pi \equiv \Pr[Yi = 0|X] = 1 - F(Xi'\beta) \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (6)$$

Where $F(X_i'\beta)$ is a defined function to be determined.

Unlike the probit and logit models which use the cumulative distribution and standard normal cumulative distribution functions respectively in their estimation, the LPM lets $F(X_i'\beta) = X_i'\beta$ (Cameron & Trivedi, 2005). Given that $E[Y_i | X] = F(X_i'\beta)$, we model the LPM theoretically as;

$$\Pr(Yi = 1) = E[Yi | X] + (Yi - E[Yi | X]) = Xi'\beta + \varepsilon i \quad \ldots\ldots\ldots (7)$$

From equation 7, the slope coefficients (β) tell the effect of a unit change in the covariates on the probability that $Y_i = 1$. That is, the probability that a child can read and write text in English/French and Ghanaian language, and the ability to do simple mathematical calculations.

It has been argued by scholars that LPM is associated with some limitations, and like the probit and logit models, it becomes inefficient if the model suffers endogeneity, which arises from breaching the weak exogeneity assumption of the Ordinary Least Squares (OLS). For consistency of the OLS estimator, we expect that the covariance of the covariates and the error term are zero. However, this expectation is mostly not met due to data issues like measurement errors, the absence of important variables that the data cannot account for, and reverse causality. Hence, some of the covariates exhibit a significant relationship with the error term. In this study, we acknowledge that the LPM could be affected by the issue of endogeneity because the policy variable, RP, and the outcome variables are influenced by inherent factors, such as ability, which cannot be observed in the data. Following the work of Kofinti et al. (2022), we rely on the instrumental variable estimation techniques to resolve this issue by considering the neighbourhood RP prevalence rate as an instrumental variable for household head RP.

Two stage least squares (TSLS)

As an instrumental variable (IV) estimator, the TSLS produces results using OLS regression two consecutive times (Cameron & Trivedi, 2005), hence its name. It first estimates the covariates together with the IV (as a covariate) on the endogenous variable, followed by regressing the outcome variable on the covariates with the predicted values from the first stage. The instrumental variable approach follows the general extensions made to the OLS model. From equation 7, let z be the variable contained in X_i, which is correlated with the error term (ε_i), and let k be the instrumental variable. As a requirement for the instrumental variable to be valid, it must satisfy the following conditions:

1. k must be uncorrelated with ε_i. The assumption of exogeneity.
2. k must be correlated with Z. The validity assumption.
3. k must have a strong correlation with Z.

Instrumental variable

We acknowledge that risk-loving is behavioural and can be influenced by unobservable inherent characteristics of the household head, which are not captured in the data. As argued by Dohmen et al. (2010), risk-loving has a strong positive correlation with cognitive skills, and the cognitive abilities of the household head (parent) can have a direct influence on the ability of a child to do well academically. The biases from the LPM estimates, as acknowledged, will therefore be dependent on the correlation between the RP and the idiosyncratic error term. The direction of the bias in the RP coefficient depends on its correlation with the error term, according to Wooldridge

(2015). However, it is impossible to determine the direction beforehand since we cannot observe the error term.

As a remedy, the study employed the approach of Lu et al. (2012), as used by Kofinti et al. (2022), to estimate the neighborhood prevalence rate of RP by considering the cluster to which a household belongs. In the GLSS7 data, a cluster is made up of 8 to 15 households. As established by earlier studies, we believe that the dominant RP in a cluster in which a particular household head dwells will have a significant influence on his or her RP. Therefore, it is likely that a particular household head will not invest in the education of his or her child if the majority of household heads in the cluster do not. We show this, in our estimation, to be true and hence satisfy the relevance requirement of the IV (Cameron & Trivedi, 2005; Greene, 2002; Wooldridge, 2015). Furthermore, we are convinced that this instrument is exogenous and does not, other than through the RP of the household head, have any theoretical relationships with any of the child learning outcome variables. This meets the requirements for the exclusion restriction. We proceed to estimate the covariates (which now include the instrument) on the endogenous variable.

First stage model

$$\Pr(Z = 1) = \gamma 0 + \gamma 1k + \gamma i \boldsymbol{X} + u \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (8)$$

Where k is the instrumental variable which is not correlated with the error term in the model, γ_0, $\gamma_{i,}$ γ_j are coefficients to be determined, and **X** is a vector of covariates. Pr $(\hat{Z} = 1)$, the predicted probability value of Z=1 from equation 8, is obtained and used as an independent variable in the main model, which is the second stage.

Second stage model

$$\Pr(Yi = 1) = \pi 0 + \pi 1 \Pr(\hat{Z} = 1) + \pi i \boldsymbol{X} + v \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (9)$$

Estimating π in equation 9 by OLS gives;

$\hat{\pi}_{TSLS} = [X'Z(Z'Z)^{-1}Z'X]^{-1} [X'Z(Z'Z)^{-1}Z'Xy]$ which indicates the effect of a unit change in the covariates on the probability that $Y_i = 1$.

Probit model

Scholars have highlighted some advantages of the probit model over the LPM, which include restricting the probability values of the outcome variables between 0 and 1 as well as allowing for nonlinearity among the variables (Gujarati, 2006). The probit model is specified below with the assumption that the learning outcomes of children depend on Y, an unobserved latent variable that is only observed when it reaches a certain threshold and is influenced by other covariates. Let the covariates be **X**i so that

$$yi* = \boldsymbol{X}'i\,\beta + \varepsilon i: where\ \varepsilon \sim N(0\ \delta^2) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (10)$$

$$Y_i = \begin{cases} 1 \text{ if } y* > 0 \\ 0 \text{ if } y* < 0 \end{cases}$$

By the assumption of normality, the probability that y* is less than or equal to Y_i can be computed from the standardized normal CDF as

$$P = \Pr(Y = 1|X) = \Pr(y* \leq Yi) = \Pr(Zi \leq \boldsymbol{X}'i\,\beta) = F(\boldsymbol{X}'i\,\beta) \ldots\ldots (11)$$

where P(Y=1|X) refers to the probability of a child exhibiting a positive learning outcome conditioned on values of the covariates, Zi is the standard normal variable, i.e., $Z \sim N(0, \delta^2)$, $\mathbf{X}_i$ is a vector of covariates, β measures the change in the z-score or probit index ($F(\mathbf{X}'_i \beta)$) for a one unit change in the predictor, and F is the standard normal CDF expressed as;

$$F = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{X'i\,\beta} e^{-Z^2/2}\, dz \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (12)$$

Similar to the estimation techniques of other binary variables, the probit model also uses the maximum likelihood estimation technique in its estimates. It estimates unknown parameters by allowing the likelihood of observing a particular value of the dependent variable to be as high as possible (Gujarati, 2006). As confirmed by Pindyck and Robbinfield (1991), scholars have established that estimates from the maximum likelihood estimator are consistent.

Since the dependent variable Y_i is binary let P be the probability of a child having a positive learning outcome, so that P = Pr (Y_i=1). Then the probability of a child not having a positive learning outcome will be Pr (Y_i=0) = 1 – P. This follows a Bernoulli distribution and the probability density function is given by

$$\Pr(Y) = P^{Y}(1 - P)^{1-Y} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (13)$$

It implies that for Y=1,

$$\Pr(Y=1) = P^{1}\left(1 - P\right)^{1-1} = P$$

Also, for Y=0,

$$\Pr(Y=0) = P^{0}\left(1 - P\right)^{1-0} = 1 - P$$

From equation 13, the likelihood function is given by,

$$L = \prod_{i=1}^{N} \Pr(Yi) = \prod_{i=1}^{N} Pi^{Yi}(1 - Pi)^{1-Yi} \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (14)$$

It follows that

$$L = \prod_{i=1}^{N} Pi^{Yi}\left(\frac{1}{1 - Pi}\right)^{Yi}(1-P)$$

$$L = \prod_{i=1}^{N}\left(\frac{Pi}{1 - Pi}\right)^{Yi}(1 - P) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (15)$$

Taking the logarithm of both sides of equation 15 gives;

$$lnL = \sum_{i=1}^{N} Yi\, ln\left(\frac{Pi}{1 - Pi}\right) \sum_{i=1}^{N} ln(1 - P) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (16)$$

But $ln\left(\frac{\text{Pi}}{1 - \text{Pi}}\right)$ is equivalent to the estimation of odds ratio in the logit model

Thus $ln\left(\frac{\text{Pi}}{1 - \text{Pi}}\right) = \mathbf{X}'_{\text{i}}\beta$ ..... (17)

Substituting equation 17 into equations 16 gives

$$lnL = \sum_{i=1}^{N} Yi\, \boldsymbol{X}'i\, \beta \sum_{i=1}^{N} ln(1 - \exp(\boldsymbol{X}'i\, \beta)) \ldots\ldots\ldots\ldots\ldots\ldots (18)$$

Since Y_i is not directly observed, we use the latent variable y_i* to maximize equation 18 and the results is given below.

$$lnL = \sum_{i=1}^{n} yi * \ln F\,(\boldsymbol{X}'i\, \beta) + (1 - yi *) \ln\big(1 - F(\boldsymbol{X}'i\, \beta)\big) \ldots\ldots\ldots\ldots (19)$$

The values of the parameters that maximize lnL are the estimators of the probit model

Instrumental variable probit model

As established earlier, the probit model is also affected by endogeneity issues, which cause the estimates to be biased. In such an instance, the expectation that no relationship exists between the regressors and the error term is breached. Thus, E (X, ε) ≠0. To remedy this problem, we employ an instrumental variable in the estimation, using the neighbourhood RP prevalence as the instrument. Consider the probit model from equation 10, which now suffers from endogeneity, let V be the variable contained in Xi that is correlated with the error term (εi), and let L be the instrumental variable that satisfies all three conditions stated above.

First stage model (reduced form)

$$\Pr(V = 1) = \theta 0 + \theta\, 1L + \theta\, i\, \boldsymbol{X}i + u \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (20)$$

Where L is the instrumental variable which is not correlated with the error term in the model, θ_0, θ_1, θ_i are coefficients to be determined, and **X** is a vector of covariates. Pr ($\widehat{V} = 1$), the predicted probability value of V=1 from equation 20 is obtained and used as an independent variable in the main model, which is the second stage.

Second stage (structural equation)

$$\Pr(Yi = 1) = \Pi 0 + \Pi 1 \Pr(\widehat{V} = 1) + \Pi i \, \boldsymbol{Xi} + v \ldots\ldots\ldots\ldots\ldots\ldots\ldots (21)$$

Equation 21 therefore is the structural equation which is also estimated using maximum likelihood estimation technique

Empirical model

Objective one

The study achieved the set objective by considering some characteristics of the child, household, and the school attended by the child. The baseline model (Probit) from equation 10 is specified as;

Probit empirical model

$$L_{Outcomeij} = \beta 0 + \beta 1RPi + \beta 2F_{Chi} + \beta 3Age_{Chi} + \beta 4Age_{St_{Chi}} + \beta 5Disab_{Chi} + \beta 6HHd_{Chi} + \beta 7Grd_{Chi} + \beta 8Adop_{Chi} + \beta 9\, PhComp_{Chi} + \beta 10Mstat_{HHdi} + \beta 11Age_{HHdi} + \beta 12Age^2_{HHdi} + \beta 13\, F_{HHdi} + \beta 14\, Educ_{HHdi} + \beta 15Emp_{HHdi} + \beta 16Insurc_{HHdi} + \beta 17Rel_{HHdi} + \beta 18logExp_{HHdi} + \beta 19\, Pub_{Schi} + \beta 20Hrs_{Clssi} + \beta 21Hrs_{Hwki} + \beta 22Sch_{Fdni} + \beta 23\, Mns_{Schi} + \beta 24Eco_{Zonei} + \beta 25Loci + \beta 26Suvr_{Yri} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots. (22)$$

Where L_Outcome$_{ij}$ is the dependent variable which denotes the probability of child i having learning outcome j (read text in English/French, write text in English/French, read text in Ghanaian language, write text in

Ghanaian language, and do simple mathematical calculations), and the independent variables are RP which is the risk preference of household head of child (policy variable), F_Ch is the sex of child with male child as the base, Age_Ch is age of child, Age_St_Ch is age at which child started schooling, Disab_Ch is child have a form of disability, HHd_Ch is child to household head, Grd_Ch is grandchild to household head, Adop_Ch is adopted child of household head, PhComp_Ch child has no access to internet via mobile phone or computer, Mstat_HHd is marital status of household head, Age_HHd is age of household head, $Age\_HHd_i\text{^}2$ is the square household head's age, F_HHd is sex of household head with male as the base, Educ_HHd is household head is educated, Emp_HHd is household head is employed, Insurc_HHd is household have health insurance which was used as a proxy for the household having an insurance cover for the child, Rel_HHd is a categorical variable which denotes the religion (Christianity, non-Christian, no religion) practiced by the household head with no religion as the base, logExp_HHd is the logarithm of total household expenditure, Pub_Sch is the type of school child attends with private school as the base, Hrs_Clss is hours of class child attended which was used a proxy for absenteeism, Hrs_Hwk is hours child spent on homework, Sch_Fdn is child benefiting from school feeding program from either the government or private organisation, Mns_Sch is a categorical variable which denotes the means (on foot, Taxi, Trotro, Metro Mass bus, School Bus or Private car, Motor or Bicycle) by which child goes to school with on foot as the base, Eco_Zone is also a categorical variable denoting the three main ecological zones (Costal Zone, Forest Zone, and Northern Zone) in which the a household dwells with

Coastal Zone as the base, Loc is the location (rural or urban) with urban as the base, and Suvr_Yr is the time fixed effect variable.

IV Probit empirical model (Endogeneity Corrected Model)

First stage

$$RPi = \gamma 0 + \gamma 1NeighPRPi + \gamma 2F_{Chi} + \gamma 3Age_{Chi} + \gamma 4Age_{St_{Chi}} + \gamma 5Disab_{Chi} + \gamma 6HHd_{Chi} + \gamma 7Grd_{Chi} + \gamma 8Adop_{Chi} + \gamma 9Int_{Chi} + \gamma 10Mstat_{HHdi} + \gamma 11Age_{HHdi} + \gamma 12Age^2_{HHdi} + \gamma 13\, F_{HHdi} + \gamma 14Educ_{HHdi} + \gamma 15Emp_{HHdi} + \gamma 16Insurc_{HHdi} + \gamma 17Rel_{HHdi} + \gamma 18logExp_{HHdi} + \gamma 19\, Pub_{Schi} + \gamma 20Hrs_{Clssi} + \gamma 21Hrs_{Hwki} + \gamma 22Sch_{Fdni} + \gamma 23Mns_{Schi} + \gamma 24Eco_{Zonei} + \gamma 25Loci + \gamma 26Suvr_{Yri} + \varepsilon i \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots . \ldots \ldots \ldots \ldots \ (23)$$

Where $NeighPRP_i$ is the neighbourhood prevalence rate of risk preference.

Second stage

$$L_{Outcomeij} = \pi 0 + \beta 1\widehat{RP}i + \pi 2F_{Chi} + \pi 3Age_{Chi} + \pi 4Age_{St_{Chi}} + \pi 5Disab_{Chi} + \pi 6HHd_{Chi} + \pi 7Grd_{Chi} + \pi 8Adop_{Chi} + \pi 9PhComp_{Chi} + \pi 10Mstat_{HHdi} + \pi 11Age_{HHdi} + \pi 12Age^2_{HHdi} + \pi 13F_{HHdi} + \pi 14Educ_{HHdi} + \pi 15Emp_{HHdi} + \pi 16Insurc_{HHdi} + \pi 17Rel_{HHdi} + \pi 18logExp_{HHdi} + \pi 19\, Pub_{Schi} + \pi 20Hrs_{Clssi} + \pi 21Hrs_{Hwki} + \pi 22Sch_{Fdni} + \pi 23\, Mns_{Schi} + \pi 24Eco_{Zonei} + \pi 25Loci + \pi 26Suvr_{Yri} + \delta i \ldots \ldots \ldots \ldots \ldots \ldots . (24)$$

Where $\widehat{RP}_i$ is the predicted probability from equation 23

Objective two

Objective two investigated the potential mediating role of total household expenditure on education as a pathway through which parental RP improves child learning outcomes. We adopted the Baron and Kenny approach

to mediation analysis, which involves a two-stage approach to investigating the mediating role of a variable of interest (Baron & Kenny, 1986; Churchill, & Marisetty, 2020; Koomson & Afoakwah, 2022; Kofinti et al., 2022). We hypothesize that risk loving attitude makes household heads spend more on the education of their children, and this expenditure improves the learning outcomes of their children. As a first step, we investigated the relationship between educational expenditure and the risk preference of household heads and included the expenditure of household heads on child education as an extra covariate in the main model as the second step.

Step one (educational expenditure and risk preference)

$$LogTotEduExp = \Pi 0 + \Pi 1RPi + \Pi 2F_{HHdi} + \Pi 3Mstat_{HHdi} + \Pi 4Emp_{HHdi} + \Pi 5Grade_{Chi} + \Pi 6MothEduci + \alpha i \ldots\ldots\ldots\ldots (25)$$

Step Two (educational expenditure as an extra covariate)

$$L_{Outcomeij} = \eta 0 + \beta 1\widehat{RP}i + \eta 2F_{Chi} + \eta 3Age_{Chi} + \eta 4Age_{St_{Chi}} + \eta 5Disab_{Chi} + \eta 6HHd_{Chi} + \eta 7Grd_{Chi} + \eta 8Adop_{Chi} + \eta 9PhComp_{Chi} + \eta 10Mstat_{HHdi} + \eta 11Age_{HHdi} + \eta 12Age^2_{HHdi} + \eta 13F_{HHdi} + \eta 14Educ_{HHdi} + \eta 15Emp_{HHdi} + \eta 16Insurc_{HHdi} + \eta 17Rel_{HHdi} + \eta 18logExp_{HHdi} + \eta 19\, Pub_{Schi} + \eta 20Hrs_{Clssi} + \eta 21Hrs_{Hwki} + \eta 22Sch_{Fdni} + \eta 23\, Mns_{Schi} + \eta 24Eco_{Zonei} + \eta 25Loci + \eta 26Suvr_{Yri} + \eta 26\, LogTotEduExpi + \mu i \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (26)$$

Measurement of variables

This section provides information on the measurement of the variables used in the study as well as their operational definition. It is worth noting that the variables used in the study were selected based on theory and existing

empirical studies. We present them in categories as dependent and independent variables.

Dependent variables

Learning outcomes

Five indicator variables were derived to measure child education from the questions asked. The first and second indicator variables are the child's ability to read and write text in English and French, respectively. The child's ability to read and write text in Ghanaian language, respectively, are the third and fourth indicator variables, whereas the child's ability to do simple calculations is the fifth indicator variable. Choosing these indicator variables was informed by existing literature (Frempong et al., 2021; Kofinti et al., 2022; Koomson & Afoakwah, 2022). Additionally, we constructed an additive index from the five indicator variables to measure the overall academic performance of a child in the study.

By the structure of Ghana education system, children within the age bracket of 11 and 15 years inclusive would have completed lower primary education, and some would have transitioned to junior high school (JHS). These children are expected to have the ability to do simple mathematical calculations and read and write simple phrases in English, French, and Ghanaian language. Consequently, the study focused on schoolchildren within this age category who are in basic school (primary to JHS). A two-year allowance was made to account for possible grade repetition and late enrollment. Hence, children between the ages of 11 and 17 years, inclusive, were used in this study.

Independent variables

Risk preference (RP)

The RP variable was measured using investment decision-eliciting questions in the GLSS7 survey data. Existing empirical studies have also measured RP with the same investment question from the GLSS7 survey data (Frempong et al., 2021). Household members of age 12 and older were asked, "Suppose you want to invest some money; which option do you prefer?"

(1) Invest in a business where I can't lose money but profits are low.

(2) Invest in a business where there is a small chance I can lose money but profits are potentially high.

We restricted response to this question to only household heads. By theory, selecting option 1 implies the household head is risk-averse, and selecting option 2 defines the household head as risk-loving. A risk-loving household head was assigned the code of 1, and a risk-averse household head was assigned 0. Therefore, the study operationalized risk preference as the quality of a household head being risk-averse or risk-loving.

As indicated by Hartarto et al. (2023) and Sovero (2018), we acknowledge that the hypothetical investment question used to measure RP may not be reflective of the actual behavior of the respondents in real life. Nonetheless, empirical studies have established that a consistent and strong association exists between incentivized RP experiments and hypothetical RP responses (Binswanger, 1981; Alan et al., 2017; Hartarto et al., 2023).

Female child

The study measured female child as a binary variable, which refers to the sex of a child, and coded it as 0 for male child and 1 for female child.

Thus, the base variable is the male child. Empirical studies have found diversity in child learning outcomes based on sex (Stipek & Hoffman, 1980; Murray et al., 2010; Afoakwah, 2018).

Age of child

The study by Pellizzari and Billari (2012) found that younger children performed better than older children. The study measured the age of a child as a continuous variable, and it was in years.

Age child started school

In Ghana, the set age for starting school, Primary 1, according to the educational system of Ghana is 6 years. However, there are preschool systems available which engage child below 6 years in educational activities. Existing empirical studies have shown that the age a child starts schooling have a significant impact on their likelihood of grade completion (Bozick & DeLuca, 2005). Afoakwah (2018) argued that children who start schooling late have a higher tendency of dropping out of school. Age child started school variable was measured as a continuous variable in the study and it is in years.

Child Disability

Richardson (2009) found that disability accounted for 0.1% of the variation in child academic performance, and recent empirical studies have found that children with disabilities face challenges attending school and are sometimes withdrawn from school for medical reasons (Moyi, 2017). In this study, child disability refers to children suffering from any form of disability. We measure it as a dummy variable, which takes on the value 1 if the child has a form of disability and 0 if there is no disability.

Child Relationship to Household Head

Household heads (mostly parents) invest more in the education of their biological children relative to other children (grandchildren or adopted children) (Shapiro & Tambashe, 2001). We measure child relationship to household head as a categorical variable, which takes on 1 if biological child to household head, 2 if grandchild to household head, 3 if adopted child, and 0 otherwise.

Child Access Mobile Phone or Computer

Access to the internet can have a positive influence on the learning outcomes of children if it is used for accessing educational contents. Lei and Zhou (2012) noted that children who had access to the internet achieved high test scores compared to children without access to the internet. The study used access to a mobile phone or computer as a proxy for children accessing the internet. We measured it as a dummy variable, with 1 denoting that a child does not have access to a mobile phone or computer and 0 denoting that a child has access to a mobile phone or computer.

Marital status

The marital status of a household head (parent) has been found to have a direct influence on the academic performance of a child. Froyen et al. (2013) found that children of divorced parents had poor academic performance relative to children whose parents were together. In comparison to a child of a single parent, we expect that children of married couples will perform better in school. Having access to both parents' assistance and resources, the child's learning outcomes are improved. We measured the marital status of the household head as a dummy variable, where a household head who is married

is assigned 1 and a household head who is not married is assigned 0, including those who have been divorced, widowed, or never married.

Age of household head

Parent-child Cordial relationships and involvement in child educational activities improve the learning outcomes of children (Hay et al., 2016). Compared to older parents, younger parents usually have quality relationship with their children. Their age allows them to have interest in some activities of their children, and the more they engage in these activities with them, the stronger the bond they build. Thus, it is expected that children of younger parents perform better academically relative to children of older parents. We measured the age of households as a continuous variable, and it is in years.

Female household head

The sex of a household head has been found by scholars to have an effect on the learning outcomes of children. In 2017, the study by Malczyk and Lawson revealed that children of female-headed households fare better in school than children of male-headed households, especially female children. Naturally, children from households headed by women are expected to do better because women are typically the primary caregivers in the home. We account for the difference in a child's academic performance caused by sex of the household head in the study, and it was measured as a dummy variable. The female household head was coded as 1 and the male household head as 0.

Educated household head

Educated parents find schooling a necessity and devote a lot of resources to the education of their children. A strong positive correlation exists between a parent's education and their child's school performance (Wang et

al., 2020). Following the work of Frempong and Stadelmann (2021), we control for the effect of household heads' education on child learning outcomes. The study measured it as a dummy variable with no education as the base, coded as 0, and 1 assigned to an educated household head.

Employment status of household head

The material needs of a child can easily be met by a parent who is employed. Needs such as quality food, uniforms, and books can be met when the household head has a source of income. Altschul (2012) and Eshetu (2015) found a positive association between family income and the academic achievement of children. The study used a binary variable to represent a household head's employment status, giving employed households a value of 1 and unemployed households a value of 0.

Household NHIS

Following the work of Kofinti et al. (2022), we expect household subscriptions to National Health Insurance (NHIS) to reduce household health expenses, which will increase income available for investment in child education. We used the household's NHIS subscription as a proxy for the child's NHIS subscription. The likelihood of a child having an NHIS subscription is higher in a household where the head has subscribed. Cohodes et al. (2014) asserted that child NHIS subscriptions will improve child learning outcomes and grade completion. We used a dummy variable to measure household head NHIS insurance subscription, with 1 representing yes and 0 denoting no.

Household head religion

The test results of kids who participate in religious activities are found to be higher than those of kids who do not (Moffat and Yoo, 2019; Park and Bonner, 2008). Such kids are mostly conscious of what they do in school, engage in less risky behaviors, are more cooperative, and have better mental health (attributed to prayer and meditation). The study measured the religion of a household head as a dummy variable, where 1 was assigned to a Christian household head and 0 was assigned to a non-Christian household head. The base is a non-Christian household head.

Household total expenditure

Consistent with the study of Frempong and Stadelmann (2021), household annual total expenditure was used as a proxy for household wealth in the study to account for the contribution of wealth in successful child learning outcomes. Whereas Ansong et al. (2015) found an indirect effect of household wealth on child educational achievements, Pugh et al. (2015) and Morris et al. (2013) found a positive direct effect of household wealth on child learning outcomes. The study therefore measured household total expenditure as a continuous variable. However, to reduce the variation in household total expenditure, it was normalized by the use of logarithms.

Household total expenditure on education

The study measured total household expenditure on education as a continuous variable. Expenditure on child education improves academic test scores (Kang, 2007). French et al. (2015) found a strong positive association between educational expenditure and Programme for International Student Assessment (PISA) scores. Similarly, Mukrimaa et al. (2016) reported a

significant positive correlation between child academic performance and household expenditure on extra classes, transport, and learning materials. We used logarithms to normalize household total expenditure to ensure it exhibited a normal distribution.

School type

The quality of educational services—in terms of facilities, teacher-student ratio, and student engagement—plays important role in academic performance. Adeyemi, S. (2014); Hahn and Seo (2014); Chudgar and Quin (2012) found that children in private schools have better academic performance compared to children in public schools. We controlled for the school type effect in the study using a dummy variable, which assigns 1 to a public school and 0 to a private school.

Hours of classes attended

Attending classes guarantees that a student is guided through all the learning modules for better knowledge of all important subject matters. The child does better academically as a result of this aiding their personal studies. Consistent with Bamuhair et al.'s (2016) findings, Kassarnig et al. (2017) found that punctuality and the higher hours of class attended have a strong positive correlation with the academic performance of children. The study therefore controlled for variations in the learning outcomes of children that are attributed to the hours a child spends in class. Hours of class attended by a child are measured in hours as a continuous variable.

Hours child spend on homework

The amount of time a child spends on homework reveals his or her level of academic motivation, particularly for students who experience fewer academic difficulties. Núñez et al. (2015) argue that hours spent on homework together with homework time management improve the academic achievement of students. The study measured the number of hours a child spends on homework as a continuous variable in hours.

School feeding

School feeding program significantly reduces absenteeism and improves student engagement in extracurricular activities. However, some studies find that the quality of food children are fed can have an adverse effect on their academic performance. According to Galal (2005), providing children with low-quality, iron- and vitamin A-deficient food has a detrimental effect on the cognitive development of young children in primary school. Additionally, schoolchildren who miss breakfast interact poorly with their teachers, which affects their academic achievement (Taras, 2005). In the study, school feeding was examined as a categorical variable. Children who are not beneficiaries of any school feeding program were coded 0; children who received benefits from the government's school feeding program were coded 1; and children who received benefits from private organizations (NGOs, religious institutions, and international organizations) were coded 2.

Means to school

Distance to school and the unavailability of safe mode of transport to school increase the risk associated with child schooling (Nunoo et al., 2023). Meanwhile, Ruz-Hermosa et al. (2018) asserted that walking to school has no

positive effect on children's academic performance and health, in contrast to Hillman et al. (2009), who discovered a favorable correlation between children walking to school and academic performance. The study measured means to school as a categorical variable that takes on 0 if the child walks to school, 1 if the child boards a taxi to school, 2 if the child uses Trotro, 3 if the child uses the Metro Mass Bus, 4 if the child uses a school bus or private car, and 5 if the child uses a motor or rides a bicycle to school.

Ecological zone

Regional disparities in income and quality of schools were accounted for in the study following the work of Kofinti et al. (2022). In 2019, Cai and Wu attributed the regional inequalities in academic performance to income disparities. Woolf's (2011) study on UK medical doctors also found inequalities in the academic performance of ethnic groups. To control for the regional differences in academic performance, which account for the geographic location fixed effect (Frempong & Stadelmann, 2021), the study categorized the former 10 administrative regions into the three main ecological zones. The coastal zone (Western, Central, and Greater Accra regions) was assigned 0; the forest zone (Volta, Estern, Ashanti, and Brong-Ahafo regions) was assigned 1; and the northern zone (Northern, Upper East, and Upper West regions) was assigned 2. The coastal zone was used as the base category.

Location

According to Zhang et al. (2018), pupils in urban and rural areas perform differently in academics, and this difference can be linked to the better teacher-to-student ratio in urban schools compared to those serving rural students. Compared to pupils from rural schools, students from urban schools

are more likely to enroll in top colleges (Chankseliani, 2013). We control for the location effect in the study by coding urban location as 0 and rural location as 1.

Table 1: Summary of variables, a priori expectations

Variable Name	Definition	Type	Expected Sign
Learning Outcome	The proficiency level of a child to 1. Read text in English/French 2. Write text in English/French 3. Read text in Ghanian language 4. Write text in Ghanaian language 5. Do simple mathematical calculations.	Dummy 1=Yes 0= No (Base)	+
Overall Learning Outcome	Cardinal measure of the 5 indicator variables of the learning outcomes	Continuous	+
Risk Preference	The risk attitude of a household head	Dummy 1= Risk loving 0= Risk Averse (Base)	+
Female Child	Sex of a child	Dummy 1 = Female 0 = Male (Base)	+
Child Age	The age of a child in years	Continuous	+
Age Child Started School	Age at which child started school, measure in years.	Continuous	-
Child relationship to household head	0. Other 1. Biological child to household head 2. Grandchild to household head 3. Adopted child to household head	Dummy 1 = Yes 0 = No	1 = + 2 = + 3 = -
Child Access Mobile Phone or Computer	Child does not have access to the internet via mobile phone or computer	Dummy 1 = Yes 0 = No	-
Marital Status	The Marital status of household head	Dummy 1 = Yes 0 = No	+
Age of Household Head	Age of household head in years	Continuous	+
Female Household Head	Sex of household head	Dummy 1 = Female 0 = Male (Base)	
Educated Household Head	Household head ever been to school	Dummy 1 = Yes 0 = No (Base)	+

Employment Status of Household Head	Household head's employment status	Dummy 1 = Employed 0 = Unemployed (Base)	+
Household Head NHIS	Household head subscribed to NHIS	Dummy 1 = Yes 0 = No	+
Log Household Total Expenditure	Total annual household expenditures	Continuous	+
Log Household Total Expenditure on Education	Total annual household expenditure on child education	continuous	+
School Type	The type of school a child attend	Dummy 1 = Public School 0 = Private School	_
Hours of Classes Attended	The number of Hours a child attended of Classes	Continuous	+
Hours Spent on Homwork	The number of Hours a child spent on homework	Continuous	+
School Feeding	Children who received free food at school	Categorical 2 = Private organization 1 = Government organization 0 = None (Base)	1 = - 2 = +
Means to school	Means by which child usualy go to school	Categorical 0 = On Foot (Base) 1 = Taxi 2 = Trotro 3 = MMT Bus 4 = School Bus/Private car 5 = Motor/Bicycle	1 = + 2 = + 3 = + 4 = + 5 = +
Ecological Zone	Ecological zone	Categorical 0 = Coastal Zone (Base) 1 = Forest Zone 2 = Northern Zone	1 = + 2 = -
Location	Rural or Urban dweller	Dummy 1 = Rural 0 = Urban (Base)	_

Post Estimation Tests

To reduce the possible biases and ensure the estimates are consistent and efficient, we carried out the Hausman specification test of endogeneity to validate our suspicion of the RP variable having a relation with the error term, and the Wald test of instrument identification was conducted to ensure the instrument used in the study is relevant and valid. The Kleibergen-Paap rk test statistic was used for the verification of the instrument.

Chapter Summary

This chapter discussed the research methodology, the estimation techniques employed to answer the research questions, and the operationalization and justification of variables used in the study. The positivist approach and quantitative research design formed the foundation of the study; LPM (OLS) was employed as the baseline model and TSLS as the main model, with Probit and IV Probit models as corroborating models; and we measured the learning outcome variables as indicator variables as well as an additive index using 5 questions in the GLSS7 data that sought the proficiency level of children in reading and writing text in English, French, and Ghanaian language. An investment decision-eliciting question was used to measure the RP of household heads.

CHAPTER FOUR

RESULTS AND DISCUSSION

Introduction

The study investigated the effect of parental risk preference on a child's learning outcomes, focusing on Ghana. This section is about the empirical results that answer the research questions and hypothesis, and for comprehensive understanding, we have presented the results in tables and figures. We precede the findings of the study with summary statistics of the variables used in the study, followed by cross-tabulations and bivariate analyses of the policy variable and the dependent variables. The next session is the discussion of the results from the estimated empirical models, and we conclude this session with the chapter summary.

Summary statistics of the variables in the study

Table 2 presents summary statistics of the variables used in the study. From the table, the average age of a child in the sample is approximately 14 years, and the minimum and maximum ages are 11 and 17 years, respectively, with a deviation of about 2 years. Averagely, a child in the study started schooling approximately at age 5 years, with a deviation of 3 years, which is quite close to the age set by the Ministry of Education in Ghana for a child to start schooling. This suggests that most children in Ghana start schooling on time. However, the maximum age at which a child started schooling in this study is 14 years.

The table further shows that the average age of household heads in the study is approximately 50 years with a deviation of 13 years, and the minimum and maximum ages are 15 and 99, respectively. On average,

households in the study spent about 7% of their income on child education annually, with a deviation of about 1.5% and a maximum of about 12%. Also, the overall household expenditure averaged 9% of their annual income, with a deviation of 0.8%, a maximum of 12.3%, and a minimum of 5.5%.

In addition, we find that a greater percentage (51.5%) of the children sampled for the study are male, similar to the sex of household heads (66.6%). Also, whereas a little over half of the children (52.4%) do not have access to the internet either through a mobile phone or computer, about 85% of them are not beneficiaries of the school feeding programs, either from the government or a private organization. Again, only 0.5% of them suffer a form of disability, and the majority (75.6%) of the sampled children are biologically related to the household head. Further, about 90% of the children travel on foot to school, and a little over 80% of them are in public schools.

Regarding the child learning outcomes, we find that, with the exception of local dialects, more than half of the children can read, write, and do simple mathematical calculations. A little over 50% of them cannot read or write text in Ghanaian language. The table further indicates that the average weekly hours of class a child in the study attended is a little over 17 hours and a maximum of 40 hours. On average, it is also evident from Table 2 that a child in the sample spent less than 1 hour per week, averagely, on homework, with 35 hours per week as the maximum.

From Table 2, it appears majority of the household heads have lower utility for risk-taking. Whereas 83.8% of the household heads identify as risk-averse individuals, 69% of them are married, about 81% of them are employed, 64.4% are educated, 29.9% practice Christianity, 76.9% have

subscribed to NHIS, and only 2.4% of them suffer a form of disability. Majority (41.1%) of households are located in the forest ecological zone, compared to 32.3% and 26.6% in the northern and coastal ecological zones, respectively. Nonetheless, most (65.9%) of them dwell in rural areas. Also, more majority (81.9%) of the respondents were interviewed in 2017

Table 2: Summary statistics of variables used in the study

Variables	Obs	Mean	Std Dev.	Min	Max
Head's Age (years)	5101	50.047	12.952	15	99
Child Age (Years)	5101	13.66	1.926	11	17
Age Child Started School	5101	5.443	3.024	0	14
Hours of class attended	5101	17.382	14.748	0	40
Hours spent on homework	5101	0.821	2.168	0	59
Log of total HH Expenditure	5101	9.163	0.815	5.475	12.296
Variables	**Obs**	**Frequency (%)**			
Child can do calculations					
No	770	15.1			
yes	4331	84.9			
	5101	**100**			
Child can read English/French					
No	1013	19.9			
Yes	4088	80.1			
	5101	**100**			
Child can write English/French					
No	1133	22.2			
Yes	3968	77.8			
	5101	**100**			
Child can read Ghanaian language					
No	2901	56.9			
Yes	2200	43.1			
	5101	**100**			
Child can write Ghanaian language					
No	3086	60.5			
Yes	2015	39.5			
	5101	**100**			
Sex of Child					
Male	2627	51.5			
Female	2474	48.5			
	5101	**100**			
Has no access to mobile phone or computer					
No	2673	52.4			
Yes	2428	47.6			
	5101	**100**			
School Type					
Private	903	17.7			
Public	4198	82.3			
	5101	**100**			

School Feeding		
No	4326	84.8
Yes, Government	749	14.7
Yes, Not Government	26	0.5
	5101	**100**
Child relationship to head		
Other	550	10.8
Head Child	3855	75.6
Head Grand Child	599	11.7
Adopted child	97	1.9
	5101	**100**
Means to School		
Foot	4603	90.2
Taxi	79	1.5
Trotro	153	3
MMT Bus	19	0.4
School Bus/ Private Care	111	2.2
Motor/Bicycle	136	2.7
	5101	**100**
Child has disability		
No	5075	99.5
Yes	26	0.5
	5101	**100**
Risk Preference		
Risk averse head	4277	83.8
Risk loving head	824	16.2
	5101	**100**
Marital status of head		
Not Married	1583	31
Married	3518	69
	5101	**100**
Sex of head		
Male	3397	66.6
Female	1704	33.4
	5101	**100**
Educated head		
No	1818	35.6
Yes	3283	64.4
	5101	**100**
Employment Status		
Unemployed	957	18.8
Employed	4144	81.2
	5101	**100**
Head has NHIS		
No	1180	23.1
yes	3921	76.9
	5101	**100**

Head has disability		
No	4979	97.6
Yes	122	2.4
	5101	**100**
Ecological Zone		
Coastal Zone	1355	26.6
Forest Zone	2098	41.1
Northern Zone	1648	32.3
	5101	**100**
Location		
Urban	1739	34.1
Rural	3362	65.9
	5101	**100**
Religion		
No Religion	261	5.1
Christian	3317	65
Non-Christian	1523	29.9
	5101	**100**
Survey year		
2016	921	18.1
2017	4180	81.9
	5101	**100**

Source: Mefful (2023)

Distribution of risk preference by sex of household head

Figure 1 shows the relationship between risk preference and the sex of the household head. We find that risk aversion is the dominant risk attitude demonstrated by both male and female household heads. However, risk-loving is more prevalent in male-headed households relative to female-headed households, which appears to be in sync with the study of Booth and Nolen (2012), although the difference is lesser compared to the risk-aversion trait. The P-value of the chi-square test of significance justifies the findings from Figure 1 at a 99% confidence level.

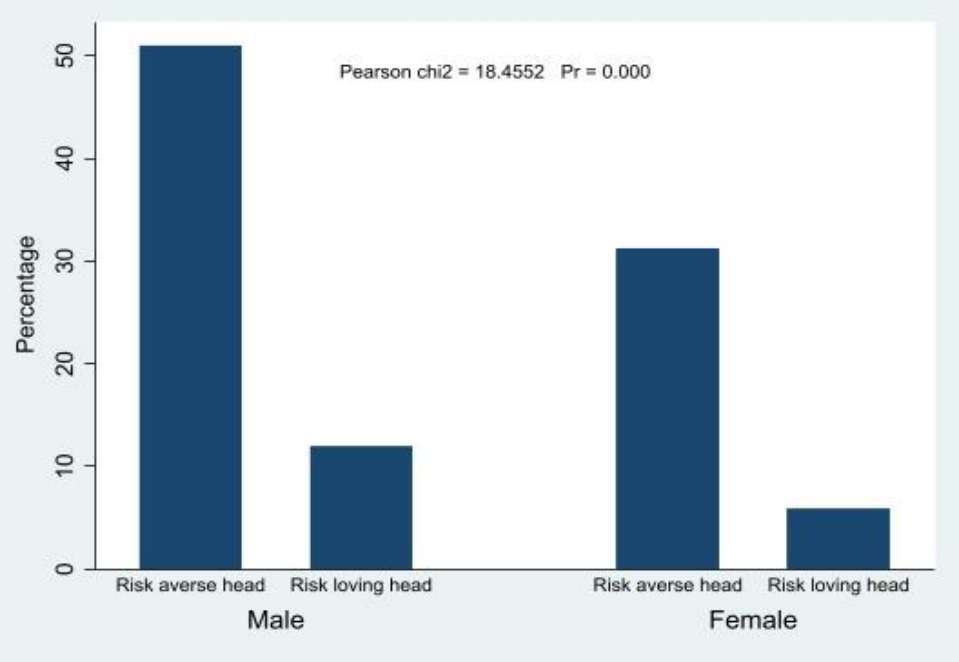

Figure 1: Risk preference by sex of household head
Source: Mefful (2023)

Distribution of risk preference by location of household

Figure 2 explores the prevalence of risk preference by the location of households. As attributed by many scholars, rural locations are found to be dominated by poor households. Although risk aversion dominates households in the two locations, we find that risk aversion is more prevalent in rural households than urban households, and this observation is justified by the P-value of the chi-square test of association at a 95% confidence level. Contrarily, risk-loving tend to be more prevalent in households located in urban communities relative to rural communities. This gives the impression that the findings of Nurrachmat and Sastiono (2022) are valid.

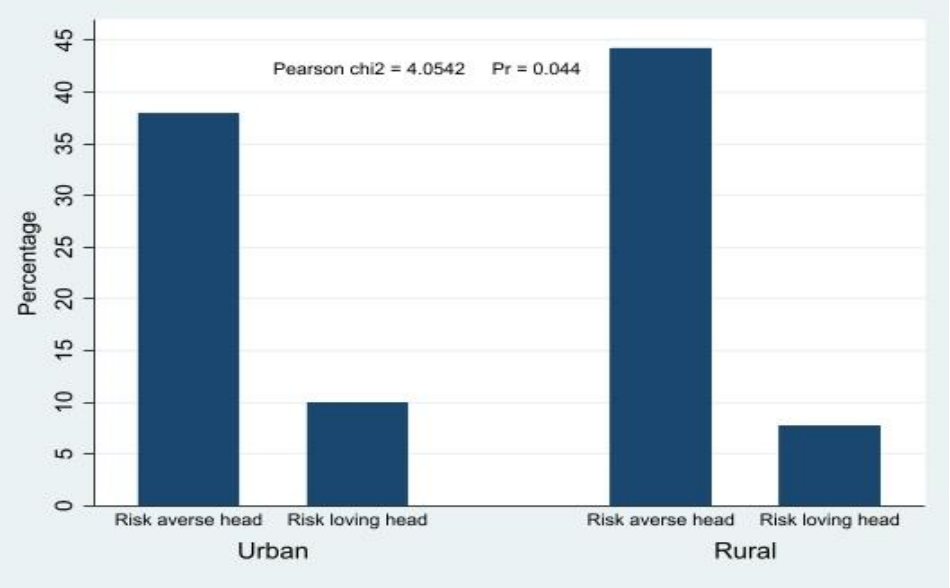

Figure 2: Risk preference by household location
Source: Mefful (2023)

Distribution of risk preference by ecological region of households

The spread of household risk preference in the three main ecological zones in Ghana is presented in Figure 3. It is evident that risk aversion and risk loving are both high in the forest ecological zone, although the margin of difference compared to the coastal zone is quite smaller in terms of risk loving. Further, the Northern Ecological Zone exhibited the least risk-loving trait, although their population in the sample is the second highest. This could be attributed to the level of poverty in the zone, as revealed by the World Bank (2020). The P-value of the chi-square test of association indicated that the observed distribution as presented in Figure 3 is significant at a 99% confidence level.

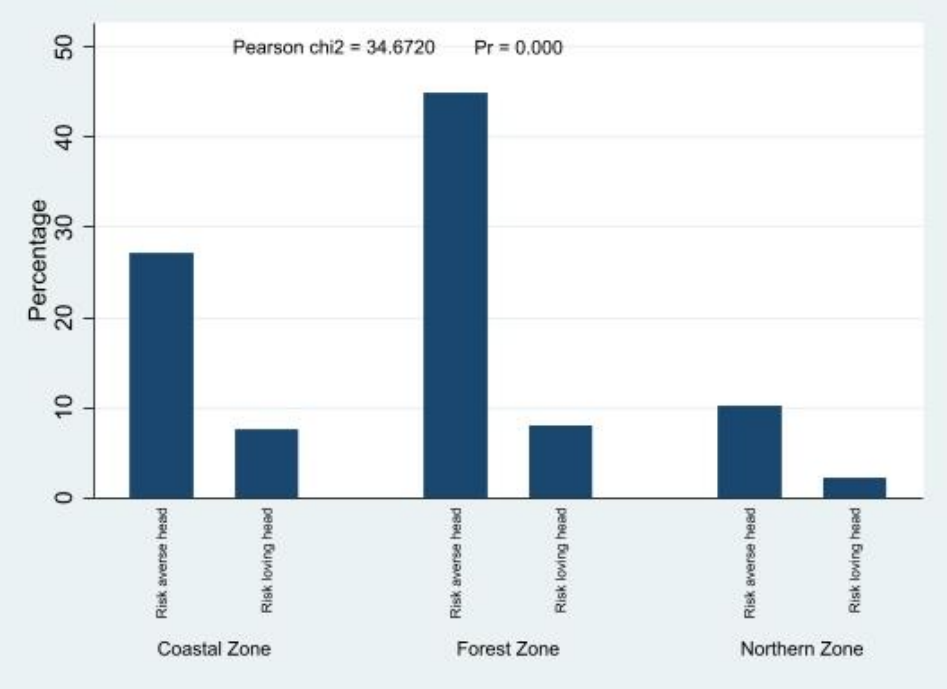

Figure 3: Risk preference by ecological zone of households
Source: Mefful (2023)

Risk preference and household total educational expenditure

Figure 4 also presents an exploration of household risk preference and total expenditure on child education in Ghana. It is evident that risk-loving households spend more on child education relative to risk-averse households. The t-Test of difference indicates that the difference is significant at a 99% confidence level. This suggests that risk-loving has the potential to influence the learning outcomes of a child through household educational expenditure.

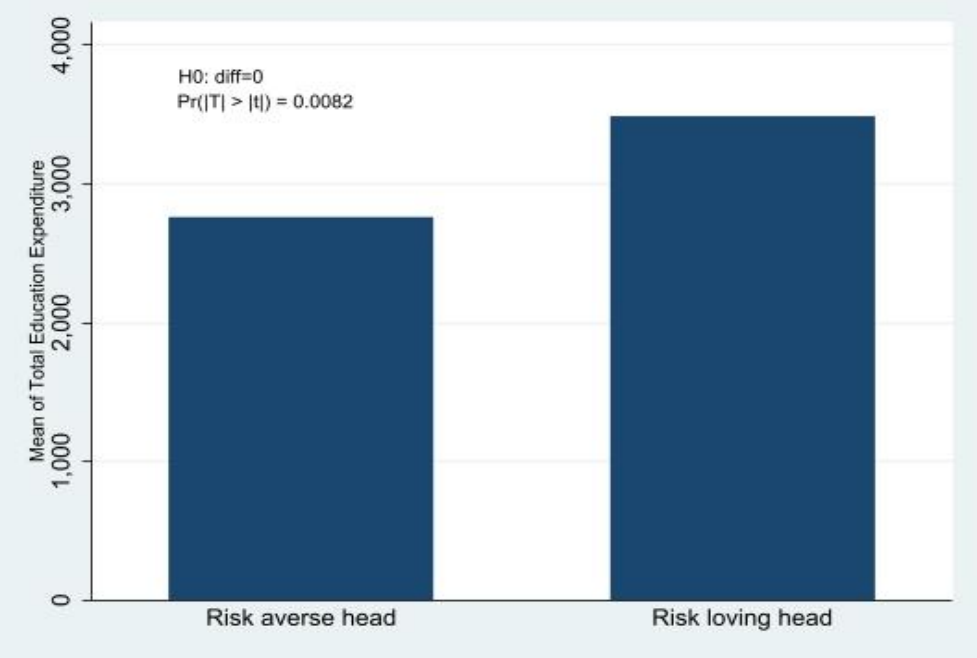

Figure 4: Risk preference and average household expenditure on education
Source: Mefful (2023)

Risk preference, hours child spent in class and on homework

We further explored the possible relationship between risk preference and the hours of classes a child attended, as well as the hours a child in the study spent at home on work. Figure 5 shows the observed relationship. On average, children from risk-loving households spent more hours in class compared to children from risk-averse households, as shown in Figure 5 (Panel A). This observation has been attributed to the premium risk-averse household heads place on immediate satisfaction (Frempong & Stadelmann, 2021). To validate the difference observed in the average hours of class a child attended, we conducted a t-Test, and the results indicated that the observed difference is not significant. Therefore, there is no significant difference between the hours children in the two households attended classes.

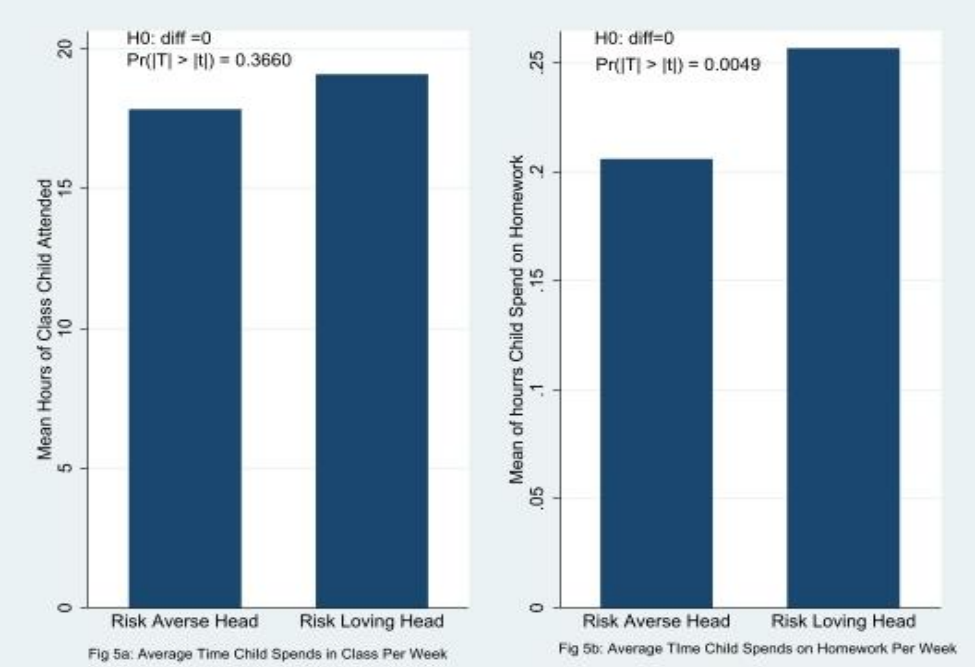

Figure 5: Risk preference and hours spent by child in class and on homework
Source: Mefful (2023)

Figure 5 (Panel B) also gives an overview of the association between risk preference and the hours a child spends doing homework. We can infer from the bar graph that children from risk-loving homes spent about 0.05 hours per week more than children from risk-averse homes on homework. The independent sample t-Test indicates that the observed difference is significant at a 99% confidence level. This suggests that risk-loving household heads encourage their children to spend time on their academics and school-related activities even after school hours.

Risk preference and child learning outcomes

Figure 6 presents a graph of the learning outcomes of children in the study by the risk preference of household heads. It further gives the results from the independent t-Test and chi-square to validate the significance of the observed difference and association. From Figure 6 (Panel A), we find a slight difference in the overall learning outcome for both households, with children from risk-loving households having the highest score. However, the observed

difference is not significant based on the P-value of the t-Test at a 95% confidence level. Thus, there is no significant difference between the overall learning outcomes of children in the two households.

On the other hand, from Figure 6 (Panel B) to Figure 6 (Panel F), children from risk-averse households appear to have better performance in the disaggregated learning outcomes, which are the ability to read and write English/French; the ability to read and write Ghanian language; and the ability to do simple mathematical calculations, relative to risk-loving households. However, with the exception of a child's ability to do simple mathematical calculations, the observed association is not significant based on the P-value obtained from the Chi-square test of association. Thus, there is no significance difference between the learning outcomes of children from both households.

The chi-square test of association has been subjected to a lot of criticism by scholars; hence, we explored the relationship between household head risk preference and child learning outcomes further using regression analysis.

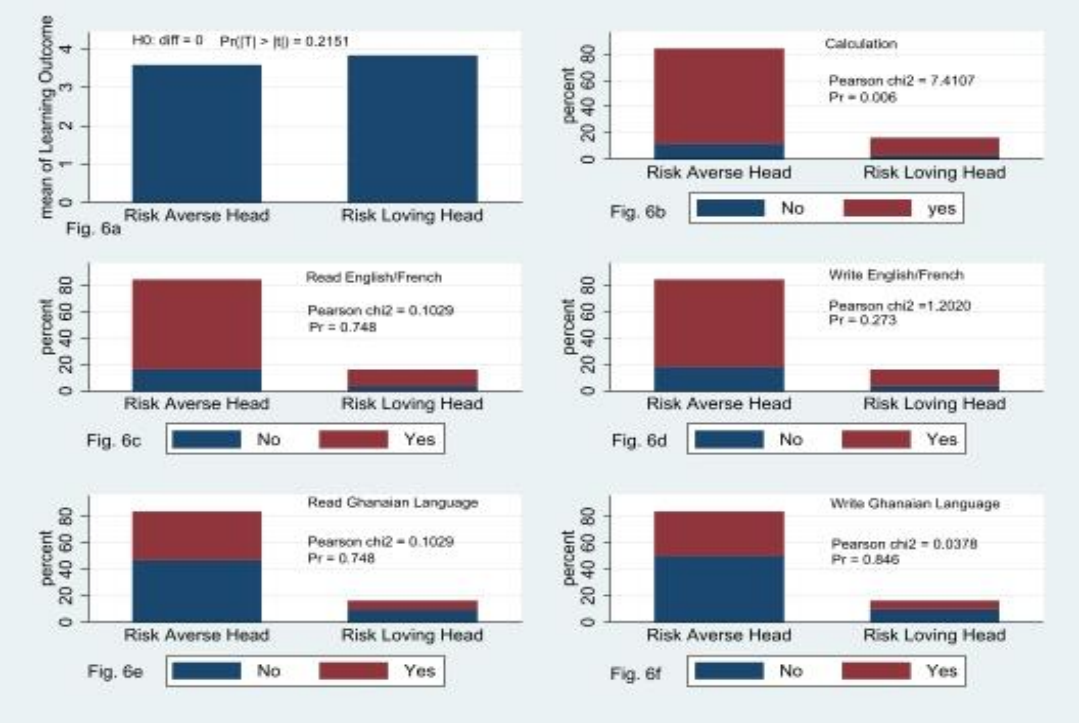

Figure 6: Risk preference and child learning outcomes
Source: Mefful (2023)

Risk preference, school type and mode of travel

Figure 7 gives an overview of the relationship between household head risk preference and the type of school their children attend, together with the means by which a child goes to school. From Figure 7 (Panel A), we find that majority of children from the two households attend public school. This suggests that the government of Ghana is the largest supplier of education in the country. However, a greater percentage of children from risk-loving households attend private school compared to children from risk-averse households.

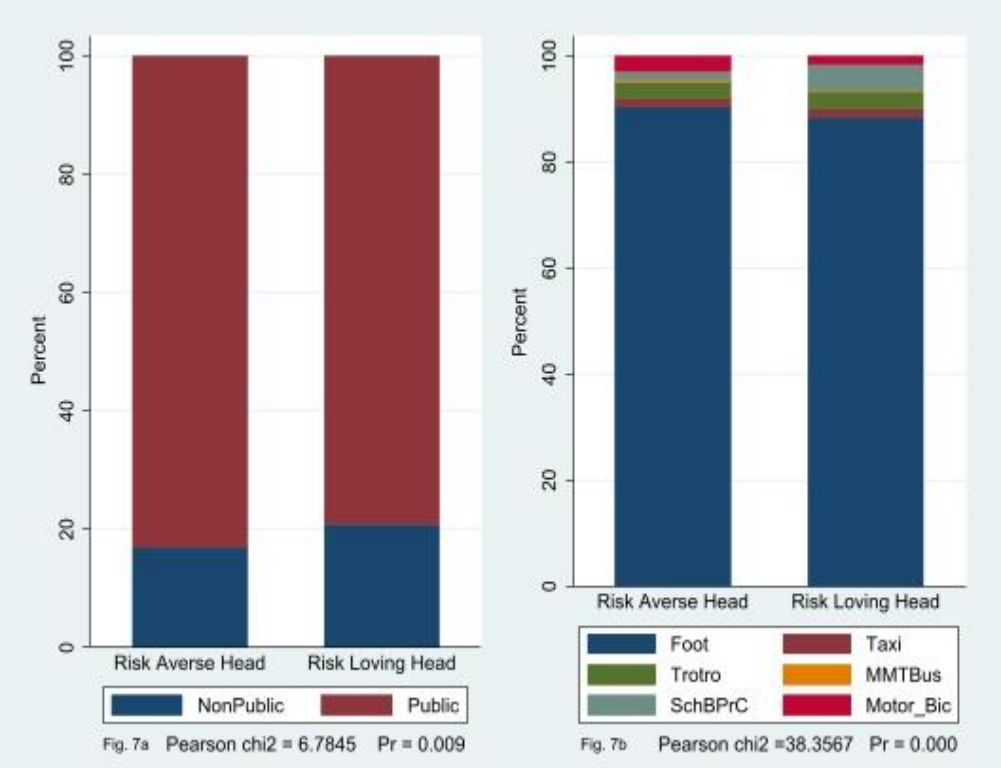

Figure 7: Risk Preference, school type and mode of travel
Source: Mefful (2023)

Further, the Chi-square test of association shows that the observed association is significant at a 99% confidence level. As established by Adeyemi, S. (2014), Hahn and Seo (2014), and Chudgar and Quin (2012), children in private schools perform better academically compared to children in public schools. Therefore, the observed association indicates children from risk-loving households are probable to have better learning outcomes relative to children from risk-averse households.

In terms of the means by which a child goes to school, Figure 7 (Panel B) shows that a greater percent of children in both households go to school on foot. Compared to risk-loving households, the percentage of children who travel to school by means of motor or bicycle is higher in risk-averse households. On the other hand, the percentage of children who travel to school by means of a school bus or private car is higher in risk-loving households

relative to risk-averse households. Amongst all the means of travel to school, the most expensive, as well as the most convenient and safe, is the school bus or private car. This suggests that risk-loving households are more willing to spend on appropriate means of transport for their children to go to school. At the 99% confidence level, based on the Chi-square test, the observed association in Figure 7 (Panel B) is also significant.

The effect of household head risk preference on child learning outcomes

The first objective of the study is to investigate the influence of household head risk preference on child learning outcomes. The findings from the bivariate and multivariate estimations are presented in panels for easy comprehension.

The baseline models (OLS/marginal effects from the probit models) are presented in Panel A of Table 3; and the main models (marginal effects from the IV Probit models) are presented in Panel B of Table 3. The first column presents results on the overall learning outcome using OLS regression, whereas the subsequent columns (2–6) deal with results from the marginal effects from the probit models.

Multivariate analysis

From Panel A of Table 3, we find that risk-loving still has a significant positive relationship with the learning outcomes of children. In column 1, children from risk-loving households have 0.183 higher overall learning outcome scores compared to children from risk-averse households at a 95% confidence level. Further, the disaggregated learning outcomes models presented in columns 2 to 6 in Panel A of Table 3 show that risk-loving attitudes of household heads significantly improve children's ability to: (1)

write text in English or French by 3.9% at a 95% confidence level; (2) read text in English or French by 4.5% at a 99% confidence level; and (3) write text in Ghanaian language by 6.4% at a 95% confidence level. However, from column 2 and 5 in Panel A of Table 3, there is no statistical evidence to show that the risk preference of household heads has a significant effect on the ability of a child to do simple mathematical calculations and read in Ghanaian language.

Nonetheless, the findings from the baseline models are biased, as acknowledged earlier. The bias-corrected model (marginal effects from the IV Probit), which will be the main model for discussion going forward, is presented in Panel B of Table 3. A test of endogeneity was conducted using the Wu-Hausman test with robust standard errors to validate our suspicion. As noted by Wooldridge (1995), at the 5% significance level and a P-value of 0.0382 (shown in Appendix C), we rejected the null hypothesis that household head risk preference is exogenous. Hence, we are justified in using the IV Probit estimation technique.

For the first stage (shown in Appendix A), the findings are consistent with our expectations since, at 99% confidence level, the neighborhood risk preference prevalence rate is positively correlated with the risk preference of a particular household head in the study. Further, we tested the relevance and validity of the instrument used to address the endogeneity issue (shown in Appendix D). For the relevance of the instrument, we rejected the null hypothesis that the instrument is not correlated with the endogenous regressor (risk preference) at a 99% confidence level using the Sargen test and the Kleibergen-Paap rk LM statistic of 29.174 with a P-value of 0.000. The

Kleibergen-Paap (2006) rk test was used for the test of relevance since the Cragg-Donald Wald fails under cluster-robust errors. Moreso, as indicated by Staiger and Stock (1994), a Kleibergen-Paap Wald rk F statistic of 63.505 and a 16.38 critical value report by Stock-Yogo at 10% warranted our rejection of the null hypothesis that the instrument is weakly identified. Thus, the instrument used is valid, and the chosen estimation technique is sound for the study.

Table 3: Risk preference and learning outcomes – Multivariate analysis

	Additive	Disaggregated Learning Outcomes				
Panel A: OLS / Probit Model (Marginal Effects)						
	(1) Overall Learning Outcome	(2) Written Cal	(3) Write Eng/Fren	(4) Read Eng/Frn	(5) Read GhLan	(6) Write GhLan
Risk loving head	0.183***	-0.005	0.039**	0.045***	0.041	0.064**
	(0.058)	(0.014)	(0.018)	(0.016)	(0.028)	(0.028)
Married head	0.141**	0.023	0.004	0.019	0.043*	0.029
	(0.067)	(0.017)	(0.018)	(0.018)	(0.025)	(0.025)
NHIS	0.249***	0.025*	0.052***	0.057***	0.048*	0.039
	(0.062)	(0.013)	(0.016)	(0.015)	(0.025)	(0.026)
Head age	0.024*	0.006**	0.007***	0.005**	0.003	0.002
	(0.013)	(0.002)	(0.003)	(0.002)	(0.005)	(0.005)
Head Disability	0.336**	0.040*	0.006	0.007	0.122**	0.112*
	(0.161)	(0.020)	(0.028)	(0.026)	(0.055)	(0.064)
Employed head	-0.142**	-0.020	-0.053***	-0.051***	-0.005	-0.007
	(0.066)	(0.013)	(0.013)	(0.012)	(0.031)	(0.031)
Educated head	0.418***	0.046***	0.046***	0.057***	0.123***	0.111***
	(0.079)	(0.016)	(0.017)	(0.016)	(0.030)	(0.030)
Female head	0.182***	0.044***	0.017	0.026*	0.035	0.032
	(0.065)	(0.014)	(0.017)	(0.016)	(0.031)	(0.029)
Female Child	0.075	0.006	0.022*	0.027**	0.006	0.012
	(0.049)	(0.009)	(0.012)	(0.012)	(0.018)	(0.019)
StartSchool age	-0.057***	-0.006***	-0.010***	-0.009***	-0.014***	-0.014***
	(0.008)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)
Child age	0.194***	0.020***	0.028***	0.029***	0.058***	0.057***
	(0.013)	(0.003)	(0.003)	(0.003)	(0.004)	(0.005)
No Internt acess	-0.243***	-0.039***	-0.041***	-0.038***	-0.080***	-0.069***
	(0.051)	(0.010)	(0.013)	(0.012)	(0.023)	(0.023)
Gov't food	-0.340***	-0.029	-0.052**	-0.050**	-0.036	-0.072*
	(0.091)	(0.017)	(0.023)	(0.021)	(0.036)	(0.038)
Privat Org	0.960***	0.024	0.036	0.054	0.313***	0.351***

food						
	(0.268)	(0.044)	(0.038)	(0.046)	(0.052)	(0.052)
Child Disability	-1.203***	-0.171*	-0.158*	-0.165**	-0.387***	-0.347***
	(0.291)	(0.090)	(0.085)	(0.081)	(0.067)	(0.066)
Public School	-0.243***	-0.044***	-0.069***	-0.073***	-0.036	-0.019
	(0.059)	(0.012)	(0.015)	(0.014)	(0.024)	(0.024)
Hrs in class	0.001	0.000	0.000	0.000	-0.000	-0.000
	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Homework hrs	0.034***	0.015***	0.015***	0.021***	0.014**	0.009
	(0.007)	(0.004)	(0.006)	(0.005)	(0.006)	(0.005)
Head child	0.278***	0.008	0.035*	0.040**	0.091***	0.111***
	(0.076)	(0.015)	(0.021)	(0.019)	(0.028)	(0.027)
Head Grndchild	0.239**	-0.013	0.037	0.045*	0.077*	0.074*
	(0.119)	(0.024)	(0.027)	(0.025)	(0.040)	(0.042)
Adopted child	-0.099	-0.022	-0.015	-0.014	-0.031	0.027
	(0.219)	(0.039)	(0.046)	(0.044)	(0.066)	(0.066)
Forest Zone	0.230***	-0.001	0.016	-0.002	0.101***	0.102***
	(0.055)	(0.013)	(0.017)	(0.016)	(0.030)	(0.031)
Northern Zone	-0.715***	-0.058***	-0.090***	-0.088***	-0.215***	-0.194***
	(0.082)	(0.021)	(0.027)	(0.025)	(0.038)	(0.039)
Rural	-0.316***	-0.029**	-0.070***	-0.058***	-0.081***	-0.079***
	(0.058)	(0.013)	(0.017)	(0.017)	(0.030)	(0.030)
Survey year	0.001	-0.005	-0.013	-0.012	0.006	0.046
	(0.058)	(0.016)	(0.018)	(0.016)	(0.030)	(0.033)
Christian	0.465***	0.029	0.054	0.053*	0.138***	0.153***
	(0.143)	(0.025)	(0.034)	(0.032)	(0.043)	(0.044)
Non-Christian	0.278*	0.017	0.043	0.048	0.057	0.049
	(0.150)	(0.024)	(0.037)	(0.034)	(0.050)	(0.052)
Total HH exp	0.187***	0.026***	0.035***	0.032***	0.041**	0.040**
	(0.041)	(0.008)	(0.011)	(0.010)	(0.020)	(0.020)
Taxi	-0.015	0.045	0.083**	0.057	-0.043	-0.031
	(0.153)	(0.030)	(0.035)	(0.038)	(0.065)	(0.079)
Trotro	0.181*	0.062**	0.079**	0.095***	0.041	0.065
	(0.098)	(0.024)	(0.040)	(0.032)	(0.040)	(0.042)
MMT Bus	0.219	0.004	-0.034	-0.072	0.205**	0.218**
	(0.190)	(0.047)	(0.079)	(0.074)	(0.091)	(0.095)
SchBus/PrivCar	0.205*	0.044	0.104***	0.060	0.096*	0.050
	(0.115)	(0.030)	(0.034)	(0.037)	(0.052)	(0.055)
Motor/Bicycle	0.228**	0.066***	0.067**	0.079***	-0.014	-0.022
	(0.101)	(0.020)	(0.029)	(0.022)	(0.043)	(0.051)
Constant	-1.960***	5101	5101	5101	5101	5101
	(0.528)	0.1863	0.2290	0.2548	0.1927	0.1830
N	5101	-0.005	0.039**	0.045***	0.041	0.064**
r2	0.300	(0.014)	(0.018)	(0.016)	(0.028)	(0.028)
Panel B: IV regression (IV Probit: Main model)						
Risk loving head	0.311***	-0.010	0.056**	0.059***	0.092***	0.122***
	(0.096)	(0.018)	(0.022)	(0.020)	(0.034)	(0.035)
Married head	0.138*	0.023	0.004	0.019	0.041*	0.027
	(0.073)	(0.017)	(0.018)	(0.018)	(0.025)	(0.025)
NHIS	0.249***	0.025**	0.052***	0.056***	0.049*	0.040

	(0.077)	(0.013)	(0.016)	(0.015)	(0.025)	(0.026)
Head age	0.024	0.006***	0.007***	0.005**	0.003	0.001
	(0.015)	(0.002)	(0.003)	(0.014)	(0.005)	(0.005)
Head age2	-0.000**	-0.000***	-0.000**	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Head Disability	0.346*	0.039*	0.008	0.008	0.126**	0.116*
	(0.180)	(0.021)	(0.028)	(0.026)	(0.055)	(0.063)
Employed head	-0.138*	-0.020	-0.052***	-0.051***	-0.004	-0.006
	(0.079)	(0.013)	(0.013)	(0.012)	(0.031)	(0.031)
Educated head	0.416***	0.047***	0.045***	0.056***	0.122***	0.110***
	(0.091)	(0.016)	(0.017)	(0.016)	(0.030)	(0.030)
Female head	0.183**	0.044***	0.018	0.027*	0.035	0.032
	(0.085)	(0.014)	(0.016)	(0.015)	(0.031)	(0.029)
Female Child	0.071	0.006	0.021*	0.026**	0.004	0.010
	(0.058)	(0.009)	(0.012)	(0.012)	(0.018)	(0.019)
StartSchool age	-0.057***	-0.006***	-0.010***	-0.009***	-0.014***	-0.014***
	(0.008)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)
Child age	0.195***	0.020***	0.028***	0.030***	0.058***	0.057***
	(0.013)	(0.003)	(0.003)	(0.003)	(0.004)	(0.005)
No Internt acess	-0.251***	-0.039***	-0.042***	-0.038***	-0.083***	-0.072***
	(0.066)	(0.010)	(0.013)	(0.012)	(0.023)	(0.023)
Gov't food	-0.343**	-0.029	-0.052**	-0.050**	-0.038	-0.074**
	(0.135)	(0.017)	(0.023)	(0.021)	(0.036)	(0.037)
Privat Org food	0.966***	0.023	0.038	0.055	0.315***	0.353***
	(0.281)	(0.044)	(0.038)	(0.046)	(0.052)	(0.052)
Child Disability	-1.193***	-0.172*	-0.155*	-0.163**	-0.383***	-0.343***
	(0.310)	(0.090)	(0.085)	(0.081)	(0.068)	(0.067)
Public School	-0.239***	-0.044***	-0.068***	-0.073***	-0.034	-0.017
	(0.065)	(0.012)	(0.015)	(0.014)	(0.024)	(0.024)
Hrs in class	0.001	0.000	0.000	0.000	-0.000	-0.000
	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Homework hrs	0.034***	0.015***	0.015***	0.021***	0.014**	0.009
	(0.009)	(0.004)	(0.006)	(0.005)	(0.006)	(0.005)
Head child	0.272***	0.008	0.035*	0.039**	0.088***	0.108***
	(0.080)	(0.015)	(0.021)	(0.019)	(0.028)	(0.027)
Head Grndchild	0.235*	-0.012	0.038	0.045*	0.073*	0.070*
	(0.122)	(0.024)	(0.027)	(0.025)	(0.040)	(0.042)
Adopted child	-0.103	-0.022	-0.015	-0.015	-0.032	0.025
	(0.220)	(0.039)	(0.045)	(0.043)	(0.064)	(0.065)
Forest Zone	0.236***	-0.001	0.017	-0.001	0.103***	0.104***
	(0.078)	(0.013)	(0.017)	(0.015)	(0.030)	(0.031)
Northern Zone	-0.716***	-0.057***	-0.091***	-0.089***	-0.215***	-0.194***
	(0.112)	(0.021)	(0.027)	(0.025)	(0.038)	(0.039)
Rural	-0.310***	-0.029**	-0.069***	-0.057***	-0.078***	-0.075**
	(0.085)	(0.013)	(0.016)	(0.017)	(0.030)	(0.030)
Survey year	0.004	-0.005	-0.014	-0.013	0.007	0.047

	(0.088)	(0.017)	(0.018)	(0.016)	(0.030)	(0.033)
Christian	0.469***	0.029	0.054	0.053*	0.139***	0.154***
	(0.151)	(0.025)	(0.034)	(0.032)	(0.043)	(0.044)
Non-Christian	0.283	0.017	0.044	0.048	0.059	0.050
	(0.175)	(0.024)	(0.037)	(0.034)	(0.050)	(0.052)
Total HH exp	0.184***	0.026***	0.034***	0.032***	0.041**	0.040**
	(0.054)	(0.008)	(0.011)	(0.010)	(0.020)	(0.020)
Taxi	-0.015	0.045	0.083**	0.057	-0.042	-0.029
	(0.167)	(0.030)	(0.035)	(0.038)	(0.066)	(0.080)
Trotro	0.183**	0.062**	0.078**	0.094***	0.042	0.066
	(0.092)	(0.024)	(0.040)	(0.032)	(0.040)	(0.042)
MMT Bus	0.217	0.003	-0.033	-0.072	0.212**	0.223**
	(0.188)	(0.047)	(0.080)	(0.074)	(0.091)	(0.096)
SchBus/PrivCar	0.186	0.044	0.103***	0.058	0.091*	0.044
	(0.116)	(0.030)	(0.035)	(0.038)	(0.053)	(0.055)
Motor/Bicycle	0.240**	0.066***	0.068**	0.079***	-0.009	-0.015
	(0.117)	(0.020)	(0.028)	(0.022)	(0.043)	(0.050)
N	5101	5101	5101	5101	5101	5101

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$ Standard errors in parentheses

The estimates in Panel B of Table 3 reveal higher coefficients for the risk preference of household heads relative to the coefficients in Panel A of Table 3. This suggests that the endogeneity issue biased the coefficients downward. Moreso, the findings from Panel B of Table 3 further strengthen the evidence against the rejection of objective one's null hypothesis. Parental risk preference is therefore a contributing factor to the human capital development in Ghana, as argued by Belzil and Leonardi (2007, 2013); Checchi et al. (2014); Heckman and Montalto (2018); Sovero (2018); Tabetando (2019); and Nurrachmat and Sastiono (2022), whose studies focused on Italy, the USA, Mexico, Indonesia, and Uganda.

The model in column 1 of Panel B (Table 3) reveals that the willingness of household heads to take risks is associated with a positive influence on the overall learning outcome of children at 99% confidence level, similar to the findings of Hartarto et al. (2023). This indicates that children from risk-loving households have 0.311 scores higher than children from risk-

averse households. The finding from column 1 suggests that household heads with risk-loving attitudes invest more in the education of their children. Risk-loving household heads spend more on the nutrition of their children, extra classes, transportation, learning materials, and tuition fees associated with the education of their children. Further, they are more likely to send their children to schools that have quality facilities and offer quality educational services such as a serene teaching and learning environment, a higher teacher-to-student ratio, well-trained teachers, a small class size, and extra-curricular activities that further develop the skills of students, although the school fees are higher, and this can explain the observed disparity between the learning outcomes of children from the two households (risk loving and risk aversion). This is consistent with the findings of Nurrachmat and Sastiono (2022), who concluded that risk-loving leads to significant increase in the expenditure of parents on child education.

Moreso, parents with risk-loving attitudes are likely to take delight in their children's school activities, which boosts their interest in achieving better outcomes from the intent of those activities. For instance, quality time spent by parents with children working together on their assignments improves their understanding of the assignment as well as boosts their interest in the subject. This leads to better learning outcome scores, and they get the motivation to study more. In addition, parents with risk-loving attitudes will be less likely to engage children in child labor, and this will allow them to spend more time in school, have personal studies, and spend more time on their homework, as argued by Frempong and Stadelmann (2021).

Findings from the disaggregated models shown in columns 2 to 6 in Table 3 generally reveal that risk-loving attitudes of household heads significantly improves the learning outcomes of children. Specifically, the probability of children from risk-loving households having the ability to read and write text in English or French is 5.6% and 5,9%, respectively, higher than that of children from risk-averse households at 95% and 99% confidence levels. Also, compared to risk-averse households, children from risk-loving households have a 9.2% and 12.2% probability of knowing how to read and write text in Ghanaian language, respectively at 99% confidence level. On the contrary, the results in column 2, Panel B of Table 3 show no statistical evidence that the risk preference of household heads influences the ability of children to do simple mathematical calculations.

In addition to the effect of risk preference on child learning outcomes, there are other interesting findings that were made from the covariates included in the various models shown in Panel B (Table 3). The marital status of household heads has positive impacts on the overall learning outcome of children (Froyen et al., 2013), although it is weak (10% significance level) and insignificant in almost all the disaggregated child learning outcome models except the child's ability to read Ghanaian language at 10% significance level. Except the ability to write text in Ghanaian language, NHIS subscription significantly improves child learning outcomes (both the overall and the disaggregated), and this is in sync with Kofinti et al. (2022).

Age of household head had no significant effect on the overall learning outcome of children. It increases the probability of children knowing how to read and write text in English/French only at 99% confidence level. However,

beyond 47 years the impact is negative on child learning outcomes. Moreso, Children of employed households' heads have lower probability of knowing how to read and write text in English/French at 99% confidence level. Also, Children of educated household heads have higher probability of having better learning outcomes relative to children of uneducated household heads (Wang et al., 2020).

The results further revealed that children from female headed households have higher probability of knowing how to do simple mathematical calculations at 99% confidence level, and how to read text in English/French at 95% confidence level. This is in conformity to the findings of Malczyk and Lawson (2017). An additional year increase in the age a child starts schooling reduces the probability of the child knowing how to read and write text in English/French (Afoakwah, 2018).

Again, not having access to internet through mobile phone or computer reduces the probability of children having better learning outcomes at 99% confidence level (Zhou, 2012). Compared to children who are non-beneficiaries of School Feeding Program from either the government or private organizations, beneficiaries of government food have lower probability of having better learning outcomes whereas beneficiaries of private organizations have higher overall learning outcome, although it is significant for only the ability to read text in English/French at 90% and the ability to read and write text in Ghanaian language at 99% confidence level similar to the findings of Galal (2005). This is attributed to the fact that the nutritional content of the food is very low (Taras, 2005).

In addition, children with disability have lower probability of having better learning outcomes at 99% confidence level. Also, compared to children in private schools, children in public schools have lower probability of having better learning outcomes at 99% confidence level (Adeyemi, 2014; Hahn & Seo, 2014; Chudgar & Quin ,2012)

Panel B (Table 3) further shows that an additional hour spent on homework increases the probability of a child having better learning outcomes at 99% confidence level, which is consistent with the findings of Núñez et al. (2015). Also, Biological children of household heads have higher overall learning outcomes at 99% confidence level (Shapiro & Tambashe, 2001). Whereas children from homes located in the Forest Zone have higher overall learning outcomes, children in the Northern Zone and rural communities have lower overall learning outcomes at 99% confidence level.

Further, Children from Christian homes have higher overall learning outcomes compared to children from non-Christian homes at 99% confidence level. This has been attributed to the fact that children from Christian homes are mostly conscious of what they do, are less likely to be involved in risky behaviours and the hope of their faith helps them mentain healthy mental health (Moffat and Yoo, 2019; Park and Bonner, 2008).

A percentage increase in household expenditure increases the probability of children having better learning outcomes at 99% confidence level, and children who travel by motor or bicycle to school have higher probability of knowing how to read and write text in English or French at 99% confidence level.

Pathway analysis

The second objective investigated the potential mediating role household expenditure on child education play as a pathway through which the risk preference of household heads improves child learning outcomes. We hypothesis that, risk loving parents are likely to spend more on child education relative to risk averse parents, and this expenditure will translate into better learning outcomes. The Baron and Kenny approach to mediation analysis was employed to test this hypothesis. For expenditure on education to be considered as a mediator, it must either make the risk preference variable insignificant or reduce its coefficient (Koomson & Churchill, 2022). The first step result is displayed in Table 4, whereas the second step is presented in Table 5.

Table 4: Pathway analysis step 1

VARIABLES	(1) Full model Log Educ Exp	(2) Female Log Educ Exp	(3) Male Log Educ Exp	(4) Urban Log Educ Exp	(5) Rural Log Educ Exp
Risk loving head	0.246***	0.198**	0.320***	0.215**	0.131
	(0.0837)	(0.0918)	(0.109)	(0.0955)	(0.126)
Marital head	0.251***	0.376***	0.106	0.267***	0.173*
	(0.0717)	(0.0910)	(0.0954)	(0.0898)	(0.105)
Employed head	0.336***	0.465***	0.212	0.160	0.361***
	(0.106)	(0.106)	(0.150)	(0.153)	(0.138)
Child Grade					
Lower Primary	-0.698***	-0.734***	-0.657***	-0.361***	-0.775***
	(0.0746)	(0.100)	(0.0967)	(0.0987)	(0.0980)
Upper Primary	-0.212***	-0.314***	-0.112	-0.194**	-0.185**
	(0.0594)	(0.0777)	(0.0795)	(0.0823)	(0.0780)
JHS/Middle School	0.168***	0.165*	0.178**	0.0801	0.154**
	(0.0617)	(0.0874)	(0.0885)	(0.0802)	(0.0775)
SHS Above	0.662***	0.605***	0.724***	0.373***	0.790***
	(0.100)	(0.128)	(0.127)	(0.131)	(0.140)
Father Grade					
Lower Primary	-0.141	-0.349	-0.0699	0.0495	-0.390
	(0.324)	(0.567)	(0.415)	(0.299)	(0.447)
Upper Primary	0.133	0.0456	0.190	0.0633	0.110
	(0.161)	(0.191)	(0.205)	(0.209)	(0.213)
JHS/Middle School	0.375***	0.339***	0.394***	0.0669	0.632***
	(0.0808)	(0.0872)	(0.120)	(0.112)	(0.103)
SHS Above	0.528***	0.422***	0.615***	0.272**	0.524***
	(0.104)	(0.120)	(0.148)	(0.131)	(0.162)
Mother Grade					
Lower Primary	-0.222	-0.312	-0.162	-0.227	-0.320

	(0.222)	(0.260)	(0.346)	(0.319)	(0.308)
Upper Primary	0.0313	0.0302	-0.00309	0.0279	0.0115
	(0.141)	(0.167)	(0.173)	(0.215)	(0.159)
JHS/Middle School	0.160*	0.0586	0.278**	-0.00747	0.201
	(0.0917)	(0.110)	(0.131)	(0.116)	(0.150)
SHS Above	-0.0947	0.286	-0.464	-0.302	0.0437
	(0.203)	(0.201)	(0.296)	(0.185)	(0.555)
Financial inclusion	0.393***	0.327***	0.465***	0.223***	0.457***
	(0.0537)	(0.0641)	(0.0686)	(0.0631)	(0.126)
Retired head	0.377**	0.539***	0.214	0.245	0.142
	(0.157)	(0.179)	(0.219)	(0.176)	(0.277)
Sex of head	-0.126	-0.0160	-0.242**	-0.117	-0.288***
	(0.0774)	(0.0989)	(0.103)	(0.102)	(0.107)
Constant	6.008***	5.988***	6.024***	6.991***	5.617***
	(0.170)	(0.204)	(0.218)	(0.235)	(0.315)
Observations	5101	2,474	2627	1739	3362
R-squared	0.121	0.129	0.125	0.081	0.125

Empirical literature suggests that the risk attitude of parents has a significant impact on their expenditure on child education (Belzil, 2007; Belzil & Leonardi, 2013; Checchi et al., 2014; Sovero, 2018; Nurrachmat & Sastiono, 2022). Evidence from Table 4 confirms this assertion. At 99% confidence level, risk-loving households have 24.6% higher expenditure on education compared to risk-averse households. Hence, the requirement of the first step is met. Further we find that with the exception of rural dwellers, risk loving improves household expenditure on child education although the influence if higher in favor of male children. It also improves educational expenditure on children in urban areas.

We also find that marriage, employment, grade of child beyond primary, grade of child's father beyond primary, retirement, and having a savings account increases the expenditure of household heads on child education.

Table 5: Pathway analysis step 2 (IV Regression)

	(1) Learning Outcome	(2) Written Cal	(3) Write Eng/Fren	(4) Read Eng/Frn	(5) Read GhLan	(6) Write GhLan
Risk loving Head	0.273***	-0.019	0.041**	0.040**	0.092***	0.120***
	(0.091)	(0.018)	(0.018)	(0.017)	(0.033)	(0.035)
Married head	0.123*	0.023	0.008	0.023	0.043	0.027
	(0.073)	(0.016)	(0.018)	(0.018)	(0.026)	(0.027)
NHIS	0.238***	0.029**	0.057***	0.063***	0.049*	0.040
	(0.077)	(0.014)	(0.017)	(0.016)	(0.026)	(0.026)
Head age	0.020	0.005*	0.006*	0.004	0.003	0.001
	(0.014)	(0.003)	(0.003)	(0.003)	(0.005)	(0.005)
Head age2	-0.000	-0.000*	-0.000**	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Head Disability	0.385**	0.069**	0.027	0.032	0.133**	0.124*
	(0.182)	(0.030)	(0.038)	(0.034)	(0.062)	(0.068)
Employed head	-0.135*	-0.021	-0.052***	-0.048***	-0.006	-0.007
	(0.079)	(0.014)	(0.015)	(0.014)	(0.030)	(0.030)
Educated head	0.380***	0.045***	0.047**	0.059***	0.121***	0.107***
	(0.086)	(0.016)	(0.018)	(0.017)	(0.029)	(0.029)
Female head	0.153*	0.044***	0.019	0.029*	0.032	0.028
	(0.086)	(0.014)	(0.017)	(0.016)	(0.033)	(0.031)
Female Child	0.075	0.004	0.024*	0.027**	0.008	0.012
	(0.058)	(0.010)	(0.013)	(0.013)	(0.018)	(0.019)
StartSchool age	-0.055***	-0.007***	-0.011***	-0.009***	-0.014***	-0.014***
	(0.008)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)
Child age	0.187***	0.017***	0.026***	0.027***	0.059***	0.058***
	(0.013)	(0.003)	(0.003)	(0.003)	(0.004)	(0.005)
No Internt acess	-0.230***	-0.027***	-0.026*	-0.024*	-0.080***	-0.072***
	(0.066)	(0.010)	(0.013)	(0.012)	(0.024)	(0.023)
Gov't food	-0.298**	-0.046	-0.080**	-0.086**	-0.029	-0.057*
	(0.133)	(0.028)	(0.035)	(0.034)	(0.034)	(0.032)
Privat Org food	0.971***	0.048	0.071	0.109**	0.353***	0.390***
	(0.252)	(0.051)	(0.049)	(0.053)	(0.068)	(0.066)
Child Disability	-1.229***	-0.165	-0.166	-0.162	-0.391***	-0.347***
	(0.310)	(0.102)	(0.102)	(0.100)	(0.066)	(0.064)
Public School	-0.188***	-0.032***	-0.053***	-0.052***	-0.037	-0.015
	(0.065)	(0.011)	(0.014)	(0.013)	(0.025)	(0.025)
Hrs in class	0.001	0.000	0.000*	0.000	-0.000	-0.000
	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Homework hrs	0.035***	0.004***	0.005***	0.006***	0.011***	0.009**
	(0.009)	(0.001)	(0.001)	(0.001)	(0.003)	(0.004)
Head child	0.263***	0.006	0.027	0.035*	0.086***	0.108***
	(0.080)	(0.015)	(0.019)	(0.018)	(0.028)	(0.028)
Head Grndchild	0.238*	-0.005	0.041	0.055**	0.076*	0.072
	(0.122)	(0.023)	(0.027)	(0.026)	(0.042)	(0.044)
Adopted child	-0.108	-0.040	-0.029	-0.021	-0.039	0.021
	(0.223)	(0.055)	(0.057)	(0.056)	(0.067)	(0.067)
Forest Zone	0.234***	0.003	0.020	0.006	0.102***	0.103***
	(0.078)	(0.012)	(0.015)	(0.014)	(0.030)	(0.032)
Northern Zone	-0.654***	-0.086***	-0.130***	-0.120***	-0.174***	-0.144***
	(0.113)	(0.025)	(0.030)	(0.029)	(0.038)	(0.039)
Rural	-0.289***	-0.024*	-0.064***	-0.050***	-0.077**	-0.074**
	(0.084)	(0.013)	(0.017)	(0.017)	(0.030)	(0.031)

Survey year	0.006	-0.009	-0.014	-0.017	0.002	0.044
	(0.087)	(0.017)	(0.019)	(0.017)	(0.030)	(0.033)
Christian	0.452***	0.031	0.061	0.064	0.141***	0.155***
	(0.157)	(0.031)	(0.043)	(0.042)	(0.044)	(0.044)
Non-Christian	0.277	0.028	0.065	0.070	0.063	0.051
	(0.180)	(0.031)	(0.048)	(0.045)	(0.050)	(0.051)
Log Total HH exp	-0.010	-0.013	-0.009	-0.012	0.014	0.010
Less Educ exp.						
	(0.064)	(0.012)	(0.013)	(0.012)	(0.024)	(0.024)
Log Educ exp	0.185***	0.041***	0.044***	0.045***	0.026**	0.027**
	(0.031)	(0.007)	(0.007)	(0.006)	(0.011)	(0.012)
Taxi	-0.074	-0.003	0.013	-0.002	-0.046	-0.035
	(0.175)	(0.015)	(0.018)	(0.017)	(0.074)	(0.092)
Trotro	0.176*	0.014	0.024	0.019	0.048	0.071*
	(0.092)	(0.012)	(0.017)	(0.013)	(0.038)	(0.041)
MMT Bus	0.192	-0.030	-0.058	-0.072**	0.163**	0.189**
	(0.176)	(0.021)	(0.037)	(0.036)	(0.068)	(0.077)
SchBus/PrivCar	0.153	0.005	0.014	-0.000	0.089*	0.046
	(0.114)	(0.014)	(0.017)	(0.015)	(0.051)	(0.059)
Motor/Bicycle	0.193*	0.082***	0.096***	0.103***	-0.039	-0.048
	(0.117)	(0.023)	(0.033)	(0.026)	(0.039)	(0.044)
Constant	-1.241*	0.333**	0.113	0.143	-0.907***	-0.924***
	(0.694)	(0.139)	(0.147)	(0.142)	(0.239)	(0.230)
N	5101	5101	5101	5101	5101	5101
r2	0.310	0.137	0.197	0.202	0.235	0.223

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$ Standard errors in parentheses

Similar to Panel B of Table 3, our findings from Table 5 show a significant positive influence of risk loving on the learning outcomes of children at 99% confidence level. However, the magnitude of influence is lower in Table 5 compared to Panel B in Table 3. This indicates that household expenditure on education plays a mediating role as a pathway through which the risk preference of household heads affects child learning outcomes. We therefore have evidence to reject the null hypothesis that total household expenditure on education is not a pathway through which parental risk preference improves child learning outcomes, and we conclude that total household expenditure on education is a pathway through which the risk preference of household head influences child learning outcomes.

Spending on child education ensures that the relevant materials needed to study are made available. Moreso, in situations like underperformance,

which will discourage risk-averse parents from spending on child education, the risk-loving household head will spend more to ensure the performance of the child is improved. Risk-loving parents will be willing to spend on extra classes, giving the child a second chance to understand subjects they are weak at, for better learning outcomes. If the distance to school is long or there are security issues on the road, as argued by Nunoo et al. (2023), risk-loving parents will be willing to spend money on a safe and convenient mode of transportation for their children to get to school, which is consistent with the findings of Checchi et al. (2014), French et al. (2015), and Mukrimaa et al. (2016).

Further, NHIS, household head suffering disability, educated household head, age of child, hours child spend on homework, school feeding program from private organization, forest zone, and belonging to a Christian household is associated with higher child learning outcomes, whereas dwelling in rural community, Northern Zone, attending public school, not having access to the internet via mobile phone or computer, child suffering disability, government school feeding program, age child started school, and employed household head are associated with lower child learning outcomes.

Robustness check

We constructed a new measure of overall child learning outcome using an index from principal component analysis (PCA) to examine the robustness of the observed relationship between risk preference and child education. The findings are presented in Tables 7.

PCA as another cardinal measure for learning outcome

Column 1 of Table 6 presents the results from the full model. Evidence from Table 6 shows that risk-loving significantly improves the education of children, even with a different measure of learning outcome. However, the magnitude of influence is smaller compared to the additive index construct. Regarding the full model as presented in column 1 (Table 6), the overall learning outcome (PCA) is 0.016 scores less than the overall learning outcome in Panel B of Table 3 (additive index), although they are both significant at a 99% confidence level. Consequently, children from risk-loving households have 0.295 scores higher than children from risk-averse households.

Table 6: PCA measure, and heterogeneities by sex of child and head

Multivariate IV regression

	1 (PCA) Full Sample Learning Outcome	2 (ADD) Male Child	3 (ADD) Female Child	4 (ADD) Male Head	5 (ADD) Female Head
Risk Loving Head	0.295***	0.239**	0.331***	0.225*	0.391***
	(0.096)	(0.106)	(0.124)	(0.124)	(0.118)
Married Head	0.139*	0.146	0.148	0.199*	0.014
	(0.075)	(0.102)	(0.097)	(0.119)	(0.093)
NHIS	0.265***	0.268**	0.200**	0.313***	0.121
	(0.077)	(0.105)	(0.094)	(0.092)	(0.130)
Head age	0.026*	0.023	0.028	0.054***	-0.001
	(0.015)	(0.020)	(0.018)	(0.019)	(0.024)
Head age2	-0.000*	-0.000	-0.000	-0.001***	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Head Disability	0.328*	0.534**	0.138	0.288	0.337
	(0.178)	(0.257)	(0.223)	(0.209)	(0.283)
Employed head	-0.159**	-0.203**	-0.083	-0.164*	-0.133
	(0.077)	(0.093)	(0.100)	(0.099)	(0.126)
Educated head	0.414***	0.320**	0.529***	0.448***	0.336**
	(0.092)	(0.139)	(0.093)	(0.117)	(0.132)
Female head	0.194**	0.206*	0.173*	No	No
	(0.083)	(0.112)	(0.098)		
Female Child	0.079	No	No	0.082	0.075
	(0.059)			(0.057)	(0.102)
StartSchool age	-0.058***	-0.056***	-0.053***	-0.058***	-0.056***
	(0.009)	(0.011)	(0.011)	(0.011)	(0.014)
Child age	0.191***	0.208***	0.184***	0.197***	0.175***
	(0.014)	(0.018)	(0.018)	(0.017)	(0.022)
No Internt acess	-0.245***	-0.211**	-0.287***	-0.276***	-0.193*
	(0.065)	(0.096)	(0.069)	(0.066)	(0.114)

Gov't food	-0.374***	-0.137	-0.594***	-0.461***	-0.328
	(0.144)	(0.154)	(0.168)	(0.141)	(0.215)
Privat Org food	0.898***	1.024**	0.880*	0.836**	0.948***
	(0.292)	(0.410)	(0.484)	(0.377)	(0.298)
Child Disability	-1.172***	-1.088***	-1.376***	-1.226**	-1.304***
	(0.359)	(0.414)	(0.450)	(0.509)	(0.458)
Public School	-0.262***	-0.267***	-0.192**	-0.241***	-0.262***
	(0.063)	(0.090)	(0.080)	(0.088)	(0.099)
Hrs in class	0.001	-0.001	0.002*	0.003**	-0.003
	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)
Homework hrs	0.034***	0.026***	0.057***	0.033**	0.031***
	(0.008)	(0.008)	(0.018)	(0.014)	(0.008)
Head child	0.257***	0.119	0.406***	0.217**	0.232*
	(0.080)	(0.117)	(0.110)	(0.097)	(0.134)
Head Grndchild	0.230*	-0.040	0.491***	0.282*	0.157
	(0.123)	(0.178)	(0.159)	(0.165)	(0.181)
Adopted child	-0.117	0.239	-0.464*	-0.257	0.286
	(0.234)	(0.321)	(0.268)	(0.269)	(0.320)
Forest Zone	0.210***	0.222**	0.244***	0.174**	0.298**
	(0.075)	(0.099)	(0.089)	(0.085)	(0.122)
Northern Zone	-0.738***	-0.633***	-0.818***	-0.714***	-0.666***
	(0.116)	(0.133)	(0.143)	(0.135)	(0.169)
Rural	-0.315***	-0.357***	-0.253***	-0.370***	-0.197
	(0.084)	(0.106)	(0.091)	(0.094)	(0.126)
Survey year	-0.011	-0.031	0.053	-0.041	0.060
	(0.088)	(0.110)	(0.107)	(0.110)	(0.110)
Christian	0.456***	0.614***	0.227	0.565***	-0.241
	(0.159)	(0.200)	(0.176)	(0.176)	(0.271)
Non-Christian	0.297	0.371	0.080	0.286	-0.113
	(0.182)	(0.234)	(0.184)	(0.199)	(0.263)
Total HH exp	0.192***	0.234***	0.134**	0.170**	0.240***
	(0.054)	(0.071)	(0.060)	(0.067)	(0.076)
Taxi	0.004	0.231	-0.224	-0.095	0.115
	(0.148)	(0.212)	(0.202)	(0.219)	(0.175)
Trotro	0.177**	0.319***	-0.005	0.192	0.243*
	(0.086)	(0.117)	(0.140)	(0.118)	(0.137)
MMT Bus	0.135	0.424***	-0.501	-0.041	0.609***
	(0.182)	(0.123)	(0.523)	(0.186)	(0.185)
SchBus/PrivCar	0.172	0.298*	0.049	0.128	0.191
	(0.105)	(0.157)	(0.153)	(0.137)	(0.172)
Motor/Bicycle	0.311***	0.165	0.384***	0.316**	0.383*
	(0.119)	(0.146)	(0.143)	(0.142)	(0.197)
Constant	-5.222***	-2.388***	-1.538*	-5.926***	-3.759***
	(0.702)	(0.911)	(0.797)	(0.872)	(1.050)
N	5101	2627	2474	3397	1704
r2	0.293	0.296	0.325	0.329	0.238

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$ Standard errors in parentheses

Heterogeneity analysis

Effect of RP on learning outcome: Heterogeneity by sex of child.

Columns 2 and 3 of Table 6 explore the relationship between risk preference and learning outcomes by the sex of the child. We find that risk preference is a significant determinant of learning outcomes for both male (95% confidence level) and female (99% confidence level) children. However, the coefficient of risk preference in the context of a female child is higher compared to a male child. This suggests that risk-loving improves the learning outcomes of female children more than male children (95% confidence level). In effect, female children in risk-loving households have 0.092 scores higher than male children from the same household, which is consistent with the findings of Heckman and Montalto (2018). This finding provides a way out to reduce the inequalities observed in the education of children based on their sex in Ghana (Kofinti et al., 2022), and hence a possible approach to meet the demands of SDG Goal 4, Sections 4.2 and 4.3.

From the disaggregated learning outcomes by sex of child (shown in Appendix E and F), compared to risk-averse households, at a 95% confidence level, we find that risk-loving increases the probability of male children having the ability to write English/French by 4.5%, read text in English/French by 3.8%, read text in Ghanaian language by 9.3%, and write text in Ghanaian language by 10.4%. Similarly, female children in risk-loving households have a 4.4% higher probability of possessing the ability to write text in English or French at a 90% confidence level, a 5.1% higher probability of having the ability to read text in English/French at a 95% confidence level, and 9.1% and 13.6% higher probabilities of knowing how to read and write

text in Ghanaian language, respectively. The ability to read and write text in Ghanaian languages is significant at 95% and 99%, respectively.

By contrast, risk-loving has a favorable impact on the probability of female children having the ability to read text in English or French compared to male children, whereas the probability of knowing how to write is higher for male children.

Effect of RP on learning outcome: Heterogeneity by sex of household head

As established by Iddrisu et al. (2017) and Afoakwah (2020), household characteristics such as the sex of the household head can influence the learning outcomes of children in the household. We explored the possible heterogeneities in child learning outcomes that could stem from household sex biases. The findings are presented in columns 4 and 5 of Table 6. We can infer from the table that the risk preferences of household heads have significant influence on child learning outcomes, even in the context of male-headed households as well as the context of female-headed households. Specifically, children from risk-loving male-headed households have 0.225 higher learning outcome scores than children from risk-averse male-headed households.

In addition, compared to risk averse female-headed households, children from risk-loving female-headed households have 0.391 higher learning outcome scores at 99% confidence level. In effect, children from risk-loving female-headed households fare better and have higher learning outcome scores compared to children from male-headed households. This finding provides evidence to support the argument of Afoakwah (2020) that

increasing the bargaining power of women in households will improve the education of children as well as their welfare.

Further, in the disaggregated learning outcome models (shown in Appendix G and H), although household head risk preference is an important determinant of the probability of a child having the ability to read and write text in both English/French and Ghanaian language in the context of male-headed household, the evidence is weak. With a 90% confidence level for English/French and a 95% confidence level for Ghanaian language, children in risk-loving male-headed homes are more likely to be literate in English/French and Ghanaian language than children in risk-averse male-headed households. On the other hand, there is enough statistical evidence to support the finding that children in risk-loving female-headed households have higher probability of being proficient in reading and writing texts in English/French and Ghanaian language.

Further, we find that the magnitude of impact is higher in risk-loving female-headed households than in risk-loving male-headed households. At 95% and 99% confidence levels, respectively, children from risk-loving female-headed households have a 0.6% and 1.3% higher probability of being proficient in writing and reading English/French text. Regarding Ghanaian language, children from risk-loving female-headed households have a 5% and 6% higher probability of being proficient in reading and writing text at 95% and 99% confidence level, respectively. Hence, risk-loving yields better learning outcomes in female-headed households compared to male-headed households, which is consistent with the study of Iddrisu et al. (2017).

In addition, we find that risk-loving in male-headed households improves the writing ability of children more than their reading ability, whereas risk-loving in female-headed households yields higher magnitude of impact in favor of reading English/French texts. However, in terms of the Ghanaian language, the impact is in favor of writing text.

Effect of RP on learning outcome: Heterogeneities by type of school

Empirical literature has established that children in private schools perform better than children in public schools (Adeyemi, 2014; Hahn and Seo, 2014; Chudgar and Quin, 2012). The study investigated this assertion, and the findings are presented in Table 7. Columns 1 and 2 of Table 7 show the explored variations in child learning outcomes by school type.

From column 1 and 2 of Table 7, we find that household head risk preference is still a significant determinant of child learning outcomes although the significance level is higher in public schools. In the context of private schools, compared to children in risk averse households, children from risk loving households have 0.197 higher learning outcome scores at 90% confidence level. Meanwhile, with respect to public schools, we find that children in risk loving households have 0.320 higher learning outcome scores compared to children in risk averse households at 99% confidence level. This suggests that risk loving improves learning outcomes of children in public schools than private schools.

Findings from the disaggregated learning outcome models by type school child attends (shown in Appendix I and J), it is evident that risk loving increases the probability of children in private schools having proficiency in reading and writing text in Ghanaian language only. Among children in

private schools, at 95% confidence level, children from risk-loving households have 11.6% and 13.6% higher probability of knowing how to read and write texts in Ghanaian language relative to children from risk-averse households. It is also evident that risk-loving household heads value the ability of children in private schools knowing how to write text in Ghanaian language more than reading text in Ghanaian language.

On the contrary, risk-loving improved all the learning outcomes of children in public schools except the ability to do simple mathematical calculations. Compared to children from risk-averse households, we find that children from risk-loving households have 6.7% (99% confidence level), 6.0% (95% confidence level), 12.0% (99% confidence level), and 9.0% (99% confidence level) higher probabilities of being proficient in writing and reading text in English/French, and Ghanaian language repectively. In addition, we find that risk loving improves the proficeincy of children in writing more than reading. Consequently, our findings provide evidence to support the arguments of Tabetando (2019) and Nurrachmat and Sastiono (2022).

Table 7: Heterogeneities by type of school and location

Multivariate IV regression (TSLS)				
	School Type		**Location**	
	1 (ADD) Private	2 (ADD) Public	3 (ADD) Rural	4 (ADD) Urban
Risk loving head	0.197*	0.320***	0.302**	0.280**
	(0.108)	(0.116)	(0.144)	(0.114)
Married head	0.205*	0.103	0.203*	0.114
	(0.119)	(0.088)	(0.123)	(0.087)
NHIS	0.220**	0.286***	0.231**	0.277**
	(0.109)	(0.088)	(0.104)	(0.119)
Head age	-0.002	0.037**	0.029	0.034
	(0.031)	(0.017)	(0.021)	(0.022)
Head age2	-0.000	-0.000**	-0.000	-0.000*
	(0.000)	(0.000)	(0.000)	(0.000)
Head Disability	1.030**	0.242	0.450**	0.009
	(0.493)	(0.197)	(0.222)	(0.291)
Employed head	0.111	-0.250***	-0.123	-0.243**
	(0.145)	(0.083)	(0.102)	(0.118)
Educated head	0.188	0.468***	0.541***	0.214**
	(0.169)	(0.102)	(0.127)	(0.108)
Female head	0.130	0.200**	0.334**	0.073
	(0.123)	(0.097)	(0.139)	(0.089)
Female Child	0.019	0.089	0.143	0.023
	(0.081)	(0.069)	(0.091)	(0.061)
StartSchool age	-0.013	-0.066***	-0.063***	-0.048***
	(0.016)	(0.009)	(0.013)	(0.012)
Child age	0.146***	0.200***	0.208***	0.175***
	(0.023)	(0.016)	(0.021)	(0.018)
No Internt acess	-0.273***	-0.224***	-0.190*	-0.329***
	(0.085)	(0.075)	(0.097)	(0.080)
Gov't food	0.219	-0.370***	-0.537***	-0.044
	(0.244)	(0.143)	(0.151)	(0.261)
Privat Org food	0.790	1.168***	0.930***	0.383*
	(0.650)	(0.328)	(0.294)	(0.229)
Child Disability	-0.690*	-1.306***	-1.410***	-0.989*
	(0.359)	(0.393)	(0.483)	(0.530)
Public School	No	No	-0.306**	-0.247***
			(0.121)	(0.075)
Hrs in class	-0.001	0.001	0.001	0.000
	(0.001)	(0.001)	(0.002)	(0.001)
Homework hrs	0.012	0.041***	0.043***	0.017
	(0.011)	(0.011)	(0.011)	(0.014)
Head child	0.201	0.300***	0.285**	0.154
	(0.182)	(0.084)	(0.121)	(0.109)
Head Grndchild	0.266	0.249*	0.165	0.194
	(0.306)	(0.130)	(0.179)	(0.165)
Adopted child	-0.277	-0.074	-0.096	-0.217
	(0.345)	(0.269)	(0.322)	(0.324)
Forest Zone	0.239**	0.197**	0.233*	0.199**
	(0.099)	(0.089)	(0.131)	(0.078)
Northern Zone	-0.724***	-0.725***	-0.724***	-0.400**
	(0.240)	(0.125)	(0.240)	(0.169)
Rural	-0.326**	-0.311***	No	No

	(0.127)	(0.094)		
Survey year	0.067	-0.028	-0.081	0.044
	(0.106)	(0.106)	(0.148)	(0.090)
Christian	0.197	0.479**	0.456***	0.444
	(0.200)	(0.196)	(0.147)	(0.370)
Non-Christian	-0.374	0.400*	0.309*	0.206
	(0.228)	(0.214)	(0.170)	(0.410)
Total HH exp	0.112	0.225***	0.174**	0.203***
	(0.080)	(0.064)	(0.077)	(0.063)
Taxi	0.021	-0.071	0.229	-0.068
	(0.194)	(0.202)	(0.247)	(0.167)
Trotro	0.198	0.156	0.248	0.194**
	(0.129)	(0.131)	(0.170)	(0.095)
MMT Bus	0.111	0.384	-0.373	0.311*
	(0.374)	(0.298)	(0.363)	(0.159)
SchBus/PrivCar	0.161	0.614**	0.334	0.101
	(0.105)	(0.265)	(0.224)	(0.116)
Motor/Bicycle	-0.204	0.554***	0.519***	-0.132
	(0.182)	(0.138)	(0.169)	(0.144)
Constant	-2.875***	-6.214***	-5.905***	-4.789***
	(1.070)	(0.831)	(0.990)	(0.927)
N	903	4198	3362	1739
r2	0.231	0.292	0.273	0.219

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$ Standard errors in parentheses

Effect of RP on learning outcome: Heterogeneities by location

Zhang et al. (2018) also argued that the presence of low teacher-to-student ratio, among other factors, in rural communities characterizes the poor performance of students compared to students in urban communities. The study investigated this assertion, and the findings are presented in Columns 3 and 4 of Table 7.

From columns 3 and 4 of Table 7, at 5% significance level, our findings show that risk preference has a significant influence on the overall learning outcome of children in both rural and urban communities. Specifically, children from risk-loving households have 0.302 higher learning outcome scores compared to children from risk averse households in rural communities. In the context of urban location, children from risk loving households have 0.280 higher overall learning outcome scores compared to children from risk-averse households at 5% significance level. Again, we find

the magnitude of impact is higher in rural locations relative to urban locations, which is contrary to the finding of Ahiakpor and Swaray (2017). This suggests that in the presence of risk-loving the arguments of Chudgar and Quin (2012), Adeyemi (2014), Hahn and Seo (2014), and Zhang et al. (2018) will not hold.

Further, it is evident from the disaggregated learning outcomes of children by location (shown in Appendix K and L) that risk-loving improves child learning outcomes in the context of both rural and urban locations. However, the impact varies. We find that children from risk loving households have 8.7% and 7.8% higher probabilities of having the ability to write and read text in English/French language only at 99% confidence level relative to children from risk-averse households in the context of rural location. However, in urban locations, risk-loving also increases the probability of a child having the ability to read and write text in Ghanaian language only by 12.3% and 15.9% at 99% confidence level. This suggests that in rural locations, emphasis is placed on acquiring skills in reading and writing text in English/French more than in Ghanaian language, whereas in Urban locations more emphasis is placed on proficiency in Ghanaian language relative to English/French.

Chapter summary

This chapter investigated the effect of household head risk preference on child education by providing answers to the research questions and hypothesis. The findings were checked for robustness using different measure of child learning outcome score and in different contexts. The study found in this chapter that household head or parental risk preference has a significant influence on child learning outcomes, leading to rejection of the null

hypothesis for objective 1. Further, the pathway analysis also revealed that total household expenditure on education plays a mediating role as a pathway through which parental risk preference influences the learning outcome of children. In addition, findings from the robustness check indicated consistency in our findings. The heterogeneity analysis also revealed that risk-loving has the potential to reduce the observed inequalities in educational performance by the sex of children. Risk loving improves the education of female children. Another notable Finding was that children in risk-loving female-headed households perform better compared to children in risk-loving male-headed households. Further, the study found that risk-loving significantly improved the learning outcomes of children in public schools and in rural locations.

CHAPTER FIVE

SUMMARY, CONCLUSION, AND RECOMMENDATION

Introduction

The study focused on investigating the effect of household head risk preference on child learning outcomes in the context of Ghana. We present a summary of the entire study in this chapter, starting from the problem statement through to discussion of results. In addition, we include conlusion made from key findings from the study and recommendations for policy actions.

Summary

Human capital development is essential for economic growth and development as well as improvement in the quality of life of individuals. Ghana, just like other developing countries, has experienced series of programs from both international organizations and governments geared towards improving human capital. However, the expected outcomes are not being achieved, as learning poverty is still an issue of concern. This warranted our study's contribution to literature by investigating an important but less studied factor, which is household head risk preference and how it influences the learning outcomes of children in Ghana. Specifically, the study investigated:

1. the influence of parental risk preference on child learning outcomes.
2. the mediating role houshold total expenditure on education of child play as a pathway through which parental risk preference influence the learning outcome of children in Ghana.

The study adopted the education production function of Todd and Wolpin (2011) to make an extension to the human capital theory to include the risk attitudes of households. This afforded us the ability to study how the risk preferences of household heads influence the learning outcomes of children. In effect, two theories—the human capital theory and the prospects theory—underpin the study. We reviewed several pieces of literature that are relevant to the study, and found that almost all studies that investigated the relationship between risk preference and child education focused on advanced countries like the USA, Italy, and Mexico. In the context of developing countries, similar studies are uncommon. Further, only a few of the existing studies focused on the academic performance of children. Majority focused on educational attainment, schooling decisions, and investment in education.

Moreso, the study followed the positivist approach to knowledge inquiry and employed TSLS estimation techniques with LPM (OLS) as the baseline models to achieve the set objectives. We corroborated the chosen estimation technique with probit and IV probit models. The study used the GLSS7 data collected by the Ghana Statistical Services in 2016/2017.

Key findings

The study found that household heads adhere to the minimum age set by the ministry of education in Ghana for children to start schooling. Further, majority of household heads in Ghana identify as being risk-averse, and majority of male household heads identified as being risk-loving. Children from risk-loving households spend more hours in class and homework relative to children from risk-averse households, and a greater percentage of children

from risk-loving households attend private schools compared to children from risk-averse households.

The first objective of the study examined the influence of parental risk preference on child learning outcomes in Ghana, and we found that children from risk-loving households have better learning outcomes than children from risk-averse households. In addition, risk-loving improves the learning outcomes of female children more than male children. Children from risk-loving female-headed households have better learning outcomes than children from risk-loving male-headed households. In the context of type of school and location, risk-loving favors the learning outcomes of children in public schools and rural communities the most.

We investigated the mediating role household total expenditure on child education plays as a pathway through which the risk preference of household heads influences the learning outcomes of children in Ghana as the second objective. The findings indicated that risk-loving household heads spend more on the education of their children, and this expenditure translates into better learning outcomes.

We used the principal component analysis (PCA) to compute another cardinal measure of child learning outcomes to ensure our findings are robust, and the results were consistent with the other measures of child learning outcomes.

Conclusion

The study established that the risk attitudes of household heads are very crucial to human capital development in Ghana. It has the potential to improve or retard human capital development. We therefore conclude that,

compared to risk aversion, risk loving improves the learning outcomes of children in Ghana. In addition, expenditure on child education is the channel through which risk-loving influences the learning outcomes of children in Ghana. Moreso, risk-loving has the potential to bridge the learning outcome inequalities observed among rural and urban, private and public, and male and female schoolchildren in Ghana.

Recommendations

The findings from the study have significant policy implications. Hence, we make the following policy recommendations:

1. Policies that are potent to induce risk loving attitudes in parents when investing child education should implemented.
2. Women should be involved in decision making when regarding investment in child education.

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APPENDICES

A: First Stage

Risk loving head	Coefficient	std. err.	P>t
Neighbourhood risk loving	1.384728	.0631261	0.000
Married head	.0059154	.0161202	0.714
NHIS	-.0149827	.0162207	0.356
Head age	.0015292	.0020629	0.459
Head age2	-9.43e-06	.0000179	0.598
Head Disability	-.0102196	.0172438	0.553
Employed head	.0221186	.0126648	0.081
Educated head	.0086306	.0122977	0.483
Female head	-.0119507	.0168963	0.479
Female Child	.0065374	.0079732	0.412
StartSchool age	-.0013199	.0015538	0.396
Child age	.0022966	.0022122	0.299
No Internt acess	-.0135149	.0094503	0.153
Gov't food	.01595	.0185585	0.390
Privat Org food	.0100176	.0487147	0.837
Child Disability	-.0651786	.0187634	0.001
Public School	-.0278268	.0129185	0.031
Hrs in class	-.0002346	.0001842	0.203
Homework hrs	-.0001189	.00136	0.930
Head child	.0016048	.0134797	0.905
Head Grndchild	-.0271888	.017715	0.125
Adopted child	.0221085	.0435624	0.612
Forest Zone	-.0218047	.0140567	0.121
Northern Zone	-.0082783	.0201962	0.682
Rural	-.0289228	.0136862	0.035
Survey year	.0139603	.0158182	0.378
Christian	.0104104	.0220582	0.637
Non-Christian	.0117296	.0222319	0.598
Total HH exp	.0012223	.0084807	0.885
Taxi	-.004172	.0364976	0.909
Trotro	-.0119752	.0233134	0.608
MMT Bus	.0260898	.0811102	0.748
SchBus/PrivCar	.0791932	.0429243	0.065
Motor/Bicycle	-.0233125	.0185474	0.209
Constant	-.0024114	.0963917	0.980

B: The effect of risk preference and child education

	2	3	4	5	6
	Written Cal	Write Eng/Fren	Read Eng/Frn	Read GhLan	Write GhLan
Panel A: Linear Probability Models					
Risk loving head	-0.006	0.033***	0.036***	0.049**	0.071***
	(0.012)	(0.013)	(0.011)	(0.022)	(0.023)
Married head	0.026*	0.012	0.027*	0.046*	0.031
	(0.015)	(0.016)	(0.015)	(0.024)	(0.024)
NHIS	0.032***	0.060***	0.066***	0.050**	0.042**
	(0.012)	(0.016)	(0.015)	(0.020)	(0.020)
Head age	0.006**	0.007**	0.005*	0.003	0.002
	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)
Head age2	-0.000**	-0.000**	-0.000*	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Head Disability	0.060**	0.017	0.021	0.124**	0.113*
	(0.028)	(0.037)	(0.034)	(0.054)	(0.060)
Employed head	-0.022*	-0.054***	-0.049***	-0.008	-0.009
	(0.013)	(0.016)	(0.015)	(0.025)	(0.024)
Educated head	0.053***	0.056***	0.068***	0.127***	0.114***
	(0.016)	(0.020)	(0.019)	(0.024)	(0.024)
Female head	0.051***	0.026*	0.037***	0.036	0.032
	(0.013)	(0.014)	(0.014)	(0.024)	(0.025)
Female Child	0.003	0.023**	0.027**	0.008	0.013
	(0.009)	(0.011)	(0.011)	(0.017)	(0.017)
StartSchool age	-0.007***	-0.011***	-0.010***	-0.014***	-0.014***
	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)
Child age	0.019***	0.028***	0.029***	0.060***	0.059***
	(0.003)	(0.003)	(0.003)	(0.005)	(0.005)
No Internt acess	-0.033***	-0.030**	-0.028**	-0.080***	-0.071***
	(0.010)	(0.012)	(0.012)	(0.017)	(0.017)
Gov't food	-0.056***	-0.091***	-0.097***	-0.034	-0.062**
	(0.020)	(0.023)	(0.023)	(0.027)	(0.027)
Privat Org food	0.047	0.069	0.107**	0.350***	0.386***
	(0.051)	(0.065)	(0.052)	(0.085)	(0.085)
Child Disability	-0.156*	-0.158*	-0.154*	-0.389***	-0.345***
	(0.088)	(0.093)	(0.093)	(0.062)	(0.061)
Public School	-0.043***	-0.065***	-0.065***	-0.045*	-0.024
	(0.010)	(0.012)	(0.011)	(0.023)	(0.024)
Hrs in class	0.000	0.000*	0.000*	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Homework hrs	0.004***	0.005***	0.005***	0.011***	0.009***
	(0.001)	(0.001)	(0.001)	(0.002)	(0.003)
Head child	0.008	0.030*	0.038**	0.090***	0.111***
	(0.015)	(0.018)	(0.018)	(0.027)	(0.028)
Head Grndchild	-0.006	0.041	0.055*	0.077*	0.073*
	(0.024)	(0.029)	(0.028)	(0.042)	(0.042)
Adopted child	-0.039	-0.028	-0.020	-0.036	0.023

	(0.053)	(0.055)	(0.055)	(0.068)	(0.069)
Forest Zone	0.004	0.019	0.005	0.100***	0.101***
	(0.010)	(0.012)	(0.012)	(0.020)	(0.020)
Northern Zone	-0.100***	-0.145***	-0.135***	-0.182***	-0.152***
	(0.019)	(0.022)	(0.021)	(0.027)	(0.027)
Rural	-0.029***	-0.070***	-0.056***	-0.082***	-0.080***
	(0.011)	(0.014)	(0.014)	(0.020)	(0.020)
Survey year	-0.010	-0.015	-0.017	0.001	0.042**
	(0.012)	(0.014)	(0.013)	(0.021)	(0.021)
Christian	0.035	0.065	0.068*	0.142***	0.156***
	(0.031)	(0.040)	(0.040)	(0.041)	(0.040)
Non-Christian	0.029	0.066	0.071*	0.062	0.050
	(0.033)	(0.044)	(0.043)	(0.044)	(0.043)
Total HH exp	0.031***	0.038***	0.036***	0.042***	0.040***
	(0.008)	(0.010)	(0.010)	(0.014)	(0.014)
Taxi	0.010	0.027	0.013	-0.038	-0.026
	(0.015)	(0.017)	(0.016)	(0.073)	(0.075)
Trotro	0.015	0.026*	0.020*	0.048	0.071
	(0.011)	(0.015)	(0.012)	(0.043)	(0.044)
MMT Bus	-0.024	-0.052	-0.066*	0.168**	0.194***
	(0.030)	(0.038)	(0.037)	(0.067)	(0.072)
SchBus/PrivCar	0.012	0.024	0.010	0.101**	0.059
	(0.014)	(0.016)	(0.014)	(0.049)	(0.056)
Motor/Bicycle	0.093***	0.105***	0.113***	-0.037	-0.047
	(0.020)	(0.030)	(0.024)	(0.041)	(0.041)
Constant	0.174	-0.059	-0.033	-1.010***	-1.031***
	(0.114)	(0.132)	(0.127)	(0.177)	(0.180)
N	5101	5101	5101	5101	5101
r2	0.123	0.186	0.189	0.234	0.222
Panel B: IV Regression (TSLS: Main Model)					
Risk loving head	-0.010	0.050**	0.049***	0.097***	0.125***
	(0.019)	(0.020)	(0.019)	(0.033)	(0.035)
Married head	0.026	0.011	0.026	0.045*	0.029
	(0.017)	(0.018)	(0.018)	(0.026)	(0.026)
NHIS	0.032**	0.060***	0.066***	0.050*	0.042
	(0.014)	(0.017)	(0.016)	(0.026)	(0.026)
Head age	0.006**	0.007**	0.005	0.003	0.002
	(0.003)	(0.003)	(0.003)	(0.005)	(0.005)
Head age2	-0.000*	-0.000**	-0.000*	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Head Disability	0.060**	0.018	0.022	0.128**	0.118*
	(0.030)	(0.038)	(0.035)	(0.061)	(0.068)
Employed head	-0.022	-0.053***	-0.049***	-0.006	-0.008
	(0.014)	(0.015)	(0.014)	(0.030)	(0.030)
Educated head	0.053***	0.056***	0.068***	0.126***	0.113***
	(0.017)	(0.019)	(0.018)	(0.030)	(0.030)
Female head	0.051***	0.026	0.037**	0.037	0.032
	(0.014)	(0.016)	(0.016)	(0.032)	(0.030)

Female Child	0.003	0.023*	0.026**	0.007	0.012
	(0.010)	(0.013)	(0.013)	(0.018)	(0.019)
StartSchool age	-0.007***	-0.011***	-0.010***	-0.015***	-0.014***
	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)
Child age	0.019***	0.028***	0.029***	0.060***	0.059***
	(0.003)	(0.003)	(0.003)	(0.004)	(0.005)
No Internt acess	-0.032***	-0.032**	-0.029**	-0.083***	-0.075***
	(0.010)	(0.014)	(0.013)	(0.023)	(0.023)
Gov't food	-0.056*	-0.091***	-0.097***	-0.035	-0.063*
	(0.029)	(0.035)	(0.034)	(0.034)	(0.032)
Privat Org food	0.047	0.070	0.108*	0.352***	0.389***
	(0.058)	(0.053)	(0.061)	(0.072)	(0.070)
Child Disability	-0.157	-0.157	-0.153	-0.385***	-0.341***
	(0.103)	(0.102)	(0.100)	(0.065)	(0.064)
Public School	-0.043***	-0.065***	-0.064***	-0.044*	-0.022
	(0.011)	(0.014)	(0.013)	(0.025)	(0.025)
Hrs in class	0.000	0.000	0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Homework hrs	0.004***	0.005***	0.005***	0.011***	0.009**
	(0.001)	(0.001)	(0.001)	(0.003)	(0.004)
Head child	0.008	0.030	0.038**	0.088***	0.109***
	(0.015)	(0.019)	(0.018)	(0.028)	(0.028)
Head Grndchild	-0.006	0.040	0.054**	0.075*	0.071
	(0.023)	(0.027)	(0.027)	(0.042)	(0.044)
Adopted child	-0.039	-0.028	-0.020	-0.038	0.022
	(0.055)	(0.058)	(0.057)	(0.066)	(0.066)
Forest Zone	0.004	0.020	0.006	0.103***	0.103***
	(0.012)	(0.015)	(0.015)	(0.030)	(0.031)
Northern Zone	-0.100***	-0.145***	-0.135***	-0.183***	-0.153***
	(0.026)	(0.030)	(0.029)	(0.038)	(0.038)
Rural	-0.029**	-0.069***	-0.055***	-0.080***	-0.077**
	(0.013)	(0.017)	(0.017)	(0.030)	(0.031)
Survey year	-0.010	-0.014	-0.017	0.002	0.044
	(0.018)	(0.019)	(0.017)	(0.030)	(0.033)
Christian	0.035	0.066	0.068*	0.143***	0.157***
	(0.032)	(0.041)	(0.040)	(0.043)	(0.043)
Non-Christian	0.029	0.066	0.072	0.064	0.052
	(0.032)	(0.046)	(0.044)	(0.049)	(0.050)
Total HH exp	0.031***	0.038***	0.036***	0.042**	0.040**
	(0.010)	(0.012)	(0.011)	(0.019)	(0.019)
Taxi	0.010	0.027	0.013	-0.038	-0.026
	(0.015)	(0.018)	(0.017)	(0.072)	(0.091)
Trotro	0.015	0.026	0.021	0.049	0.072*
	(0.012)	(0.017)	(0.013)	(0.038)	(0.041)
MMT Bus	-0.024	-0.052	-0.066*	0.166**	0.192**
	(0.019)	(0.038)	(0.038)	(0.070)	(0.079)
SchBus/PrivCar	0.012	0.022	0.008	0.094*	0.050
	(0.014)	(0.017)	(0.015)	(0.052)	(0.059)
Motor/Bicycle	0.093***	0.107***	0.115***	-0.033	-0.041
	(0.023)	(0.033)	(0.026)	(0.040)	(0.044)

Constant	0.173	-0.058	-0.032	-1.008***	-1.029***
	(0.140)	(0.151)	(0.144)	(0.231)	(0.221)
N	5101	5101	5101	5101	5101
r2	0.123	0.186	0.189	0.233	0.220

Standard errors in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

N is number of observations, Cal is calculation, Eng is English, Fren is French, and GhLan is Ghanaian language

C: Wu-Hausman tests of endogeneity

H0: Variables are exogenous

Robust regression F (1,885) = 4.30723 (p = 0.0382)

(Adjusted for 886 clusters in clust)

D: Post Estimation Test

Relevance of instrument test

Under identification (Kleibergen-Paap rk LM statistic): 29.174

Chi-square (1) P-value = 0.0000

Validity of instrument test

Weak identification (Cragg-Donald Wald F statistic): 4258.455

(Kleibergen-Paap rk Wald F statistic): 63.505

Stock-Yogo weak ID test critical values: 10% maximal IV size 16.38

15% maximal IV size 8.96

20% maximal IV size 6.66

25% maximal IV size 5.53

Source: Stock-Yogo (2005). Reproduced by permission.

NB: Critical values are for Cragg-Donald F statistic and i.i.d. errors.

E: Heterogeneity by Sex of Child – Male Child

IV Regression (TSLS: Full Model)

	Written Cal	Write Eng/Fren	Read Eng/Frn	Read GhLan	Write GhLan
Risk loving head	-0.041	0.045**	0.038*	0.093**	0.104**
	(0.028)	(0.022)	(0.022)	(0.038)	(0.040)
Married head	0.037	0.025	0.040	0.033	0.011
	(0.022)	(0.025)	(0.024)	(0.034)	(0.033)
NHIS	0.026	0.067***	0.072***	0.044	0.058*
	(0.019)	(0.023)	(0.023)	(0.035)	(0.034)
Head age	0.005	0.009*	0.005	0.001	0.003
	(0.004)	(0.005)	(0.004)	(0.006)	(0.006)
Head age2	-0.000	-0.000**	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Head Disability	0.073**	0.048	0.042	0.177*	0.193**
	(0.035)	(0.049)	(0.048)	(0.091)	(0.096)
Employed head	-0.036*	-0.075***	-0.063***	-0.016	-0.012
	(0.019)	(0.020)	(0.019)	(0.034)	(0.033)
Educated head	0.043*	0.042	0.051*	0.096**	0.087**
	(0.026)	(0.029)	(0.028)	(0.042)	(0.042)
Female head	0.059***	0.031	0.046**	0.040	0.030
	(0.019)	(0.022)	(0.021)	(0.043)	(0.039)
StartSchool age	-0.005**	-0.013***	-0.010***	-0.014***	-0.014***
	(0.002)	(0.003)	(0.003)	(0.004)	(0.004)
Child age	0.019***	0.034***	0.033***	0.063***	0.058***
	(0.004)	(0.004)	(0.004)	(0.007)	(0.007)
No Internt acess	-0.017	-0.017	-0.017	-0.090***	-0.071**
	(0.014)	(0.020)	(0.020)	(0.031)	(0.030)
Gov't food	-0.045	-0.039	-0.029	0.014	-0.039
	(0.035)	(0.041)	(0.038)	(0.041)	(0.044)
Privat Org food	0.076	0.085	0.148*	0.339**	0.376***
	(0.070)	(0.069)	(0.077)	(0.142)	(0.140)
Child Disability	-0.104	-0.143	-0.106	-0.381***	-0.354***
	(0.123)	(0.132)	(0.125)	(0.103)	(0.105)
Public School	-0.027*	-0.068***	-0.054***	-0.062*	-0.055*
	(0.015)	(0.018)	(0.018)	(0.032)	(0.033)
Hrs in class	-0.000	0.000	0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)
Homework hrs	0.003**	0.005***	0.004***	0.008***	0.007*
	(0.001)	(0.001)	(0.001)	(0.003)	(0.004)
Head child	0.002	-0.004	0.017	0.044	0.059
	(0.024)	(0.029)	(0.030)	(0.038)	(0.039)
Head Grndchild	-0.031	0.006	0.018	-0.001	-0.032
	(0.039)	(0.041)	(0.041)	(0.058)	(0.059)
Adopted child	0.028	-0.009	0.009	0.061	0.150
	(0.055)	(0.072)	(0.072)	(0.107)	(0.107)
Forest Zone	-0.000	0.025	0.012	0.094***	0.092**
	(0.015)	(0.022)	(0.021)	(0.036)	(0.037)
Northern Zone	-0.074**	-0.132***	-0.129***	-0.168***	-0.130***
	(0.030)	(0.037)	(0.035)	(0.044)	(0.045)
Rural	-0.034**	-0.075***	-0.057**	-0.085**	-0.105***
	(0.017)	(0.025)	(0.025)	(0.036)	(0.036)

Survey year	-0.013	-0.022	-0.033	-0.006	0.043
	(0.023)	(0.025)	(0.022)	(0.037)	(0.041)
Christian	0.041	0.098*	0.106*	0.168***	0.200***
	(0.042)	(0.058)	(0.056)	(0.053)	(0.049)
Non-Christian	0.022	0.095	0.105*	0.061	0.089
	(0.041)	(0.063)	(0.060)	(0.065)	(0.062)
Total HH exp	0.045***	0.050***	0.056***	0.048**	0.035
	(0.013)	(0.017)	(0.016)	(0.023)	(0.023)
Taxi	0.022	0.035	0.024	0.064	0.086
	(0.021)	(0.025)	(0.024)	(0.097)	(0.098)
Trotro	0.016	0.034*	0.023	0.111**	0.134**
	(0.017)	(0.019)	(0.018)	(0.047)	(0.054)
MMT Bus	0.006	-0.052**	-0.054*	0.243***	0.281***
	(0.019)	(0.024)	(0.028)	(0.045)	(0.043)
SchBus/PrivCar	0.027	0.039*	0.040*	0.095	0.098
	(0.021)	(0.022)	(0.021)	(0.068)	(0.074)
Motor/Bicycle	0.073**	0.081*	0.101***	-0.039	-0.051
	(0.030)	(0.044)	(0.036)	(0.052)	(0.060)
Constant	0.054	-0.255	-0.265	-0.972***	-0.951***
	(0.175)	(0.199)	(0.194)	(0.289)	(0.280)
N	2627	2627	2627	2627	2627
r2	0.106	0.185	0.179	0.243	0.234

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$ Standard errors in parentheses

F: Heterogeneity by Sex of Child – Female Child

IV Regression (TSLS: Full Model)					
	Written Cal	Write Eng/Fren	Read Eng/Frn	Read GhLan	Write GhLan
Risk loving head	0.010	0.044*	0.051**	0.091**	0.136***
	(0.020)	(0.023)	(0.020)	(0.046)	(0.048)
Married head	0.021	-0.003	0.014	0.064*	0.052
	(0.021)	(0.023)	(0.023)	(0.037)	(0.038)
NHIS	0.038**	0.045**	0.053***	0.049	0.016
	(0.018)	(0.022)	(0.019)	(0.034)	(0.034)
Head age	0.007*	0.006	0.006	0.006	0.002
	(0.004)	(0.004)	(0.004)	(0.006)	(0.006)
Head age2	-0.000*	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Head Disability	0.051	-0.019	-0.003	0.072	0.036
	(0.046)	(0.055)	(0.047)	(0.073)	(0.078)
Employed head	-0.009	-0.031	-0.036*	0.001	-0.009
	(0.018)	(0.020)	(0.018)	(0.039)	(0.038)
Educated head	0.062***	0.072***	0.088***	0.161***	0.145***
	(0.020)	(0.022)	(0.020)	(0.035)	(0.032)
Female head	0.044**	0.021	0.027	0.040	0.041
	(0.019)	(0.021)	(0.021)	(0.037)	(0.036)
StartSchool age	-0.008***	-0.010***	-0.008***	-0.014***	-0.013***
	(0.002)	(0.003)	(0.003)	(0.004)	(0.004)
Child age	0.019***	0.022***	0.025***	0.057***	0.061***
	(0.004)	(0.004)	(0.004)	(0.006)	(0.006)
No Internt acess	-0.047***	-0.048***	-0.042***	-0.074***	-0.076***

	(0.014)	(0.016)	(0.014)	(0.026)	(0.026)
Gov't food	-0.066*	-0.156***	-0.179***	-0.093**	-0.099**
	(0.037)	(0.044)	(0.043)	(0.046)	(0.041)
Privat Org food	0.021	0.051	0.054	0.360***	0.393***
	(0.092)	(0.089)	(0.091)	(0.125)	(0.127)
Child Disability	-0.218	-0.174	-0.207	-0.415***	-0.363***
	(0.136)	(0.139)	(0.138)	(0.079)	(0.082)
Public School	-0.061***	-0.057***	-0.072***	-0.020	0.018
	(0.014)	(0.018)	(0.014)	(0.035)	(0.036)
Hrs in class	0.000**	0.001**	0.000**	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Homework hrs	0.007***	0.006**	0.009***	0.018***	0.016*
	(0.002)	(0.003)	(0.002)	(0.006)	(0.008)
Head child	0.011	0.055**	0.053**	0.130***	0.157***
	(0.020)	(0.025)	(0.023)	(0.040)	(0.039)
Head Grndchild	0.019	0.061*	0.081**	0.154***	0.177***
	(0.027)	(0.034)	(0.032)	(0.058)	(0.060)
Adopted child	-0.104	-0.061	-0.063	-0.133	-0.102
	(0.088)	(0.087)	(0.087)	(0.083)	(0.072)
Forest Zone	0.003	0.018	-0.001	0.110***	0.115***
	(0.015)	(0.018)	(0.016)	(0.036)	(0.037)
Northern Zone	-0.134***	-0.160***	-0.148***	-0.199***	-0.177***
	(0.034)	(0.038)	(0.036)	(0.047)	(0.047)
Rural	-0.022	-0.061***	-0.050***	-0.073**	-0.047
	(0.016)	(0.018)	(0.018)	(0.034)	(0.035)
Survey year	-0.003	-0.006	0.001	0.016	0.044
	(0.023)	(0.022)	(0.021)	(0.038)	(0.040)
Christian	0.026	0.010	0.006	0.105*	0.081
	(0.040)	(0.042)	(0.041)	(0.057)	(0.057)
Non-Christian	0.030	0.011	0.012	0.049	-0.022
	(0.045)	(0.050)	(0.043)	(0.062)	(0.060)
Total HH exp	0.016	0.026**	0.015	0.035	0.043*
	(0.013)	(0.013)	(0.013)	(0.024)	(0.023)
Taxi	0.004	0.018	-0.000	-0.123	-0.122
	(0.023)	(0.024)	(0.024)	(0.084)	(0.123)
Trotro	0.007	0.010	0.008	-0.027	-0.002
	(0.015)	(0.025)	(0.016)	(0.062)	(0.064)
MMT Bus	-0.088	-0.063	-0.104	-0.101	-0.146
	(0.128)	(0.124)	(0.122)	(0.184)	(0.177)
SchBus/PrivCar	-0.006	-0.000	-0.027	0.083	-0.000
	(0.019)	(0.026)	(0.021)	(0.074)	(0.077)
Motor/Bicycle	0.121***	0.159***	0.142***	-0.019	-0.020
	(0.027)	(0.038)	(0.031)	(0.068)	(0.062)
Constant	0.295	0.159	0.237	-1.075***	-1.154***
	(0.193)	(0.182)	(0.178)	(0.280)	(0.264)
N	2474	2474	2474	2474	2474
r2	0.154	0.202	0.221	0.240	0.231

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$ Standard errors in parentheses

G: Heterogeneity by Sex of Household Head – Male Head

IV Regression (TSLS: Full Model)					
	Written Cal	Write Eng/Fren	Read Eng/Frn	Read GhLan	Write GhLan
Risk loving head	-0.024	0.048*	0.043*	0.073**	0.099**
	(0.025)	(0.026)	(0.025)	(0.036)	(0.039)
Married head	0.053**	-0.000	0.037	0.061	0.047
	(0.026)	(0.025)	(0.025)	(0.040)	(0.041)
NHIS	0.039**	0.063***	0.067***	0.066**	0.065**
	(0.017)	(0.020)	(0.019)	(0.031)	(0.031)
Head age	0.006	0.013***	0.007*	0.015**	0.012**
	(0.004)	(0.005)	(0.004)	(0.006)	(0.006)
Head age2	-0.000	-0.000***	-0.000**	-0.000**	-0.000**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Head Disability	0.045	-0.004	-0.017	0.151**	0.157**
	(0.040)	(0.047)	(0.041)	(0.073)	(0.076)
Employed head	-0.037**	-0.064***	-0.055***	0.014	0.010
	(0.016)	(0.021)	(0.020)	(0.040)	(0.038)
Educated head	0.038	0.069***	0.089***	0.130***	0.123***
	(0.023)	(0.026)	(0.025)	(0.041)	(0.039)
Female Child	0.001	0.022	0.027**	0.013	0.014
	(0.012)	(0.013)	(0.013)	(0.019)	(0.021)
StartSchool age	-0.007***	-0.012***	-0.011***	-0.013***	-0.013***
	(0.002)	(0.003)	(0.003)	(0.004)	(0.004)
Child age	0.021***	0.031***	0.031***	0.058***	0.057***
	(0.004)	(0.004)	(0.004)	(0.005)	(0.006)
No Internt acess	-0.037***	-0.037**	-0.031**	-0.097***	-0.082***
	(0.013)	(0.016)	(0.014)	(0.024)	(0.023)
Gov't food	-0.072**	-0.098***	-0.113***	-0.058*	-0.088**
	(0.030)	(0.036)	(0.034)	(0.033)	(0.035)
Privat Org food	0.022	0.092	0.076	0.343***	0.375***
	(0.078)	(0.075)	(0.077)	(0.075)	(0.075)
Child Disability	-0.135	-0.147	-0.119	-0.456***	-0.427***
	(0.131)	(0.140)	(0.134)	(0.083)	(0.079)
Public School	-0.048***	-0.063***	-0.063***	-0.038	-0.002
	(0.015)	(0.018)	(0.017)	(0.033)	(0.035)
Hrs in class	0.001**	0.001***	0.001***	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Homework hrs	0.004**	0.005**	0.006***	0.009**	0.007
	(0.002)	(0.002)	(0.002)	(0.004)	(0.007)
Head child	-0.004	0.021	0.040*	0.083**	0.092***
	(0.020)	(0.025)	(0.023)	(0.035)	(0.033)
Head Grndchild	-0.017	0.061*	0.087**	0.101*	0.047
	(0.035)	(0.036)	(0.034)	(0.060)	(0.067)
Adopted child	-0.066	-0.058	-0.041	-0.040	-0.033
	(0.063)	(0.067)	(0.065)	(0.080)	(0.076)
Forest Zone	-0.001	0.021	-0.004	0.096***	0.088**
	(0.015)	(0.019)	(0.017)	(0.035)	(0.035)
Northern Zone	-0.106***	-0.141***	-0.140***	-0.158***	-0.141***
	(0.031)	(0.036)	(0.034)	(0.046)	(0.045)
Rural	-0.038**	-0.081***	-0.061***	-0.095***	-0.088***
	(0.016)	(0.021)	(0.021)	(0.032)	(0.033)
Survey year	-0.021	-0.022	-0.033	0.008	0.052

	(0.025)	(0.025)	(0.022)	(0.035)	(0.036)
Christian	0.044	0.083*	0.086*	0.179***	0.187***
	(0.033)	(0.045)	(0.044)	(0.046)	(0.045)
Non-Christian	0.021	0.067	0.073	0.054	0.057
	(0.034)	(0.052)	(0.049)	(0.050)	(0.052)
Total HH exp	0.039***	0.028*	0.034**	0.031	0.027
	(0.013)	(0.015)	(0.014)	(0.023)	(0.023)
Taxi	-0.007	0.017	-0.006	-0.053	-0.064
	(0.021)	(0.025)	(0.022)	(0.096)	(0.125)
Trotro	0.022	0.051**	0.033	0.027	0.051
	(0.022)	(0.023)	(0.021)	(0.053)	(0.054)
MMT Bus	-0.037	-0.068	-0.095**	0.105	0.128*
	(0.027)	(0.047)	(0.046)	(0.074)	(0.077)
SchBus/PrivCar	-0.001	0.017	-0.004	0.081	0.055
	(0.021)	(0.025)	(0.021)	(0.062)	(0.070)
Motor/Bicycle	0.110***	0.135***	0.131***	-0.067	-0.088*
	(0.026)	(0.038)	(0.035)	(0.043)	(0.051)
Constant	0.070	-0.154	-0.120	-1.240***	-1.225***
	(0.188)	(0.190)	(0.181)	(0.284)	(0.277)
N	3397	3397	3397	3397	3397
r2	0.143	0.210	0.219	0.265	0.247

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$ Standard errors in parentheses

H: Heterogeneity by Sex of Household Head – Female Head

IV Regression (TSLS: Full Model)					
	Written Cal	Write Eng/Fren	Read Eng/Frn	Read GhLan	Write GhLan
Risk loving head	0.016	0.054**	0.056***	0.123**	0.159***
	(0.026)	(0.025)	(0.020)	(0.052)	(0.054)
Married head	-0.011	0.008	0.004	0.013	0.001
	(0.019)	(0.026)	(0.026)	(0.035)	(0.035)
NHIS	0.007	0.052*	0.056*	0.004	-0.024
	(0.019)	(0.031)	(0.030)	(0.044)	(0.043)
Head age	0.006	0.002	0.003	-0.007	-0.009
	(0.004)	(0.005)	(0.005)	(0.007)	(0.008)
Head age2	-0.000	-0.000	-0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Head Disability	0.061	0.042	0.062	0.090	0.075
	(0.045)	(0.062)	(0.056)	(0.090)	(0.110)
Employed head	0.002	-0.038	-0.040	-0.025	-0.023
	(0.023)	(0.026)	(0.025)	(0.042)	(0.043)
Educated head	0.079**	0.021	0.029	0.115***	0.101**
	(0.031)	(0.027)	(0.026)	(0.040)	(0.041)
Female Child	0.007	0.025	0.026	-0.002	0.008
	(0.014)	(0.022)	(0.022)	(0.032)	(0.032)
StartSchool age	-0.007**	-0.009***	-0.008**	-0.017***	-0.016***
	(0.003)	(0.004)	(0.003)	(0.005)	(0.005)
Child age	0.014***	0.022***	0.023***	0.062***	0.062***
	(0.004)	(0.005)	(0.005)	(0.007)	(0.008)
No Internt acess	-0.020	-0.024	-0.025	-0.064	-0.068*
	(0.017)	(0.022)	(0.021)	(0.039)	(0.038)

Gov't food	-0.035	-0.101*	-0.091*	-0.026	-0.043
	(0.042)	(0.053)	(0.051)	(0.053)	(0.057)
Privat Org food	0.070*	-0.003	0.159***	0.375***	0.419***
	(0.042)	(0.112)	(0.055)	(0.088)	(0.094)
Child Disability	-0.228	-0.183	-0.211	-0.377**	-0.288**
	(0.160)	(0.145)	(0.148)	(0.162)	(0.140)
Public School	-0.027	-0.062***	-0.060***	-0.049	-0.050
	(0.017)	(0.020)	(0.019)	(0.040)	(0.038)
Hrs in class	-0.000	-0.000	-0.000	-0.001	-0.001
	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)
Homework hrs	0.004***	0.004***	0.004***	0.010***	0.009***
	(0.001)	(0.001)	(0.001)	(0.003)	(0.003)
Head child	0.016	0.031	0.024	0.066	0.107**
	(0.021)	(0.031)	(0.029)	(0.049)	(0.049)
Head Grndchild	0.015	0.038	0.026	0.026	0.050
	(0.038)	(0.040)	(0.039)	(0.064)	(0.063)
Adopted child	0.093***	0.055	0.039	-0.091	0.167
	(0.030)	(0.083)	(0.080)	(0.133)	(0.144)
Forest Zone	0.011	0.027	0.028	0.120***	0.138***
	(0.017)	(0.025)	(0.024)	(0.043)	(0.044)
Northern Zone	-0.083**	-0.114***	-0.087**	-0.218***	-0.170***
	(0.038)	(0.043)	(0.041)	(0.052)	(0.053)
Rural	-0.019	-0.042	-0.040	-0.043	-0.048
	(0.017)	(0.026)	(0.025)	(0.045)	(0.045)
Survey year	0.012	0.000	0.012	-0.001	0.038
	(0.018)	(0.023)	(0.021)	(0.044)	(0.050)
Christian	-0.007	-0.042	-0.067	-0.075	-0.045
	(0.058)	(0.060)	(0.055)	(0.092)	(0.093)
Non-Christian	0.028	-0.001	-0.014	-0.052	-0.099
	(0.061)	(0.063)	(0.057)	(0.095)	(0.093)
Total HH exp	0.012	0.060***	0.045**	0.061**	0.058**
	(0.013)	(0.018)	(0.018)	(0.027)	(0.027)
Taxi	0.032	0.043	0.043	-0.034	0.006
	(0.030)	(0.030)	(0.030)	(0.100)	(0.104)
Trotro	0.028*	0.012	0.026*	0.085	0.109
	(0.015)	(0.025)	(0.015)	(0.062)	(0.069)
MMT Bus	-0.015	0.001	0.005	0.345***	0.385***
	(0.026)	(0.031)	(0.031)	(0.072)	(0.076)
SchBus/PrivCar	0.023	0.024	0.010	0.108	0.038
	(0.019)	(0.022)	(0.022)	(0.091)	(0.110)
Motor/Bicycle	0.052	0.039	0.084**	0.092	0.111
	(0.051)	(0.060)	(0.034)	(0.078)	(0.074)
Constant	0.473**	0.106	0.196	-0.610*	-0.675*
	(0.191)	(0.238)	(0.237)	(0.368)	(0.375)
N	1704	1704	1704	1704	1704
r2	0.090	0.146	0.139	0.204	0.199

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$ Standard errors in parentheses

APPENDIX I: Heterogeneity by Type of School – Private School

IV Regression Model (TSLS: Full Model)					
	Written Cal	Write Eng/Fren	Read Eng/Frn	Read GhLan	Write GhLan
Risk loving head	-0.018	-0.006	0.009	0.116**	0.136**
	(0.023)	(0.021)	(0.011)	(0.059)	(0.060)
Married head	0.003	0.004	0.014	0.094	0.118**
	(0.028)	(0.019)	(0.018)	(0.058)	(0.056)
NHIS	0.029*	0.023	0.012	0.090*	0.079
	(0.017)	(0.024)	(0.016)	(0.052)	(0.050)
Head age	-0.005	0.000	-0.007	0.007	0.008
	(0.005)	(0.008)	(0.005)	(0.011)	(0.011)
Head age2	0.000	-0.000	0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Head Disability	0.124***	-0.003	-0.011	0.477***	0.585***
	(0.029)	(0.101)	(0.097)	(0.166)	(0.188)
Employed head	0.025	-0.023	-0.014	0.072	0.077
	(0.025)	(0.019)	(0.015)	(0.076)	(0.073)
Educated head	0.024	0.056	0.061**	0.024	-0.002
	(0.029)	(0.038)	(0.031)	(0.069)	(0.059)
Female head	0.007	0.009	0.006	0.042	0.080
	(0.024)	(0.020)	(0.016)	(0.060)	(0.056)
Female Child	0.026**	0.014	0.036***	-0.024	-0.062
	(0.013)	(0.016)	(0.011)	(0.036)	(0.038)
StartSchool age	-0.002	-0.003	-0.003	-0.001	-0.003
	(0.003)	(0.003)	(0.003)	(0.007)	(0.007)
Child age	0.005	0.009*	0.011***	0.067***	0.069***
	(0.004)	(0.005)	(0.004)	(0.009)	(0.011)
No Internt acess	-0.011	-0.032**	-0.021	-0.127***	-0.105**
	(0.013)	(0.016)	(0.013)	(0.043)	(0.041)
Gov't food	0.061	0.111***	0.110***	-0.091	-0.047
	(0.038)	(0.026)	(0.024)	(0.128)	(0.117)
Privat Org food	0.019	0.060	0.049	0.310*	0.442**
	(0.144)	(0.132)	(0.121)	(0.160)	(0.197)
Child Disability	0.029	0.031	0.007	-0.447***	-0.457***
	(0.025)	(0.088)	(0.099)	(0.110)	(0.144)
Hrs in class	-0.000	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)
Homework hrs	0.003**	-0.000	0.002	0.002	0.006
	(0.001)	(0.002)	(0.001)	(0.006)	(0.006)
Head child	0.081**	0.069*	0.080**	-0.026	-0.060
	(0.032)	(0.037)	(0.032)	(0.071)	(0.071)
Head Grndchild	0.023	0.086	0.078	0.041	0.010
	(0.064)	(0.066)	(0.053)	(0.101)	(0.102)
Adopted child	0.100**	0.111**	0.116***	-0.418**	-0.367**
	(0.041)	(0.049)	(0.045)	(0.166)	(0.152)
Forest Zone	0.008	0.030*	0.005	0.108**	0.114**
	(0.014)	(0.017)	(0.013)	(0.050)	(0.048)
Northern Zone	-0.006	-0.119*	-0.146*	-0.274***	-0.197***
	(0.035)	(0.071)	(0.076)	(0.077)	(0.076)
Rural	-0.035*	-0.051**	-0.073***	-0.072	-0.089
	(0.018)	(0.021)	(0.020)	(0.062)	(0.058)
Survey year	-0.009	0.000	0.008	-0.004	0.082

	(0.014)	(0.019)	(0.015)	(0.053)	(0.053)
Christian	-0.014	-0.004	-0.009	0.116	0.154
	(0.034)	(0.045)	(0.038)	(0.100)	(0.103)
Non-Christian	-0.059	-0.068	-0.053	-0.060	-0.129
	(0.042)	(0.063)	(0.045)	(0.108)	(0.112)
Total HH exp	0.026**	0.025*	0.021*	0.019	0.011
	(0.011)	(0.013)	(0.013)	(0.037)	(0.035)
Taxi	0.017	0.016	0.000	-0.031	0.010
	(0.013)	(0.013)	(0.010)	(0.117)	(0.119)
Trotro	0.011	0.025*	0.008	0.086	0.086
	(0.015)	(0.013)	(0.011)	(0.073)	(0.073)
MMT Bus	-0.030	-0.059	-0.079	0.165	0.202*
	(0.038)	(0.083)	(0.080)	(0.116)	(0.112)
SchBus/PrivCar	0.012	0.026	0.008	0.086	0.039
	(0.015)	(0.016)	(0.013)	(0.055)	(0.059)
Motor/Bicycle	-0.031	-0.022	0.031	-0.080	-0.132
	(0.047)	(0.052)	(0.047)	(0.060)	(0.100)
Constant	0.682***	0.536***	0.702***	-0.872**	-0.976**
	(0.169)	(0.208)	(0.168)	(0.439)	(0.430)
N	1704	1704	1704	1704	1704
r2	0.090	0.146	0.139	0.204	0.199

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$ Standard errors in parentheses

J: Heterogeneity by Type of School – Public School

IV Regression (TSLS: Full Model)					
	Written Cal	Write Eng/Fren	Read Eng/Frn	Read GhLan	Write GhLan
Risk loving head	-0.008	0.067***	0.060**	0.090***	0.120***
	(0.024)	(0.024)	(0.023)	(0.034)	(0.040)
Married head	0.030	0.008	0.022	0.032	0.005
	(0.019)	(0.023)	(0.022)	(0.028)	(0.028)
NHIS	0.038**	0.073***	0.084***	0.036	0.027
	(0.017)	(0.020)	(0.020)	(0.028)	(0.027)
Head age	0.009***	0.009**	0.008**	0.004	0.001
	(0.004)	(0.004)	(0.004)	(0.005)	(0.005)
Head age2	-0.000**	-0.000***	-0.000**	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Head Disability	0.042	0.018	0.027	0.089	0.074
	(0.032)	(0.043)	(0.039)	(0.064)	(0.071)
Employed head	-0.038**	-0.065***	-0.064***	-0.029	-0.032
	(0.016)	(0.018)	(0.018)	(0.027)	(0.027)
Educated head	0.059***	0.057***	0.072***	0.149***	0.137***
	(0.020)	(0.022)	(0.021)	(0.032)	(0.032)
Female head	0.058***	0.026	0.039**	0.039	0.023
	(0.016)	(0.020)	(0.019)	(0.035)	(0.033)
Female Child	-0.005	0.022	0.021	0.016	0.035*
	(0.012)	(0.016)	(0.016)	(0.020)	(0.021)
StartSchool age	-0.008***	-0.013***	-0.011***	-0.017***	-0.016***
	(0.002)	(0.003)	(0.002)	(0.003)	(0.003)
Child age	0.022***	0.032***	0.033***	0.057***	0.055***
	(0.004)	(0.004)	(0.004)	(0.005)	(0.005)

No Internt acess	-0.035***	-0.029*	-0.029*	-0.069***	-0.064***
	(0.012)	(0.016)	(0.016)	(0.025)	(0.024)
Gov't food	-0.051*	-0.090**	-0.096***	-0.034	-0.069**
	(0.029)	(0.035)	(0.034)	(0.034)	(0.033)
Privat Org food	0.079	0.101*	0.149**	0.443***	0.470***
	(0.060)	(0.061)	(0.069)	(0.068)	(0.072)
Child Disability	-0.209*	-0.191*	-0.182	-0.385***	-0.339***
	(0.110)	(0.112)	(0.111)	(0.070)	(0.068)
Hrs in class	0.000	0.001**	0.000*	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Homework hrs	0.005***	0.007***	0.007***	0.013***	0.010**
	(0.002)	(0.002)	(0.002)	(0.003)	(0.005)
Head child	-0.008	0.023	0.031	0.123***	0.164***
	(0.018)	(0.022)	(0.021)	(0.030)	(0.028)
Head Grndchild	-0.011	0.033	0.051*	0.090**	0.099**
	(0.025)	(0.030)	(0.030)	(0.046)	(0.045)
Adopted child	-0.061	-0.052	-0.038	0.029	0.094
	(0.062)	(0.065)	(0.064)	(0.065)	(0.067)
Forest Zone	0.001	0.015	0.004	0.102***	0.103***
	(0.015)	(0.019)	(0.019)	(0.032)	(0.033)
Northern Zone	-0.109***	-0.147***	-0.131***	-0.166***	-0.144***
	(0.029)	(0.033)	(0.032)	(0.039)	(0.039)
Rural	-0.029*	-0.072***	-0.050**	-0.080***	-0.075**
	(0.016)	(0.020)	(0.021)	(0.030)	(0.031)
Survey year	-0.009	-0.014	-0.021	0.001	0.028
	(0.023)	(0.024)	(0.021)	(0.033)	(0.037)
Christian	0.034	0.071	0.073	0.152***	0.162***
	(0.037)	(0.048)	(0.048)	(0.050)	(0.048)
Non-Christian	0.034	0.085	0.087*	0.090	0.092*
	(0.037)	(0.052)	(0.051)	(0.055)	(0.056)
Total HH exp	0.032**	0.043***	0.043***	0.050**	0.049**
	(0.013)	(0.015)	(0.014)	(0.021)	(0.021)
Taxi	-0.001	0.026	0.015	-0.059	-0.079
	(0.026)	(0.029)	(0.030)	(0.089)	(0.127)
Trotro	0.014	0.023	0.026	0.026	0.070
	(0.018)	(0.027)	(0.021)	(0.053)	(0.052)
MMT Bus	0.003	0.012	0.006	0.235**	0.188*
	(0.037)	(0.055)	(0.051)	(0.092)	(0.100)
SchBus/PrivCar	0.010	0.024	0.005	0.310***	0.358***
	(0.034)	(0.052)	(0.047)	(0.071)	(0.074)
Motor/Bicycle	0.131***	0.158***	0.153***	0.010	0.023
	(0.023)	(0.036)	(0.031)	(0.054)	(0.051)
Constant	0.000	-0.292	-0.305*	-1.141***	-1.110***
	(0.174)	(0.187)	(0.181)	(0.249)	(0.241)
N	4198	4198	4198	4198	4198
r2	0.126	0.181	0.181	0.251	0.242

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$ Standard errors in parentheses

K: Heterogeneity by Location – Rural Location

IV Regression Model (TSLS: Full Model)					
	Written Cal	Write Eng/Fren	Read Eng/Frn	Read GhLan	Write GhLan
Risk Loving head	0.008	0.087***	0.078***	0.050	0.063
	(0.031)	(0.029)	(0.029)	(0.046)	(0.049)
Married head	0.054**	0.052	0.046	0.018	0.009
	(0.026)	(0.032)	(0.032)	(0.037)	(0.036)
NHIS	0.028	0.067***	0.071***	0.024	0.015
	(0.020)	(0.023)	(0.022)	(0.031)	(0.033)
Head age	0.008*	0.010**	0.009**	-0.002	-0.003
	(0.004)	(0.005)	(0.005)	(0.006)	(0.006)
Head age2	-0.000	-0.000**	-0.000**	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Head Disability	0.088**	0.019	0.032	0.173**	0.162*
	(0.035)	(0.048)	(0.040)	(0.080)	(0.086)
Employed head	-0.031	-0.064***	-0.049**	0.029	0.026
	(0.019)	(0.022)	(0.021)	(0.035)	(0.033)
Educated head	0.071***	0.086***	0.091***	0.147***	0.141***
	(0.024)	(0.027)	(0.026)	(0.037)	(0.037)
Female head	0.086***	0.069**	0.061**	0.048	0.043
	(0.023)	(0.029)	(0.027)	(0.049)	(0.045)
Female Child	0.005	0.035	0.034	0.019	0.046**
	(0.015)	(0.021)	(0.021)	(0.024)	(0.023)
StartSchool age	-0.008***	-0.012***	-0.011***	-0.016***	-0.015***
	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)
Child age	0.028***	0.037***	0.039***	0.051***	0.048***
	(0.005)	(0.005)	(0.004)	(0.006)	(0.006)
No Internt acess	-0.031**	-0.028	-0.026	-0.057*	-0.047
	(0.014)	(0.020)	(0.019)	(0.033)	(0.032)
Gov't food	-0.071**	-0.137***	-0.135***	-0.055	-0.096***
	(0.029)	(0.040)	(0.038)	(0.034)	(0.035)
Privat Org food	0.060	0.080	0.123**	0.349***	0.376***
	(0.057)	(0.056)	(0.057)	(0.085)	(0.086)
Child Disability	-0.268*	-0.292**	-0.279**	-0.257***	-0.228***
	(0.139)	(0.131)	(0.127)	(0.078)	(0.085)
Public School	-0.058***	-0.090***	-0.065**	-0.045	-0.018
	(0.020)	(0.026)	(0.026)	(0.043)	(0.042)
Hrs in class	0.000	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)
Homework hrs	0.004**	0.006***	0.006***	0.014***	0.014***
	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)
Head child	-0.006	0.049	0.056*	0.087**	0.109***
	(0.024)	(0.031)	(0.030)	(0.035)	(0.034)
Head Grndchild	-0.014	0.049	0.070*	0.031	0.015
	(0.032)	(0.043)	(0.039)	(0.057)	(0.054)
Adopted child	-0.098	-0.015	0.000	0.025	0.019
	(0.079)	(0.078)	(0.080)	(0.071)	(0.072)
Forest Zone	-0.006	0.015	0.008	0.125**	0.125**
	(0.020)	(0.027)	(0.026)	(0.049)	(0.049)
Northern Zone	-0.115***	-0.164***	-0.154***	-0.136***	-0.122**
	(0.032)	(0.040)	(0.039)	(0.052)	(0.053)
Survey year	-0.003	-0.013	-0.012	-0.039	-0.016

	(0.031)	(0.032)	(0.029)	(0.043)	(0.045)
Christian	0.006	0.043	0.051	0.189***	0.207***
	(0.036)	(0.037)	(0.037)	(0.049)	(0.048)
Non-Christian	-0.016	0.028	0.039	0.136***	0.155***
	(0.034)	(0.045)	(0.043)	(0.053)	(0.054)
Total HH exp	0.038***	0.032*	0.026	0.040	0.031
	(0.015)	(0.017)	(0.016)	(0.025)	(0.025)
Taxi	0.013	0.044	0.030	0.082	0.067
	(0.021)	(0.031)	(0.031)	(0.115)	(0.114)
Trotro	0.010	0.070***	0.062**	0.067	0.026
	(0.029)	(0.023)	(0.024)	(0.078)	(0.084)
MMT Bus	-0.076	-0.177*	-0.184*	0.060	0.113
	(0.060)	(0.095)	(0.096)	(0.119)	(0.120)
SchBus/PrivCar	0.005	0.011	0.014	0.200**	0.151
	(0.036)	(0.043)	(0.042)	(0.082)	(0.100)
Motor/Bicycle	0.134***	0.164***	0.147***	0.015	-0.027
	(0.031)	(0.042)	(0.040)	(0.050)	(0.057)
Constant	-0.072	-0.320	-0.289	-0.913***	-0.858***
	(0.200)	(0.213)	(0.205)	(0.287)	(0.262)
N	3362	3362	3362	3362	3362
r2	0.136	0.183	0.180	0.220	0.211

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$ Standard errors in parentheses

L: Heterogeneity by Location – Urban Location

IV Regression Model (TSLS: Full Model)					
	Written Cal	Write Eng/Fren	Read Eng/Frn	Read GhLan	Write GhLan
Risk Loving head	-0.018	0.022	0.030	0.123***	0.159***
	(0.020)	(0.019)	(0.018)	(0.045)	(0.049)
Married head	0.006	-0.017	0.014	0.078**	0.053
	(0.018)	(0.017)	(0.019)	(0.036)	(0.037)
NHIS	0.026	0.038	0.048**	0.088**	0.082**
	(0.019)	(0.026)	(0.024)	(0.043)	(0.041)
Head age	0.006	0.006	0.003	0.010	0.009
	(0.004)	(0.005)	(0.005)	(0.008)	(0.007)
Head age2	-0.000	-0.000*	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Head Disability	-0.023	0.008	-0.008	0.026	0.016
	(0.059)	(0.060)	(0.061)	(0.084)	(0.106)
Employed head	-0.025	-0.049**	-0.058***	-0.051	-0.051
	(0.021)	(0.021)	(0.019)	(0.047)	(0.047)
Educated head	0.029	0.014	0.037	0.084*	0.057
	(0.021)	(0.025)	(0.023)	(0.045)	(0.045)
Female head	0.015	-0.014	0.010	0.037	0.034
	(0.017)	(0.017)	(0.017)	(0.040)	(0.037)
Female Child	0.008	0.015	0.021*	-0.008	-0.027
	(0.011)	(0.013)	(0.012)	(0.025)	(0.028)
StartSchool age	-0.006**	-0.010***	-0.008***	-0.012**	-0.012***
	(0.002)	(0.003)	(0.003)	(0.005)	(0.004)
Child age	0.010**	0.020***	0.020***	0.066***	0.070***

	(0.004)	(0.004)	(0.004)	(0.007)	(0.008)
No Internt acess	-0.044***	-0.048***	-0.047***	-0.103***	-0.091***
	(0.014)	(0.018)	(0.016)	(0.030)	(0.030)
Gov't food	-0.017	0.002	-0.022	-0.003	0.002
	(0.054)	(0.054)	(0.059)	(0.067)	(0.063)
Privat Org food	-0.018	-0.018	-0.026	0.202**	0.335***
	(0.050)	(0.049)	(0.045)	(0.096)	(0.096)
Child Disability	-0.065	-0.043	-0.039	-0.511***	-0.447***
	(0.133)	(0.132)	(0.126)	(0.084)	(0.093)
Public School	-0.034**	-0.056***	-0.063***	-0.044	-0.032
	(0.014)	(0.016)	(0.014)	(0.030)	(0.030)
Hrs in class	0.000	0.000	0.000	-0.000	-0.001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)
Homework hrs	0.004**	0.003	0.004**	0.005	0.000
	(0.002)	(0.002)	(0.002)	(0.006)	(0.008)
Head child	0.006	-0.004	0.007	0.074	0.093**
	(0.021)	(0.023)	(0.023)	(0.045)	(0.044)
Head Grndchild	-0.017	0.017	0.026	0.093	0.099
	(0.034)	(0.032)	(0.036)	(0.064)	(0.067)
Adopted child	0.018	-0.037	-0.047	-0.149	-0.012
	(0.054)	(0.080)	(0.076)	(0.106)	(0.107)
Forest Zone	0.002	0.015	-0.002	0.102***	0.110***
	(0.013)	(0.016)	(0.015)	(0.035)	(0.038)
Northern Zone	-0.009	-0.019	-0.015	-0.233***	-0.178***
	(0.036)	(0.041)	(0.038)	(0.057)	(0.055)
Survey year	-0.007	-0.006	-0.011	0.014	0.071*
	(0.015)	(0.018)	(0.017)	(0.039)	(0.043)
Christian	0.101**	0.123	0.111	0.026	0.030
	(0.050)	(0.091)	(0.086)	(0.083)	(0.078)
Non-Christian	0.101**	0.122	0.117	-0.091	-0.143
	(0.051)	(0.102)	(0.092)	(0.097)	(0.092)
Total HH exp	0.014	0.038***	0.040***	0.051*	0.059**
	(0.011)	(0.013)	(0.012)	(0.027)	(0.027)
Taxi	0.010	0.018	-0.002	-0.069	-0.047
	(0.019)	(0.021)	(0.021)	(0.083)	(0.105)
Trotro	0.025**	0.026	0.021	0.043	0.085*
	(0.012)	(0.017)	(0.013)	(0.044)	(0.048)
MMT Bus	0.002	0.001	-0.018	0.185**	0.201**
	(0.014)	(0.019)	(0.019)	(0.086)	(0.095)
SchBus/PrivCar	0.014	0.017	-0.001	0.063	0.016
	(0.013)	(0.016)	(0.013)	(0.061)	(0.071)
Motor/Bicycle	-0.006	-0.029	0.019	-0.096	-0.038
	(0.036)	(0.048)	(0.021)	(0.062)	(0.060)
Constant	0.453***	0.143	0.179	-1.163***	-1.332***
	(0.164)	(0.182)	(0.176)	(0.353)	(0.348)
N	1739.000	1739.000	1739.000	1739.000	1739.000
r2	0.068	0.105	0.134	0.204	0.207

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$ Standard errors in parenthesis