UNIVERSITY OF CAPE COAST

EFFECT OF COGNITIVE AND SOFT SKILLS ON LABOUR MARKET OUTCOMES IN GHANA

JACOB NUNOO

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EFFECT OF COGNITIVE AND SOFT SKILLS ON LABOUR MARKET OUTCOMES AMONG ADULTS IN GHANA

BY

JACOB NUNOO

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DECLARATION

Candidate's Declaration

I hereby declare that this thesis is the result of my own original work and that no part of it has been presented for another degree in this University or elsewhere.

Candidate's Signature…………………………... Date…………………

Name: Jacob Nunoo

Supervisors' Declaration

We hereby declare that the preparation and presentation of this thesis were supervised in accordance with the guidelines on supervision of thesis as laid down by the University of Cape Coast.

Principal Supervisor's Signature……………… Date…………………….

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ABSTRACT

Cognitive and soft skills have gained traction among economists in recent times. Using the World Bank's Skills toward Employment and Productivity (STEP) surveys, this study examines three objectives: (1) the effect of age of starting school on cognitive skills proficiency, (2) the effect of cognitive skills on labour market outcomes, and (3) the effect of soft skills on labour market outcomes. The econometric approaches used in this study were the ordinary least square (OLS), logit, ordered logit regression and structural equation modelling techniques. Empirical results indicate that starting school at the required age of six significantly improves cognitive skills proficiency by between 5 and 23 points. It was observed that one-standard-deviation increase in literacy proficiency score was associated with an average increase in hourly earnings of about between 3 and 25 percent. Further, cognitive skill proficiency had a significant positive effect on employment, working in the formal sector, being a wage worker and occupying a managerial position. In addition, personality traits capturing soft skills were found to have significant effect on all the labour market outcomes. The study recommended that the law on school starting age should be enforced through house-to-house sensitisations at the community level. Basic educational institutions should concentrate on developing cognitive competencies through the teaching of the three Rs – reading, writing and arithmetic. Finally, the teaching and learning of soft skills should be introduced by Ghana Education Service in the new educational reforms.

KEYWORDS

Age of starting school

Cognitive skills

Soft skills

Personality traits

Labour market outcomes

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DEDICATION

To my mother, wife and daughter

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LIST OF ACRONYMS

AFQT	Armed Forces Qualification Test
BHPS	British Household Panel Study
CFI	Comparative Fit Index
EFA	Education for All
EGMA	Early Grade Maths Assessment
EGRA	Early Grade Reading Assessment
ETS	Educational Testing Service
GED	General Educational Development
GLSS	Ghana Living Standard Survey
HCM	Human Capital Model
IALS	International Adult Literacy Survey
ILO	International Labour Organisation
MOE	Ministry of Education
NEA	National Education Assessment
OCEAN	Openness to Experience, Conscientiousness, Extraversion, Agreeableness and Neuroticism or Emotional Stability
OLS	Ordinary Least Squares
PIAAC	Programme for the International Assessment of Adult Competencies
PISA	Programme for International Student Assessment
RMSEA	Root Mean Square Error of Estimation
SDG	Sustainable Development Goals
SEM	Structural Equation Model

SES	Socio-Economic Status
SRMR	Standardized Root Mean Squared Residual
STEP	Skills Toward Employment and Productivity
UIS	UNESCO Institute for Statistics
UNESCO	United Nations Educational, Scientific and Cultural Organisation

CHAPTER ONE

INTRODUCTION

In today's technologically changing world, individuals, societies, and economies can only survive with continual development of their human capital. The introduction of the Sustainable Development Goals (SDGs), particularly, goals 4 and 8, has renewed the interest and need for governments to place more emphasis on education to impart the required knowledge and skills to youths and offer opportunities for continuous and lifelong learning to all. World Bank (2019) argues that in addition to basic cognitive skills, the ability to demonstrate accompanying soft skills is gaining more traction in the world of work. Given that Sub-Saharan Africa has always lagged behind in imparting the foundational skills to learners, this has the potential of creating bottlenecks for the development of advanced skills and preparing the workforce for wider opportunities in the global environment.

This thesis sort to contribute to the literature regarding the effect of cognitive and soft skills on labour market outcomes in Ghana. Using an internationally comparable household level data, the study investigates how age of starting school affects cognitive skills measured with literacy proficiency, and determines the effect of literacy proficiency and soft skills (captured by personality traits) on labour market outcomes in Ghana.

This chapter gives a detailed overview to the study as it encompasses the background to the study, problem statement, objectives of the study, hypothesis and justification of the study. It also highlights the scope of and organisation of the study.

Background to the Study

The importance of education and improved literacy in enhancing the lives of individuals and societies has long been documented (Barro & Sala-i-Martin, 1995; Hanushek & Woessmann, 2010). Equal access to education is among the basic human rights that all citizens are entitled to. According to Mazumdar (2005), "illiteracy or the absence of literacy is considered as the greatest impediment to human development" (p 98). This is because literacy level reflects the quality of human capital, which is enhanced through education and lifelong learning. Besides, education enhances the effectiveness and efficiency of work. This is achieved through inculcating in people the ability to understand and evaluate new concepts as well as the facilitation of adoption or alteration of technology.

Several studies have recognised that, at the societal level, education, and literacy levels stimulate economic growth leading to poverty reduction and increase in the democratic involvement of citizens, with the outcome of reducing conflicts and civil strives (Berg & Ostry, 2011; Hanushek & Woessmann, 2008; OECD, 2012; Palma, 2011; UNESCO, 2008). Vinod and Kaushik (2007) found in their study involving 18 developing countries that a rise in national literacy levels were associated with higher economic growth in most of the countries. Literacy, according to Desjardins (2004), is important for the advancement of culture, especially in eliminating harmful practices. In the area of health and life long well-being, education is identified as a key driver. This observation has been made across different contexts, especially among those with formal education (Baker, Seltzer & Greenberg 2011; Cutler, Sorlie, Wolz, Thom, Fields, & Roccella 2008; Mirowsky & Ross, 2003). UNESCO

(2016) observed that education that makes people functionally literate can be used as the most effective tool in managing problems effectively such as to heighten society's sense of disaster preparedness, reduce crimes in inner cities and to decrease high fertility rates experienced in the developing world. Education is also strongly noted to contribute to improved earnings and employability of individuals in the society (Farkas, 2006; Krueger, 2003; Hanushek & Woessmann, 2008).

A literate population is a potentially productive work force. Therefore, education that teach individuals to be functionally literate gives people a foundation for the growth of their full capacity and position them to be employable. For those who are even out of school, lifelong learning has the potential of helping them to maintain the skills and competencies needed at work and to live a fulfilled life. Basic literacy proficiency (i.e., an array of skills from numeracy to the understanding of printed words and sentences, including the interpretation, comprehension and appraisal of complicated texts) is viewed as central for the improvement in "higher-order" cognitive skills and abilities, which are essential in the world of work today (OECD, 2016). According to International Labour Organization (2011), the future success of any country depends mainly on the number of its citizenry in employment and how productive they work. The literature on economics is replete with studies that highlight the important association between literacy and numeracy proficiency and a more educated and skilled populace and workforce, all of which benefit a country's economy as a whole (Hanushek & Woessmann 2008; OECD, 2013).

In a cross-country growth analysis by Hanushek and Woessmann (2015), which measured the stock of human capital, they found that there is a strong positive association between long-term growth and human capital development at the country level. When the foregoing was compared to human capital measured by years of completing school, the impact on economic growth was weak, though the outcome was still significant. Hanushek and Woessmann (2015) concluded that what counts for labour market outcomes and economic growth is what individuals know and are able to do, but not the years it takes to reach the skill level. Their finding gives credence to the need emphasise learning outcomes of educational institutions. This assertion hinges on the theory of human capital which argues that investing in education leads to productive citizens which attracts premium in earnings.

In the United States, several studies have corroborated the foregoing. Using the High School and Beyond and the National Longitudinal Survey (NYSY) of the High School Class of 1972, Murnane, Willett and Tyler (2000) estimated that males obtained a 15 percent increase and females had a 10 percent surge per a one standard deviation increase in cognitive skills test performance on annual earnings. Lazear (2003) and Altonji and Pierret (2001) corroborate this view, noting that the impact of cognitive skills on earnings, measured by achievement test, increases with experience. This shows that employers place premium on cognitive skills and experience. With the NLSY data, Mulligan (1999) also found an 11 percent effect for the normalized Armed Forces Qualifying Test (AFQT) score on earnings in the United States (US). These analyses focused on early career workers. However, Hanushek and Zhang (2009) asserted that the importance of cognitive skills is not just limited to early career workers and younger workers but cognitive skills hold true across all work and professional experience. Using the International Adult Literacy

Survey (IALS), Hanushek and Zhang (2009) found that literacy proficiency has the tendency to increase earnings by about 9 percent in 13 countries sampled for their study and that the effect of school completion falls from about 7 to 6 percent after adjusting for literacy scores, which is used to proxy cognitive skills. Lin, Lutter and Ruhm (2016) observed cognitive skills to be positively correlated with future labour market outcomes at all ages using scores on the AFQT. They argue that although the relationship is reduced, it is not rejected by the addition of controls for non-cognitive skills. They further revealed that returns to cognitive skill rise with age which tend to favour women than men.

Drawing on a UK birth cohort data sets, Vignoles, De Coulon and Marcenaro-Gutierrez (2010) and McIntosh and Vignoles (2001) found that for a given set of early childhood abilities, individuals with higher basic skills in adulthood benefited from earning premium and higher employment rates. This suggests that early childhood development in basic cognitive skills tends to have a lasting effect on earnings and other market outcomes. From Vignoles *et al.* (2010), a 1 percent increase in cognitive skills attracts an earning premium of about 14 percent while numeracy skills attract earning premium of about 11 percent for individuals in their prime age. Espinoza, Sarzosa, Urzúa and Miyamoto (2016) also observed that investment and assessment of cognitive and soft skills in early years and adolescence in OECD countries suggested considerable effects on relevant outcomes like social behaviour, health and job market outcomes. These findings corroborate the Heckman equation that advocates for early interventions in nurturing cognitive and soft skills in children from birth to age five. Heckman reckons that this has the potential to generate a 13 percent return on investment (Cunha & Heckman, 2007).

Developing countries have a limited number of studies examining the effect of cognitive skills on labour market outcomes especially earnings and employment status. Among these are Ghana (Glewwe, 1996; Jolliffe, 1998; and Vijverberg, 1999), Kenya (Boissiere, Knight & Sabot, 1985; and Knight & Sabot, 1990), Pakistan (Alderman, Behrman, Ross & Sabot, 1996; Behrman, Ross & Sabot, 2008), South Africa (Moll, 1998), Argentina (Tetaz & Cruces, 2009) and Peru (Cunningham, Acosta & Muller, 2016).

Glewwe (1996) recognised that cognitive skills acquired measured by literacy and numeracy proficiency was what drove the earnings and employment in the private sector of Ghana not innate ability measured by Raven Test. He stressed the need for greater emphasis on school quality to improve learning outcomes. This view is consistent with those of Alderman *et al.* (1996) for Pakistan and Boissiere *et al*. (1985) for Kenya. Jolliffe (1998) using the same Ghana Living Standards Survey (GLSS 1988-89) dataset as Glewwe (1996) documented that cognitive skills measured as reading proficiency had a positive effect on total and off-farm income but not agricultural income. In their work on the effect of cognitive skills on labour market outcomes in Peru, Cunningham, Torrado and Sarzosa (2016) articulated the view that cognitive skills are positively correlated with a variety of labour market outcomes in Peru including being employed. They specifically found that cognitive skills positively correlate with earnings and that the likelihood of being a wage worker, managerial worker, and formal worker, is higher with literacy proficiency and numeric ability.

A rising body of works in economics has also documented the crucial role soft skills play in explaining differences in the possible creative competence in addition to cognitive skills. The soft skills also known as non-cognitive or socio-emotional skills embody personality traits, behaviours, manners, and beliefs (Almlund, Duckworth, Heckman, & Kautz, 2011; Borghans, Duckworth, Heckman & Ter Weel, 2008). These non-cognitive skills have been identified to be accrued over the life course of a person, and they have the power to shape decisions and success not only in the labour market but in health and educational attainment, especially tertiary education. In countries like the United States (US), United Kingdom, Germany, the Netherlands, and Sweden, the burgeoning literature reveals that personality traits are as essential as cognitive skills in determining labour market outcomes including the possibility of being employed, higher earnings and positions held at the work place (Borghans *et al*., 2008; Bowles, Gintis, & Osborne, 2001; Groves, 2005; Heckman, Stixrud & Urzúa, 2006; Heineck & Anger, 2010; Lindqvist & Vestman, 2011; Nyhus & Pons, 2005; Mueller & Plug, 2006; Segal, 2013). Goff and Ackerman (1992) opines that non-cognitive skills are more vital than cognitive skills in the long run when dealing with economic success.

Heckman *et al.* (2006) demonstrated that cognitive and soft skills are jointly significant in explaining higher earnings, reduce job hunt time, and professional choice, and that soft skills are predominantly integral for persons with lower levels of education, youth, and women. Aedo, Hentschel, Luque and Moreno (2013) examined labour force and household surveys in about 30 countries, ranging from low-income to higher middle-income countries, and observed a robust positive connection between economic development and the skill intensity of both cognitive and soft skills. Using measures of non-cognitive skills based on school assessments, Carneiro, Crawford, and Goodman (2007) and Segal (2013) highlighted significant positive relationship between behaviours exhibited in childhood and adult earnings in the United States and the United Kingdom. Lindqvist and Vestman (2011) also identified similar relationship between soft skills captured by leadership capabilities in youth and adult wages in Sweden. They observed that Swedish men with lower leadership skills earned lower annually compared with those with higher leadership qualities. Tetaz and Cruces (2009) found similar results in Argentina.

Many of the works on the effect soft skills on labour market outcomes have concentrated on the big five personality traits namely conscientiousness, openness to experience, emotional stability (locus of control and self-esteem), extraversion and agreeableness (Almlund *et al.*, 2011; Heckman & Kautz, 2012).

Borghans *et al.* (2008) submitted that in the US, conscientiousness and openness to experience jointly with cognitive ability, is a key determinant of adult socioeconomic success. Other studies in the US have also found similar results with conscientiousness, arguing that it plays a crucial role in determining wages and employment status (Kern, Della Porta & Friedman 2013), especially for women (Mueller & Plug, 2006). Emotional stability has also been recognised to exhibit significantly positive effects on the wages of men in the US but negative effect on the wages of Germans (Muller & Plug, 2006). Groves (2005), on the other hand, finds that personality traits like locus of control and hostility attribution are robust estimators of earnings among females in advanced economies notably US and UK. Heineck and Anger (2010) have also documented that the effect of external locus of control on earnings is negative while reciprocity has positive effects on earnings. Agreeableness has been found to be compensated by the labour market in US for both males and females (Mueller & Plug, 2006), but in Germany, women who exhibit this trait are punished with lower earnings (Heineck & Anger, 2010). Nyhus and Pons (2005) examine the interaction between the big five personality traits and earnings and find negative association between agreeableness and warnings. Nandi and Nicoletti (2014) opine that extraversion has the tendency to provide about 5 percentage pay increase for workers. While such works on non-cognitive skills can be found in a number of developed economies, this body of knowledge is scant in developing economies.

To benefit from education, one must start schooling at the right age. It has been established in the literature that the age at which one starts school influences lifetime outcomes including cognitive skills proficiency. Kawaguchi (2011) and Elder and Lubotsky (2009) have established positive association between age of starting school and achievement, IQ scores, schooling years and labour market outcomes. While the official age of starting primary school is six years, Akyeampong et al. (2007) noted that the estimated mean age was 7.5 years with only a third of the primary one population being 5 and 6 years old in 2003. Net enrolment ratios for primary and junior high schools in 2016 were 91 and 50 percent respectively; showing that at these levels, there were about 91 and 50 percent of pupils who were mostly older than the ages of their colleagues (Ministry of Education (MOE), 2017). Glewwe (1996) in examining the factors that influence English reading and numeracy skills for adults, included age, number of years of schooling, regions effects, and spatial school quality variation. Jolliffe (1998) in assessing the determinants of cognitive skills (English and mathematics) in Ghana looked at only work-related experience and schooling and their interactions. Blunch (2008), who also investigated the factors that influence literacy and numeracy production emphasised education reform policy and literacy course attendance as the key variables.

Ghana, like all other nations, has rolled out policies and initiatives to increase schooling and youth employment. Among these have been the educational reform of 1987 which came along with some form of skills training and the 2007 educational reform which is the most current in the educational sector. These reforms along with policies like capitation grant, school feeding programme and free uniform among others have increased access to education (Ministry of Education (MOE), 2017). On the employment front, policies such as the National Youth Employment Programme (NYEP) and the National Builders' Corps (NABCO) all aimed at improving the employment opportunities for the teeming youth. Many educationists and policy analysts have however, bemoaned the poor learning outcomes and job creation potential of these policies. Thus, the relationships between education, cognitive skills, soft skills and labour market outcomes are worth examining.

Problem Statement

The attainment of Sustainable Development Goal 4 (SDG 4), which calls for inclusive and equitable quality education and the promotion of "lifelong learning opportunities for all" has learning and achieving competence as its central idea. Targets 4.4 and 4.6 focus on youths and adults reaching proficiency in cognitive and technical skills that will make them employable and useful to society. In addition, the goal 8, target 8.6 of the SDG seeks to promote youth employment, education and training (UNESCO, 2018). These two goals harmonised in the development of skilled and competent workforce for tomorrow.

According to Zimmermann *et al.* (2013) and Giulietti, Tonin, and Vlassopoulos (2019), education and skills are core factors in determining opportunities in the labour market for all, but especially the youth. Teaching people to be functionally literate improves their employability and facilitates transition into the labour market. This can be done through skills development and training, both inside and outside the education system. In addition, occupation-specific technical skills and soft skills should be given greater attention. This is because, increasingly, employers across the globe are emphasising the importance of soft skills (Manpower Group, 2013; Cunningham, Sanchez-Puerta & Wuermli 2010). Soft skills are accentuated because educational attainment alone (especially, at the basic level) is a poor indicator of human capabilities (Hanushek & Woessmann, 2008). While millions of people leave school each year, especially young ones, they do so without adequate levels of literacy skills to be productive participants of the labour market (Richmond, McCroskey & Hickson, 2008; UNESCO, 2016).

According to Ghana Statistical Service [GSS] (2014), urban dwellers are more likely to be unemployed than rural folks in Ghana. It can also be observed that among the various age groups, the 20 to 24 years category had the highest unemployment rate of about 12 percent. Over half of all male urban workers were more likely to be in wage employment while about 69 percent of all workers are estimated to be in vulnerable employment (GSS, 2014). Among female urban workers, more than half of them are self-employed. About 70 percent of all females workers were in the informal sector.

In Ghana, the quality of schooling has come under scrutiny. The 2013 and 2015 Early Grade Reading Assessment (EGRA) showed that only about 2 percent of pupils in Primary 2 could read proficiently, with about 50 percent unable to identify a single word. The Early Grade Maths Assessment (EGMA) of 2015 found that even though between 46 –72 percent of pupils performed well on routine knowledge; sub-tasks were much more challenging. Approximately two-thirds of all children were unable to correctly answer any question in conceptual knowledge sub-tasks. These tests also revealed that children in urban areas performed significantly better than rural folks in both reading and numeracy (Ministry of Education (MOE), 2017).

A scrutiny of the National Education Assessment (NEA) in 2016 shows that about 30 percent of Primary 4 pupils performed below minimum competence for reading, with nearly 50 percent below minimum competence for mathematics. These striking statistics clearly demonstrate the existing educational gaps and the challenges fraught with improving learning outcomes in basic cognitive skills in Ghana. For mathematics, Primary 6 pupils did quite well with about 40 percent achieving proficiency and only 11 percent achieving grades below minimum competence. However, the overall percentage of pupils not achieving minimum competency in both assessments were high accounting for about a third of them (MOE, 2017). Therefore, while Ghana has seen huge increases in enrolment, this has not been associated with the corresponding increases in skills acquisition and labour productivity of workers. In addition, Ghanaians spend an average 11.6 years in school, which is low according to the Human Capital Index Report of 2018. According to the World Bank (2019) report, the actual duration in which learning takes place is just 5.7 years. Therefore, with the poor-quality education and its associated low levels of literacy skills acquisition, human capital may deteriorate quickly over time if individuals are not retrained and given the opportunities to adopt lifelong learning.

Adult literacy in Ghana has generally seen considerable progress as shown in Figure 1. A comparison of years 2000 and 2010 shows that there have been about 14 percentage points increase in adult literacy in Ghana over the period. Literacy levels among the youths are generally better than all the other age categories which was about 86 percent in 2010. Despite these appreciable increases in the literacy level measured by the various population census, many Ghanaian adults are not functionally literate.

UNESCO (2016) found that among the share of adults (aged 15 to 64) who performed at or above the minimum literacy competence threshold, which corresponds to a level that captures the adult's ability to read simple texts to detecting and identifying specific information, the evidence highlighted that Ghana and Kenya were the least performing lower middle-income countries in the World Bank's Skills Towards Employability and Productivity (STEP) household survey. Only about 42 percent of Ghanaians and about 70 percent of Kenyan adults demonstrate competence at the minimum literacy proficiency, while a number of middle-income economies like Ukraine, Serbia and Georgia have a fairly large share of adults who are at or above the minimum literacy level.

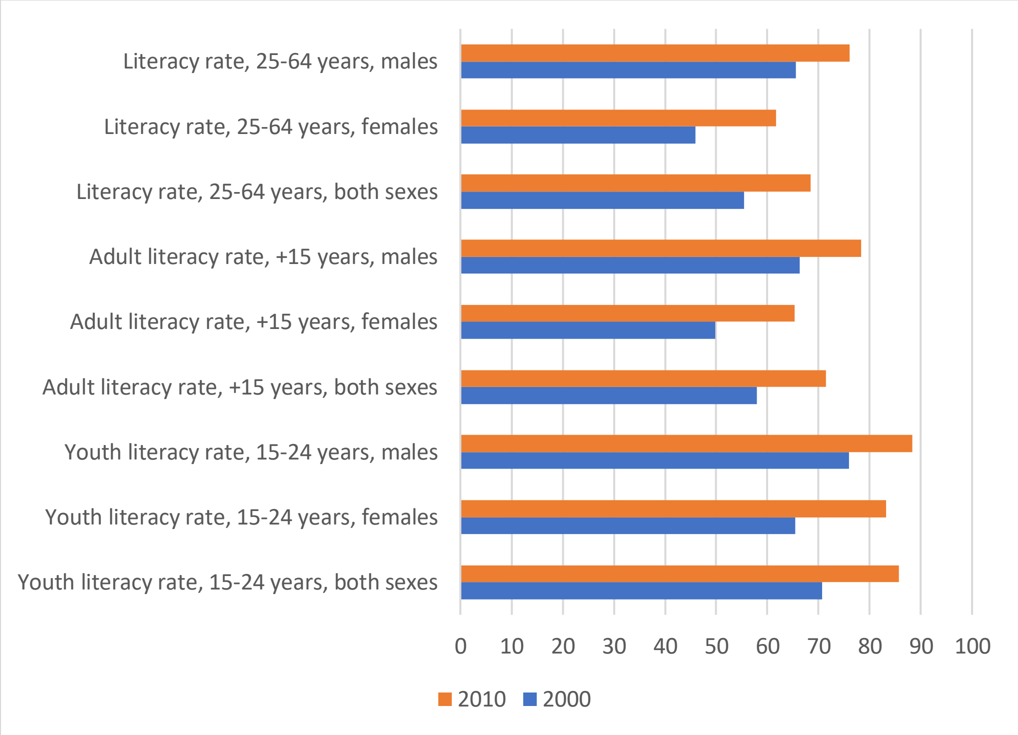

Figure 1: Literacy levels in Ghana

Source: Nunoo (2020)

These challenges in Ghana and many other places have necessitated that employers look beyond just the years of schooling completed but assess the level of cognitive skills and soft skills (personality traits) that can improve worker productivity (Cunningham & Villaseñor, 2014). Therefore, this study first examines the factors that influence cognitive skills (literacy proficiency) development with special emphasis on school starting age and second, how cognitive and soft skills affect labour market outcomes.

While some work on the effect of cognitive skills on labour market outcomes have been done on Ghana (Glewwe 1996; Blunch and Verner, 1999; Blunch, 2014), these studies have largely relied on the Ghana Living Standards Survey (GLSS) of 1988/89. Even though insights provided by this over two-decade old datasets can provide some understanding into how cognitive skills affect labour market outcomes in Ghana, they are largely out of date. The educational sector of Ghana has undergone at least two reforms during this period. The Ghanaian economy has also moved from being agriculture led to service sector driven. This study benefits from the introduction of a more refined data from the World Bank's STEP household survey which provides richer data on cognitive skills (literacy proficiency) intended to identify different levels of proficiency at accessing, identifying, incorporating, unravelling, and assessing information (World Bank, 2014). This study is deviate from existing studies on the grounds that assesses the effect of different levels of cognitive skills measured by literacy proficiency on the various labour market outcomes in the country.

The study also charts a new territory in examining the effect of age of starting school on the literacy proficiency of adults. In Ghana, the works of Glewwe (1996), Jolliffe (1998) and Blunch (2008) have all examined the determinants of cognitive skills using variables like parental education, education reform policy and adult literacy course attendance among others. None of these studies gave attention to how one's age of starting school affects cognitive skills.

An additional value of the study lies in its ability to model the effect of soft skills (the big five personality traits) on labour market outcome which has not been explored for Ghana. The only work close to this is Baffour, Mohammed and Rahaman (2019) which probed the effect of personality traits on risk aversion in Ghana and established a clear difference in personality traits and gender and their relations with risk aversion. The current study differs from Baffour *et al*. (2019) in that it looks at how the personality traits affect labour market outcomes in Ghana.

It is against this backdrop that the present study seeks to examine the effect of literacy proficiency and soft skills on labour market outcomes in Ghana using the STEP surveys. The study proxied cognitive skills with literacy proficiency and soft skills with the big five personality traits.

Purpose of the Study

The purpose of this study is to examine the effect of age of starting school on cognitive skills proficiency and how literacy proficiency skills and soft skills affect labour market outcomes of adults in Ghana.

Objectives of the Study

This study seeks to achieve the following objectives:

1. examine the effect of one's age of starting school on cognitive skills proficiency;
2. assess the effect of cognitive skills proficiency on labour market outcomes, and
3. examine the effect of soft skills on labour market outcomes.

Hypotheses of the Study

The study is guided by the following hypotheses:

Objective 1

H_0: Attending school at six has no positive effect on cognitive skills proficiency.

H_1: Attending school at six has a positive effect on cognitive skills proficiency.

H_0: The effect of starting school at age six on cognitive skills proficiency is not moderated by gender and education.

H_1: The effect of starting school at age six on cognitive skills proficiency is mediated by gender and education.

Objective 2

H_0: There is no significant positive relationship between cognitive skills proficiency and hourly earnings, employment status, being in the formal sector and being highly skilled.

H_1: There is a significant positive relationship between cognitive skills proficiency and hourly earnings, employment status, being in the formal sector and being highly skilled.

Objective 3

H_0: Soft skills have no effect on hourly earnings, employment status, being in the informal sector and being highly skilled.

H_1: Soft skills have an effect on hourly earnings, employment status, being in the informal sector and being highly skilled.

H_0: There is no significant difference in the effect of soft skills on hourly earnings for males and females.

H_1: There is significant difference in the effect of soft skills on hourly earnings for males and females.

Significance of the Study

As in many countries, the government and policy makers in Ghana have been interested in enhancing equity and access to quality education and understanding how these interventions transform people into functional and skilled workforce for the country (Ministry of Education, 2013). This study examines how cognitive skills and soft skills influence labour market outcomes of adults in Ghana.

As a government policy, all children in Ghana should start primary school at age six. Unfortunately, the Ministry of Education (2018) observed that over 450,000 children mostly from the disadvantaged poor backgrounds and mainly within the three northern regions were out of school in Ghana. The literature has linked school starting age to higher wages and the likelihood of becoming a corporate CEO and tertiary education attainment (Kawaguchi, 2011; Du, Gao, & Levi (2012); Fredriksson & Öckert, 2014). The study, therefore, fills the gap in the literature in Ghana by examining whether one's age of starting school has any effect on the literacy proficiency of adults in Ghana. The study provides evidence for policy engagement by examining whether the one's age of starting school should be revised depending on how it affects cognitive skills development and how continuous skills development can be enhanced throughout the working life of an adult in Ghana. The study will reveal which subgroups (children who start schooling below 6, exactly 6 and above 6) in Ghana are relatively underserved in the education system and predisposed to low cognitive skill levels and low income.

A large body of studies have revealed that cognitive skills are important in producing economic and social success around the world (Altonji & Pierret, 2001; Lazear, 2003; Hanushek & Woessmann, 2015). While a few studies on the effect of cognitive skills on labour market outcomes especially wages have been done on Ghana (Glewwe, 1996; Blunch & Verner, 1999; Blunch, 2014), this study is very significant in that it expands the scope of this area of research in the country. The study will explore how the internationally standardized levels of cognitive skill and education levels influence one's labour market relevance, which is absent in Ghana. This will also help in situating the theories of signalling and human capital in the Ghanaian context.

Absent in the discourse of policy makers and educationists on the factors that influence labour market outcomes in Ghana has been the issue of soft skills. Even though many countries have started to pay closer attention to these non-cognitive skills and how they affect both social and economic well-being (Borghans *et al*. 2008; Heckman, Stixrud, & Urzúa, 2006; Heineck & Anger, 2010; Lindqvist & Vestman, 2011; Mueller & Plug, 2006), little is known on how they affect labour market outcomes in Ghana. Using data from the World Bank STEP survey of adult in Ghana, this study shows how personality traits influence individuals' labour market outcomes. The study will provide well-defined evidence on the role of non-cognitive skills in determining adults' labour market outcomes, while controlling for the effects of educational attainment, wealth quintile, number of economic shocks before age 15, mother tongue, gender, socioeconomic status and other work-related variables.

Organisation of the Study

The study is organised into seven chapters. Chapter One covers the introduction to the study and includes the background to the study, statement of the problem, purpose of the study, hypotheses to be tested, significance of the study, and organisation of the study. It also outlines the organisation of the study. The second chapter presents review of related literature. This chapter discusses the various theoretical perspectives on cognitive and non-cognitive skills. A survey of empirical literature relevant to the study is also provided.

The third chapter details the methodology used for the study. It presents the research philosophy underpinning the study and describes the research design. The source of data used for the study is also highlighted in the chapter. It also presents the theoretical frameworks and the econometric models used for estimations. The measurements of the variables and descriptive statistics are also provided in the chapter. Chapter Four presents and discusses the empirical results of the effects of starting school on literacy proficiency. The results on the effect of literacy proficiency on labour market outcomes are presented and discussed in the Chapter Five. This is followed by the results of the empirical analysis of the effect of personality traits on labour market outcomes in Chapter Six. Chapter Seven concludes with the summary, conclusions and recommendations. The chapter also outlines the limitations to the study and areas for future studies.

CHAPTER TWO

LITERATURE REVIEW

Introduction

This chapter discusses the review of related literature for the study. It is organised into two sections. The first section looks at the various theoretical perspectives on cognitive development and general human capital development. The second section covers empirical studies on the effect of cognitive and soft skills on labour market outcomes and school starting age and its effect on both cognitive skills development and labour market outcomes.

Review of Theoretical Literature

This section covers three main theoretical perspectives on the link between cognitive and soft skills development and labour market outcome. The theories are human capital theory, signaling theory and the Heckman equation. Two theories will also be reviewed to examine the relationship between age of starting school and cognitive development, namely, Piaget's theory of cognitive development and Marsh's cognitive developmental theory.

Human capital theory

The root of human capital can be traced to the advent of the classical economies in 1776 which developed into a scientific theory (Fitzsimons, 2017). The theory of human capital has been an essential idea in the design of educational policy for many decades. The human capital idea, in its modest form, expects individual differences in human capital to be associated with modifications in productivity in a series of market and non-market activities. Many studies (e.g., Becker, 1964; Heckman, 2000; Mincer, 1974; Schultz, 1961), have focused on associations between human capital and labour market outcomes - earnings.

Human capital concept is multidimensional and it comprises a diversity of facets including the knowledge and abilities which result in earnings. Human capital presumes pliability among different observed and unobserved human capital dimensions. Endowment in human capital via expenditure on education and job training promotes the acquisition of marketable capabilities and skills which can lead to higher productivity among individuals, reflecting in real earnings. Differences in earnings is linked closely to comparable differences in human capital (Bowlus, Liu, & Robinson, 2005).

Some researchers have expensively attempted to elucidate how human capital could contribute to socio-economic development and liberty (Lazerson & Grubb, 2004; Kwon, 2009). Schultz (1961) and Strauss and Thomas (1995) stress that economic prosperity and the performance of a nation depend on the physical and human capital stock of the nation. The theoretical framework underpinning the human capital theory hinges on the notion of education being the heart of human capital formation (Psacharopoulos & Woodhall, 1997; Sakamoto & Powers, 1995). According to Olaniyan and Okemakinde (2008), human capital theory affords analysts foundational rationale for public expenditure on education, both in developing and developed countries. Lucas (1998) and Babatude and Adafabi (2005) viewed human capital as an alternative engine of increased productivity.

The concept of human capital can be categorised by each perspective of academic fields. The first viewpoint is based on the individual. Schultz (1961) recognises human capital as something analogous to property against the concept of labour force in the capital viewpoint, and conceptualised 'the productive capacity of human beings in now larger than all other forms of wealth accumulated'. A number of studies accept that a person's thought of viewing the capacity of human being is knowledge and skills imbedded in the individual (Beach, 2009). Similarly, studies show that the human capital can be closely linked to schooling, knowledge, skills and capabilities (Youndt, Subramaniam, & Snell, 2004; Garavan, Morley, Gunnigle, & Collins, 2001). Rastogi (2002) conceptualises the human capital as capability, knowledge, attitude and behaviour imbedded in the individual. The second perspective on human capital and the growth process emphases knowledge and skills gained throughout the education process such as compulsory basic education and vocational education (Booth & Bryan, 2005). The economic benefits of education credentials are found to increase and peak around the middle of an individual's working life (Carnevale, Rose, & Cheah 2013). This perspective neglects the view that human beings would acquire knowledge and skills (both technical and soft) throughout the person's experience.

The third perspective is associated with the production-oriented viewpoint of capital. Romer (1990) denotes human capital as 'a fundamental source of economic productivity'. Bernanke and Frank (2009) opines that human capital is 'an combination of elements such as education, experience, training, intelligence, energy, work habit, trustworthiness, and initiative that affect the value of workers' marginal product'. Accordingly, human capital concurrently includes both of the instrumental concept to produce certain value and the 'endogenous' meaning to self-generate it. Human capital has the following features: accumulated slowing, an investment, yields economic return and that can depreciate in value due to knowledge or technical progress.

Becker (1964) reports that the neo-classical tradition, focusing on the educational aspects of employment, is the human capital model. The human capital model assumes that the labour units is a heterogenous labour units forming. He posits that individuals are different in terms of the kind and levels of skills capabilities they enjoy. Their main impact is delivering reasonable clarification for the disparity in skills and its associated wage gaps. According to this model, skills gap is directly connected to the difference in levels of education achieved by the individuals. They argue that the education levels reached directly correspond to the amounts spent on educating that individual. Human capitalists are clear in their justification regarding the skill-inculcating function of schooling (Mincer, 1974). Schultz (1961) argues that education improves cognitive skills which increase the efficiency and thereby the output of individuals, that is, well educated individuals contributes more to the national income.

Despite the positive correlation between education and wages, human capital theorists believe that there is more to the accumulation of human capital other than education. These characteristics include but not limited to quality of schooling, good health, training, ability to obey instructions, attitudes towards work and so on. Education performs a vital role in the productivity of workers, that is, workers who are more educated have a high productivity level than those who are not. People who have acquired higher education stand the chance of being employed at the expense of those without any education. The higher educated labour force has a competitive advantage than the others. In terms of transition, it is expected that individuals who are educated and thus have a competitive advantage over the non-educated turn to occupy higher positions in their respective line of work, whether private or public (Schultz, 1971).

In effect, Schultz (1971) argues that any form of education and training has a potential positive effect on the cognitive abilities of an individual, thus making him or her appreciate things better than one who is uneducated. Heckman and Mosso (2014) highlight that some non-cognitive skills interact with cognitive skills dynamically to shape the capabilities in subsequent competencies acquisition. Investments in non-cognitive skills development at earlier stages increase the stock of cognitive skills and other advanced competencies, which then increase the return, in later adulthood of future investments. One of the key concepts of the theory of human capital is the attainment of more knowledge and skills. It raises the value of a individual's human capital which in turn increases their productivity, employability and income potential. The theory further portrays the flexibility of labour in the labour market. For instance, if one has accumulated enough knowledge and skills in a number of disciplines, the model explains that when one sector of the economy suffers shocks resulting in a collapse of industries in that sector, they can apply for other jobs due to the skills they have accumulated. Considering that experiences can be included as a category of knowledge; the human capital is, therefore, synonymous of knowledge embodied in an individual.

In today's labour markets, many jobs require individuals develop greater capabilities and advanced knowledge and skills (Cappelli, 2015). Payne and Kyllonen (2012) argue that individuals must possess cognitive skills, and non-cognitive skills to meet the needs of an information saturated and innovation-driven marketplace. They assert that such cognitive and soft skills are useful and transferable lifelong learning skills since they enable individuals to quickly acquire and apply new knowledge for self-development and to allow workers to accommodate to changing labour markets. Each of these components of human capital has significant impact on wages (OECD, 2013). Individuals with higher education background enjoy a wage premium because of the signalling role of educational credentials in presumed productivity from underlying knowledge and competencies (Mora & Muro, 2014).

Heckman and Kautz (2012) suggest that non-cognitive skills—personality traits, motivations, goals and preferences enable individuals to acquire advanced competencies. These multiple character skills can predict success in life, such as academic achievement and labour market outcomes. Heckman and Kautz (2013) assert that high-quality education can enhance non-cognitive skills, which have enduring predictive power in labour market success. They argue that non-cognitive skills matter as the foundation for cognitive skills development and one's interaction with cognitive skills in a positive way throughout the life cycle. By influencing the subsequent capabilities in knowledge and skills acquisition, non-cognitive skills predict job performance and wage premium.

Other studies support the claim that both cognitive and non-cognitive skills are important for a country's economic growth (Tomer, 2012). Higher cognitive skills are found to be associated with greater labour market success, including employability, current earnings, and lifetime earnings (Heckman, Stixrud & Urzua, 2006). Some studies such as Hanushek and Pace (1995) suggest that education goes hand-in-hand with cognitive skills proficiency.

Heckman and Mosso (2014) highlight that some soft skills interact with cognitive skills dynamically to shape the capabilities in subsequent competencies acquisition. Investments in soft skills development at earlier stages increase the stock of cognitive skills and other advanced competencies, which then increase the return in later adulthood of future investments. Aedo, Hentschel, Luque and Moreno (2013) find a significant positive association between economic development and the skill intensity of both cognitive and soft skills.

Signalling Theory and Hypothesis

The role of education in enhancing productivity through the attainment of knowledge and skills and possibly economic returns influences one's decision to continue to pursue education to the tertiary level. It encompasses an informal analysis on the part of the individual in educational pursuit of the costs of education and the estimated benefit of its returns. If the benefit exceeds the cost, one will pursue higher education; the opposite is also true. The signalling theory proffers the argument which opines that education only reflects inherent human capital. According to Kjelland (2008), this imbedded human capital is what improves efficiency which eventually leads to higher wages.

The signalling theory focuses on the effect of education on labour market rather than the effect on students. According to this theory, people have various levels of inborn capability but no easy way to present it to potential employers. The signalling model assumes that employers are uncertain about the productivity of employees and they use certain indicators such as educational level and personality traits to inform decisions on wages (Zhou, 2019). If an employee remains in a firm over some period of time, his/her productivity can be directly evaluated by the employer, and the signalling effect decreases. Under these conditions, the wage reflects the worker's actual skills and knowledge more accurately. The theory continues that education may not really improve students' productive ability but rather serve as an effective method for workers to inform potential employers of their skills. Consequently, individuals with higher-order abilities use schooling to gain the education signals that afford them the opportunities to move into high-status and high-wage positions. Rather than instilling skills, education signals simply serve as a useful market function. Taking this perspective to the extreme, some insist that public funding for education should be limited. They opine that beyond a basic education, investment in education may deliver only individual, but not social benefit.

According to Arrow (1973) and Spence (1973), education is a sorting process where more talented and productive individuals are recognised. Accordingly, they do not assent to the view that education leads to skill development. To them, talents and skills are inherent in individuals and those who are more talented get higher levels of education, at the same or even at less cost, than those who are less talented. Hence, what employers are captivated by and what they observe in the labour market are people with more potential abilities and skills. The certificated individuals only serve as a proxy or signal for their potential abilities and skills (Sweetland, 1996). In the absence of such a signalling or screening device like education, there can be a possibility of misallocation of the talented; thereby making a distortion in the labour market.

The signalling model is grounded on the idea that people are rational humans and will invest in their education as when the benefit of an extra year of schooling exceeds the cost. The rewards for an extra year of schooling are fundamentally the same for low and high productivity workers. Also, the signalling model depends on the hypothesis that worker efficiency and the cost of securing a signal are inversely related. Kroch and Sjoblom (1994) argued that if education acts as a signal, then within a group, the signal can be related to an peoples position in the distribution of education. To buttress their point, they use models which include absolute and relative education and explored that while no one's level of education is associated with wages positively, one's rank in the education distribution is strictly significant. This is evidence that the value of schooling is not primarily due to signalling.

Brown and Sessions (1999) found that individuals in the private sector compared the self-employed tend to have higher levels of education with its resultant higher returns, which the argue supports the signalling ideology. Opponents of the signalling theory offer a contrary opinion and allure to problem of selection bias, which is accounted for by Brown and Sessions (Chevalier, 2004). The signalling ability of education is also seen in the inability of individuals to foreknow the future and hence seek education in anticipation to signal to prospective future employers.

To further elaborate, Hungerford and Solon (1987) argues that even when years of school are not controlled for, certificates of completion have economic returns independent of years of education. This finding gives credence to the predictive power of the signalling theory. Thus, going through school without a certificate to show reveals a lack of ability to do leading to lower returns. To put differently, individuals who dropped out of school before receiving a qualification might be those individuals who overestimated their returns to schooling and quit when they discovered their mistake.

Heckman equation

Proposed by James Heckman, the Heckman Equation suggests that non-cognitive skills captured by personality traits, goals, motivations and preferences enable a person to acquire new competencies and improve old ones throughout life. This builds on the human capital investment model that treats a person as a passive receiver of investment made in knowledge and cognitive skills in a single period (Heckman & Kautz, 2012). Heckman argues that non-cognitive skills of their various forms are dynamic in nature. Hence, skill produces skill and motivation produces motivation. The strength of the proposition is that early development of effective life and social skills greatly impacts the successful development of intelligence and eventually, personal and social productivity.

Heckman proposes that the most cost-effective period to develop both cognitive and soft skills is in the very early years when developmental education is most effective. He further stresses the vital role families play in helping children acquire critical skills at an early age. Families from disadvantaged backgrounds are least likely to have the economic and social resources to afford the early developmental incentive every child requires as a basic opportunity for future success in school, college, career and life (Heckman & Masterov 2007).

Heckman's equation therefore states, investing in early childhood development builds the human capital that is needed for economic achievement.

Invest + Develop + Sustain = Gain

where *invest* represents the investment needed to be made in the lives of underprivileged family by way of education and development resources to provide equivalent access to successful early human development. *Develop* connotes the effort required to cultivate the cognitive skills, non-cognitive skills and physical well-being in children early from birth to age five when it matters most. The incorporation of *sustain* calls for the maintenance and continual early development of the child with effective education through to adulthood. These efforts will lead to *gaining* of a more proficient, productive and valuable workforce that will contribute to the lives of the unborn generation.

As espoused by Heckman, Stixurd and Urzua (2006) and Cunha, Heckman, Lochner and Masterov (2006), the non-cognitive skills can estimate success in later life, such as educational achievement and labour market outcomes. In addition, numerous other economic and social ills of societies such as crime, of high school dropping out, teenage pregnancy and adverse health conditions are associated with low levels of both cognitive and non-cognitive skills. To solve this, they argue that deterrence through early childhood development is more life and cost-efficient than remediation. Heckman and Kautz (2013) assert that high-quality education can augment non-cognitive skills, which have lasting predictive power in labour market achievement. They contend that non-cognitive skills matter as the basis for cognitive skills development and interact with cognitive skills in a positive way throughout one's life cycle. Through their influence on subsequent proficiencies in knowledge and skills acquisition, non-cognitive skills can predict job performance and workers earnings.

Theories of Cognitive Development

Piaget's theory of cognitive development

Piaget (1970) explained that the brain and mental functioning of the child as it grows across a number of generally accepted stages. His theory articulates the knowledge acquisition process of children and the nature of intelligence. Piaget identified four stages of mental development which include sensorimotor stage, preoperational stage, concrete operational stage and formal operational stage. Sensorimotor stage starts from birth to roughly age two. This stage mainly deals with the ability of children to move sense things around them. An important characteristic of this stage is object permanence that things around them continues to exist even if they cannot see them. Children are able to assimilate the world around them through sucking, grasping, looking and listening.

The next stage is the preoperational stage which transpires from age two to seven years. During this stage children begin to think symbolically and learn the use of words and images to characterise objects. Despite the fact that they are able to establish these relationships, they cannot articulate information because they do not comprehend the logical representations themselves. Also, this stage is marked with irreversible thinking where children only think in one direction. It is a stage the child learns to play through pre-tense. Next is the concrete operational stage which is from about seven to eleven years. This is a key turning point in a child's cognitive development. This means that a child can now do a lot of things on his or her own. Children begin to become more skilled at using logic and are able to group things based on a number of different features rather than a single attribute.

The final stage starts from approximately twelve years and beyond. Piaget argues that during this stage, children begin to think in a more abstract manner, that is, to cultivate and manipulate symbols to generalise familiar situations. The capacity to use additional higher order of deductive thinking, inductive thinking and hypothetical thinking is developed at this stage. Learning these forms of formal operational thinking can be augmented through the use of thinking skill lessons (Johnson, 2014).

Marsh's cognitive developmental theory

Marsh's cognitive developmental theory suggests that cognitive development of children is age related. Like the Piaget's theory of cognitive development, he suggests that children make advancement through four stages of reading progression (Marsh, Friedman, Welch & Desberg 1981). Marsh argues that transition from one stage to the other is mostly dependent on intellectual development stage of the child as put forward also by Piaget (1985).

Marsh's first stage of cognitive development involves linguistic predictions centered on context and the second stage involves guessing based on visual and semantic hints. During the third stage, children learn to concentrate on a word's sounds, and begin to decode new words based on letter-sound correspondences. Entry into the third stage normally transpires at about age seven which corresponds to Piaget's stage of concrete operations. Finally, the stage of hierarchical decoding comes last. During this stage, children learn to use higher order rules and analogies to interpret new words. This stage starts at about age eleven, a phase which requires the child to have entered the formal operation stage as in Piaget's cognitive development theory.

The concept of cognitive skills

Cognitive ability is defined as a "mental capability that involves the ability to reason, plan, solve problems, think abstractly, comprehend complex ideas, learn quickly and learn from experience" (Gottfredson, 1997, p.13). Neisser *et al*. (1996) also define cognitive skills as the ability to comprehend complicated ideas, to adapt successfully to the environment, to learn from experience, to engage in various forms of reasoning, to overcome obstacles by taking thought. Therefore, cognitive skills generally involve intelligence or mental abilities. It can be grouped into two levels: (1) basic cognitive skills (lower-order) which are foundational skills or basic academic knowledge such as reading and numeracy proficiency, and (2) advanced cognitive skills (higher-order) which also comprise more complicated thinking such as critical thinking or problem solving (Neisser *et al*. 1996; Cattell 1987). The Secretary's Commission on Achieving Necessary Skills (SCANS) in US, reports recognize that skills like literacy proficiency, ability to script, numeracy, problem solving are the foundational cognitive skills that every school system should seek to produce in their students.

The concept of literacy proficiency

Education for All (EFA) 2000 assessment defined literacy proficiency as the ability to read and write with understanding a simple statement related to one's everyday living. It encompasses a range of skill by way of reading and writing, and often embraces basic numeracy. This definition was further reinforced by UNESCO in 2003 as: "the ability to identify, understand, interpret, create, communicate and compute, using printed and written materials associated with varying contexts. Literacy involves a continuum of learning in enabling individuals to achieve their goals, to develop their knowledge and potential, and to participate fully in their community and wider society" (UNESCO, 2004). More recently, the Programme for the International Assessment of Adult Competencies (PIAAC) also defined literacy as: "the understanding, evaluating, and engaging with written texts to participate in society, to achieve one's goals, and to develop one's knowledge and potential" (OECD, 2012). From the various definitions, it can be ascertained that literacy for all and more importantly for the adult population is an essential life skill needed for them to contribute more fully in the practices of their societies especially in the labour market. Chiswick *et al.* (2003) suggest that going beyond the educational attainment and looking at literacy will help in explaining why some groups are less prone to succeed in the labour market.

Sum (1999) reveals that the national panel of experts committee endorsed and accepted the idea that literacy proficiency is neither a single skill but that literacy proficiency is associated with a specified kind of text or material. With this evaluation, the committee concurs to adopt the definition of literacy that includes prose, document, and quantitative literacy. They, therefore, define literacy to mean the ability of one to use printed and written information to function in society, to achieve a goal, and to develop knowledge and potential.

Sum (1999) argues that prose literacy involves the knowledge and skills for understanding and using data from texts that include all printed literally works. Document literacy involves the dexterities and comprehension needed to discover and use the evidence enclosed in materials that include job applications forms, tables, weather forecast, maps, and graphs. Quantitative literacy involves the knowledge and skills needed to apply arithmetic operations, either alone or chronologically, using figures imbedded in published materials including checking one's balance in an account, finalising an order form, and determining the amount of interest from a loan advert.

According to Brandon, Purdy and Learns (2013), several meanings of literacy are framed by diverse and seemingly opposing theoretical frameworks, but all of these opine that literacy is about reading and writing – sometimes numeracy is also added alongside. They articulate that literacy should allow people to read the world rather than just the word" using the different kinds of communication beyond reading and writing, which present additional prospects in society. Literacy should help individuals to understand the world better (Caspe, 2003).

Chang (2012) states that over the past 20 years, literacy has become a major policy question. He assigns four major explanations for that; first, the swift development of new telecommunications technologies and practices, second, the power of free market economics and ideas of the 'knowledge economy', third, the policy agenda surrounding social inclusion and equality of opportunity, and fourth, economic deregulation especially in the multi-media industries. He imitates that these four points offer the political impetus for literacy to become a policy priority and have also been the main drivers of policy thinking about skills development and education.

Campbell, Kirsch and Kolstad (1992) argue policymakers and professionals have increasingly emphasised the need to deepen the literacy proficiency skills of the existing and potential workforce. They further argue that most of the existing information are founded on works of individuals still in school and of young adults where literacy skills may have a reduced impact on labour market success than for more veteran workers who have had access to a wider range of jobs.

However, to Campbell (2007), literacy can be social practice which is deals with writing, reading, numeracy, and other forms of communication in the contexts of social relationships. Literacy in this context are the activities that people do related to and informed by all the other activities in their lives (Barton, 2009). Social practice literacy is contextual and power related (Hamilton, 2001). Guadalupe and Cardoso (2011) argue that literacy, viewed this way, is always social, and is not only economic. Literacy involves multiple skills that are embedded in the social purposes for which it is used (Tett & Maclachlan, 2007).

In order to help policy makers improve their educational policies and programmes, the various international large-scale assessments like the World Bank's STEP, the OECD's Programme for the International Assessment of Adult Competencies (PIAAC), the International Adult Literacy Survey (IALS), the Programme for International Student Assessment (PISA) and the German Level-One Survey (LEO) among others, are to categorize literacy and other skills into proficiency level (Grotlüschen & Riekmann 2012; OECD, 2013; World Bank 2014). These levels are from below level 1 (0-1765, level 1 (176-225), level 2 (226-275), level 3 (276-325), level 4 (326-375) and level 5 (376-500).

Literacy below level 1 is associated with tasks that entail the reading of short texts on accustomed subjects to the identification of single pieces of specific items. Knowledge and skill in appraising the meaning of sentences, and reading of paragraph text is demanded at level 1. Proficiency level 2 requires test takers to make matches between the text and information, and could also involve low-level deductions with some opposing pieces of information. Level 3 usually involves lengthy, and expect respondents to recognize, decode or appraise one or more pieces of information. At level 4, complex inferences and application of background knowledge is demanded with many tasks asking respondents to identify and understand one or more specific relationships. The final level involves the application and assessment of logical and abstract models of ideas (OECD, 2013; World Bank, 2014).

Interestingly around the globe, there are clear differences in literacy levels such as between gender and between developing and developed economies. Available statistics show that between 2004–2011, only about 6 percent of adults with no education in 29 poorer countries had ever participated in a literacy programme. As shown in Table 1, between 2005–2014, about 758 million adults, with about 114 million of this number aged 15 to 24 in the youth category were unable to read or write a simple sentence. Nearly two thirds of this number were women. During the same period, the global adult literacy rate was 85 percent. This translates into a gender parity of 91 literate women for every 100 literate men – and as few as 76 literate women for every 100 literate men in sub-Saharan African countries. The global youth literacy rate was 91percent. The youth literacy rate was as low as 71percent in sub-Saharan Africa. While the Caucasus and Central Asia regions have achieved universal youth and adult literacy with perfect gender parity, the Eastern and South-Eastern Asia regions are near universal literacy rate with regard to both youth and adult literacy (UNESCO, 2016).

Table 1: Youth and adult literacy

	Youth literacy rate%	Gender parity index	Illiterate youth (000)	Adult literacy rate%	Gender parity index	Illiterate adults (000)
	2005-2014	2005-2014	2005-2014	2005-2014	2005-2014	2005-2014
World	91	0.96	114,127	85	0.91	757,920
Low income	68	0.85	35,078	57	0.74	134,811
Lower middle income	86	0.93	72,405	74	0.83	493,776
Upper middle income	99	1.00	5,854	94	0.95	114,350
Caucasus and Central Asia	100	1.00	15	100	1.00	120
Eastern and south-eastern Asia	99	1.00	3,217	95	0.96	84,135
Latin America and the Caribbean	98	1.00	2,266	93	0.99	33,373
Northern Africa and Western Asia	93	0.96	6,073	82	0.86	52,878
Southern Asia	84	0.91	52,848	68	0.76	389,408
Sub-Saharan Africa	71	0.86	48,765	60	0.76	188,315

Source: UIS database

Worldwide, there still remains gender gap in youth literacy rates, even though this gap is dwindling over time. According to UIS (2016), there was 8.6 percentage point difference between male and female youth literacy rates during 1985-1994. This figure shrunk to 2.9 percent during 2005-2016 period such that there were 92.8 percent of males compared to 89.9 percent of females who were literate by 2010. In connection with the 20 lowest female youth literacy rates countries, 19 were found in sub-Saharan Africa except for Pakistan. In Burkina Faso and Mali, only one-third of female youth are literate. The gender gap for adult literacy rates shrunk from 29 percent to 7.2 percent during 2005-2016, leaving 89.8 percent of males compared to 82.6 percent females being literate.

The concept of soft skill

Individuals who obtain the identical training and education are likely to exhibit difference in their approach to issues due to dissimilar experiences (Bonnstetter, 2012). Different studies give it a different name – non-cognitive skills, socioemotional skills and personality traits. Other studies generally term it as "soft skills" or "character traits". According to Lippman, Ryberg, Carney and Moore (2015), soft skills refer to a broad set of skills, competencies, behaviours, attitudes, and personal qualities that enable people to effectively navigate their environment, interact well with others, perform well, and achieve their goals. These skills are broadly applicable and related to other skills such as technical, vocational, and academic skills. Guerra, Modecki and Cunningham (2014) define soft skills as the unique set of skills that assist individuals to navigate interpersonal and social situations effectively. These skills incorporate behaviours and attitudes that are coherent patterns of thoughts, feeling, and conduct such as discipline, commitment, or the ability to work in a team and personality traits such as self-confidence, perseverance, and emotional stability that are broad facets which are relatively stable over time.

Non-cognitive skills, soft competences, personal\skills and people skills are all used to represent soft skills although in real terms these are not synonymous (Balcar, 2014). This unique ability can thus be described as "intangible skills" which are difficult to measure and are intertwined with personal attitudes of individuals (Balcar, Homolová, & Karásek, 2011). According to Subramanian (2017), soft skills involve those individual attributes that reveal a person's high level of emotional intelligence which are relevant to various occupations and industries. Soft skills are relevant indicators of the employability of an individual, returns to earnings, labour turnover rate and a large extent of successful business and productivity indictors of an organisation. Traits such as positive demeanors, buoyancy, common sense, empathy, and ability to collaborate are all essential soft skills that workers must have or develop (Subramanian, 2017). These skills comprise the behaviours and attitudes that are stable patterns of thoughts, feeling, and conduct such as commitment, discipline, or the ability to work in a team and personality traits that are broad features fairly constant over time (Almlund *et al.* 2011; Borghans *et al.* 2008).

The Big Five Personality Traits

Allport and Odbert (1936) hypothesise that the differences that exist among humans are the most significant and striking features of people's lives which will ultimately be translated into their language. Allport and Odbert surveyed the English language dictionaries at their disposal and came up with 18,000 personality-describing words. They then isolated 4500 personality-describing words which they considered to describe observable and relatively permanent traits.

Cattell (1946) analysed Allport-Odbert list of 1936 in the hope of establishing a common taxomony. He enmeshes the list into 181 clusters and asks subjects to rate people whom they were acquainted with the adjectives on his list. Cattell generates 16 factors on premises that individuals describe themselves and others according to those 16 different independent factors. Based on those factors, Cattell went on to construct 16 Personal Factors (PF) questionnaires. His work was replicated by Norman (1963) who concluded that five of the 16 factors were enough to describe personality traits. Around the 1980s, three developments brought personality research into the modern era: personal computers, statistical aggregation, and the Big Five. The Honolulu symposium in 1981 held by Goldberg, Takamoto-Chock, Comrey, and Digman reviewed the personality tests and concluded that most of the tests has promises of five factors just as in the work of Norman (1963). This led to the birth of the big five personality traits. The Big Five Traits include Openness to Experience, Conscientiousness, Extraversion, Agreeableness and Neuroticism or Emotional Stability popularly known as OCEAN (Table 2).

Broadly, the big five personality traits can be classified into two higher order personality traits namely alpha and beta. Alpha impacts neuroticism or emotional stability, agreeableness and conscientiousness whereas beta incorporates openness to experience and extroversion (Digman, 1997). The alpha portion of the big five trait is more aligned to social development while beta is related to personal growth and development. This model is referred to as the alpha-beta (AB) model.

Openness to Experience

Openness to Experience determines how receptive one is to new ideas and experiences. According to John and Srivastava (1999), openness to experience can be described as the depth and complexities of an individual's mental life and capability. Those who are considered "open to experience" can largely be described as intelligent and creatively inquisitive with a keen sense of beauty. Those who are open to experience perform creditable in creative functions, and can be found in the upper stratums of academia and design teams. However, they tend to avoid views that require strict adherence to a set of rules and standards. The trait reflects individual's readiness to try new things, ability to think independent and have a wide array of interest. Openness to experience has been found to affect educational attainment and predict school attendance (Almlund *et al.*, 2011; Heckman, Stixrud, & Urzúa 2006). Mueller and Plug (2006) also found that men who exhibit this trait tend to earned more in wages than others.

Table 2: The Big Five Domains and Their Facets

Big Five Personality Factor	American Psychology Association Dictionary Description	Facets (And correlated Trait Adjective)	Related Traits	Analogous Childhood Temperament
Openness to Experience	"The tendency to be open to new aesthetic, cultural, or intellectual experiences"	Fantasy (imaginative), Aesthetic (artistic), Feelings (excitable), Actions (wide interests), Ideas (unconventional)		Sensory sensitivity, Pleasure in low-intensity activities, and Curiosity
Conscientiousness	"The tendency to be organized, responsible, and hardworking."	Competence (efficient), Order (organized), Dutifulness (not careless), Achievement striving (ambitious), Self-discipline (not lazy), and Deliberation (not impulsive)	Grit, Perseverance, Delay of gratification, Impulse control, Achievement striving, Ambition, and Work ethic	Attention/(lack of) distractibility, Effortful control, Impulse control/delay of gratification, Persistence, and Activity
Extraversion	"An orientation of one's interest and energies toward the outer world of people and things rather than the inner world of subjective experience; characterized by positive affect of sociability"	Warmth (friendly), Gregariousness(sociable), Assertiveness(self-confident), Activity(energetic), Excitement seeking (adventurous), and Positive emotions (enthusiastic)		Surgence, Social dominance, Social vitality, Sensation seeking, Shyness, Activity, Positive emotionality, and Sociability/affiliation
Agreeableness	"The tendency to act in a cooperative, unselfish manner"	Trust (forgiving), Straight forwardness (not demanding), Altruism (warm), Compliance (not stubborn), Modesty (not show- off), and Tender-mindness (sympathetic)	Empathy, Perspective taking, Cooperation, and Competitiveness	Irritability, Aggressiveness, Wilfulness

Table 2: Continued

Neuroticism/Emotional Stability	Emotional stability is "predictability and consistency in emotional reactions, with absence of rapid mood changes". Neuroticism is "a chronic level of emotional instability and proneness to psychological distress"	Anxiety (worrying), Hostility (irritable), Depression (not contended), Self-consciousness (shy), Impressions (moody), Vulnerability to stress (not self-confident)	Internal vs. External, Locus of control, Core self-efficacy, optimism, and Axis I Psychopathologies (mental disorders) Including depression and anxiety disorders	Fearfulness/behavioural inhibition, Shyness, Irritability, Frustration, (Lack of) soothability, Sadness

Source: Adapted from John and Srivastava (1999).

Conscientiousness

Conscientiousness is a trait that describes the tendency to exhibit mastery over one's impulses and act in generally acceptable ways and behaviours that expedite goals (John & Srivastava, 1999). Conscientious people do better exercising delay gratification, abide by rules, and excel at planning and organizing efficiently. Conscientiousness enable people who rank highly in it to have better control over their emotions. Individuals high in conscientiousness are prone to be succeed in school and in their chosen careers, become better at leadership positions, and pursue their goals with tenacity and insight (Lebowitz, 2016). Of the big five traits, conscientiousness is widely found to be associated with improved job performance and cognitive skill (Schmidt & Hunter, 2004). Borghans *et al.* (2008) argue that conscientiousness is highly linked to increased earnings and improved productivity especially among women.

Extraversion

Extraversion is connected with excitability, sociability, talkativeness, assertiveness, and high amounts of emotional expressiveness. People who are high in extraversion are exiting and are inclined to likely to gain energy in social circumstances. Their energies are derived from being around other people. Individuals high in extraversion tend to seek occasions to be in social interaction and are often the center of attraction at social events. They are gregarious, comfortable around others and are disposed to action (Lebowitz, 2016). Boudreau *et al.* (2001) found that extraversion is a positive predictor of career success among leaders. Fletcher (2016) found that in the US, extraversion has a large and robust link with earnings but Heineck and Anger (2010) observed a negative association between the trait and women's earnings in Germany. Anger (2013) argued that extraversion positively influences graduation rate among disadvantaged women.

Agreeableness

Agreeableness as a personality trait describes how people get along with others, and one's orientation to others. As a construct, agreeableness depends on how an individual normally cooperates with others. People high in agreeableness are incline to be admired, esteemed, and thoughtful to the needs of others. They are mostly affectionate toward their loved ones and friends, and are considerate of the predicaments of outsiders. They likely have fewer enemies (Lebowitz, 2016). Agreeable individuals recognise the importance of building bridges and as such give thought to the goals and emotions of others, viewing them as vital, often times even above their own interests. Disagreeable individuals usually do not concern themselves with the welfare of others, but instead focus on enhancing their own goals and agenda. They are mostly unfriendly and uncooperative, and self-centered. According to Dohmen, Falk, Huffman *et al.* (2010), agreeableness was found to be related to risk aversion. Agreeableness among women have been found to negatively influence earnings by Díaz, Arias, and Tudela (2012) and Heineck and Anger (2010) and a negative effect on labour force participation by Wichert and Pohlmeier (2010).

Neuroticism/Emotional Stability

Neuroticism is a personality trait characterised by moodiness, sadness, and emotional instability (John & Srivastava 1999; Heckman, Stixrud, & Urzúa 2006). Individuals who exhibit this trait lean toward experiencing mood swings, nervousness, irritability and sadness. It is the opposite of emotional stability.

People who are emotionally stable tend to be enthusiastic and likely to respond to stimuli with excessive reaction. This has the tendency to progressively corrode an individual's capacity to think logically, make complicated decisions with levity, and efficiently handle with stress. Others see these individuals as negative and always being in bad moods. Besides, individuals who have low levels of neuroticism tend to be more emotionally steady, less disposed to flare-up, and are usually considered calmer people. Low-neuroticism is associated with ability to deal with emotional setbacks. Almlund *et al*. (2011) found that being emotional stability is highly associated with years of schooling and has a positive predictive power with school completion. On the other hand, neuroticism has been found to affect school dropout and other vices (Heckman, Stixrud, & Urzúa 2006). In addition, Díaz, Arias, and Tudela (2012) and Mueller and Plug (2006) found that men are more likely to earn higher wages when they are emotionally stable.

Empirical Literature on Cognitive Skills and Labour Market Outcomes

The empirical literature focuses on the factors that influence cognitive skills development, how one's age of starting school specifically influences literacy proficiency and cognitive skills in general and how cognitive skills affect labour market outcomes. Literature on the effect of soft skills on labour market outcomes with emphasis on personality traits is also reviewed.

Determinants of cognitive skills

Among children and even adults, many factors and reasons have been assigned for the development of cognitive skills. Among these factors are biological, socioeconomic, environmental, education and even learning opportunities available to individuals as well as health status have been hypothesised as the most important of all determinants impacting cognitive skills development (Aber *et al*., 1997; Behrman *et al.*, 2014; Bordone & Weber, 2012; Desjardins 2003; Duc 2009; Kaila Sahn & Sunder, 2018; Lipnicki 2019; Rico 2018; Santos *et al*., 2008a; Santos *et al*., 2008b; Vaportzis & Gow, 2018; Zhu, Zhao, Chen & Wang, 2018; Ranjitkar *et al*., 2019).

Education and related literacy programmes are recognized by many researchers as key determinants of cognitive skills development around the globe. Desjardins (2003) after accounting for home characteristics and literacy activities at work among others, found that education relics the topmost spot as the most essential determinant of literacy proficiency. The study explains that in most countries, the total effect of education is significantly mediated through further learning occurring at work, home and in the community. He concluded that job and other literacy-related factors complement education in determining literacy proficiency.

This observation is supported by Zhu, Zhao, Chen and Wang (2018) who found that lower education is associated with poor cognitive function among adults. In addition, Behrman *et al.* (2014) argue that school attainment has a positive and significant effect on the verbal cognitive capabilities of adults more than non-verbal cognitive skills. Santos *et al.* (2008b) confirm the importance of education by adding the need for educational materials to complement the tuition received at school for children and literacy programmes for adults. Duc (2009) and Santos *et al.* (2008a) also identified parental education especially maternal education as having significantly and positively effects on a child’s cognitive development. Glick and Sahn (2009) add by showing that better educated parents contribute significantly to the academic performance of their wards. This view is re-echoed by Kaila Sahn and Sunder (2018) who corroborate the fact that parental education is key to both current and future cognitive skills. In the study on determinants of cognitive development in Nepal, Ranjitkar *et al*. (2019) found that biological and environmental factors are significant and positive in early life cognitive development and learning opportunities. Height for age was found to be positively correlated with cognitive skills, while low birth weight was associated to lower performance. Children who had ever had diarrhoea and hospital stay histories were more likely to performance poorly in the cognitive assessment.

Health status measured by the child's height, whether the person is suffering from a chronic ailment or risky behaviours among others have been found to affect cognitive capacity. Vaportzis and Gow (2018) in assessing how beliefs and expectations affect cognitive skills with changes in age, found that when individuals have a meaningful life, eat healthy meals, sleep well and have enough physical activity, it was perceived to positively improve the cognitive skills. Kaila Sahn and Sunder (2018) worked on Senegal and Madagascar found that proxying health status by height, shorter individuals prove to have a stronger association between later life outcomes and cognitive skills measured by second grade performance. Lipnicki *et al.* (2019) articulate that risky health behavior and chronic diseases have the tendency to deteriorate cognitive capabilities of individuals. The study of Zhu, Zhao, Chen and Wang (2018) also support the view that health related and dietary habits are associated with cognitive performance like concentration and learning among adults.

Santos *et al*. (2008a) in their study on the determinants of early cognitive development in Brazil, confirmed the significant role of other socioeconomic characteristics on cognitive development. They found that family income and parental occupation have an effect on the child's cognitive development. Bradley, Corwyn, and Whiteside-Mansell (1996) and Santos *et al*. (2008b) all support the assertion that unfavourable socioeconomic status including poor home sanitary conditions and absentee fathers negatively affect cognitive development of children. This sometimes is mediated through poor environmental conditions and poor schooling.

In the study on determinants of cognitive development in Nepal, Ranjitkar *et al*. (2019) found that biological and environmental factors were significant and positive in early life cognitive development and learning opportunities. Height for age was found to be positively correlated with cognitive skills, while low birth weight was associated lower performance. Children who had ever had diarrhoea and hospital stay histories were more likely to performance poorly in the cognitive assessment.

Treiman (2007) in his study of growth and determinants of literacy in China reports that literacy proficiency depends mainly on the level of education one attains. However, the study observed that issues such as the quality of schooling, parental education, the number of books available to a household and the reading culture of parents as well as gender; and the extent of literacy usage over the life course of individuals are all associated with improved proficiency. Shomos (2010) in assessing the links between literacy and numeracy skills and labour market outcomes reported some of the determinants of cognitive skills.

He included country of birth, age, gender, and educational attainment as determinants of literacy proficiency.

On the macro level, the outcomes of cognitive skills are believed to be widespread, involving probable benefits such as health, personal and intellectual effects, as well as economic successes. For instance, Pehrsson (2012) argues that economic development, health status, quality of education and institutional variables explain literacy proficiency. The result from his study showed that literacy proficiency at the national level is strongly affected by primary school enrolment rates, government's expenditure on education and fertility rates.

Buchmann and Hannum (2001) submit that concerning education and cognitive skills development, the central role of the government should be acknowledged. To the authors, the state may determine the educational structure and opportunities through its educational policies. The state can also increase the demand for education by improving school quality, enacting laws on free and compulsory schooling or education the citizenry on the benefits of education. Strong authoritarian states like apartheid South Africa before democratic rule dramatically changed the educational opportunities through policies, to block the social mobility of the black majority and this determines the low literacy or cognitive skills in those areas.

Michalak (2014) studied the environmental factors that determine literacy learning and instruction in US. The results of the synthesis revealed that among other factors that influence literacy learning positively are access to reading material in the classroom and functional public libraries. In addition, application of technology in the classroom, the physical layout of the classroom, student behaviour and school atmosphere all affect literacy level. The study further showed that additional invisible factors positively contribute to literacy learning and these include school safety environment, classroom diversity, a supportive learning environment, and student motivation. Williamson (2000) acknowledged the role of informal institutions such as customs, norms, religion, languages plays in developing cognitive skills. He concluded that these informal institutions at the social strata determine cognitive skills though very slowly. He also noted the role of institutional environment such as the constitutions, laws, property rights and bureaucratic regime of a country as important determinants of literacy proficiency.

Lavy, Spratt, and Leboucher (1995) analysed the determinants of literacy in Morocco. Their study found that illiteracy is more prevalent among females than among males, higher in rural areas than in urban areas, and inversely correlated with age. According to their study, this inverse relationship between age and literacy reflects both deteriorating literacy skills over time and improvements in the quality of education. Also, Lavy *et al.* (1995) recognized that parents' literacy and household expenditure level positively affect children's level of literacy, suggesting that poverty and family background are important determinants of literacy.

Drawing on evidence from Ghana, Glewwe and Jacoby (1992) studied the determinants of student achievement in middle schools. Accounting for school characteristics and the sporadic nature of school attendance, they found that household's lack of access to credit, and school characteristics affect the cognitive skills of students' numeracy and literacy skills in Ghana. Moreover, making use of Ghanaian data, Glewwe and Jacoby (1994) studied student achievement and schooling choice. Using the 1988-89 GLSS, they underscored the indirect effect of school quality improvements on cognitive skills measured by student achievement. Again, improving classroom condition has a better chance of enhancing cognitive skills than delivering more instructional materials and improving teacher quality.

Blunch and Verner (2000) in assessing the determinants of adult literacy proficiency found that literacy proficiency and age are negatively correlated, signifying improvement school quality in recent years. They observed that females were less likely to be literate compared to males, after accounting for other factors. Blunch and Verner argued that parental education had a positive relationship with literacy proficiency. In addition, they recognised that distance to the closest primary school, residency in a rural area, and poverty levels affect literacy proficiency negatively in Ghana.

In the analysis of school enrollment in Ghana using data from the Ghana Living Standard Survey round 6 (GLSS 6) Iddrisu, Danquah and Quartey (2017) estimated a three-step sequential logit model for factors of secondary school enrollment and the determinants of completing primary school. They revealed that socio-economic factor such as parental education, income of the household and the sex of household head played a role in households' child schooling decisions and cognitive development. The study further showed that parents who are educated were more likely to send their children to school and retain them until they completed primary schooling. Besides, the educated parents were gender sensitive in investment in children schooling at the basic level. They further argued that primary school completion rates depended on household welfare.

Effect of age of starting schooling and cognitive skills

The literature on the heading above is replete with studies examining the effects of the school entry age on the cognitive skills development of school-age children with quite a few on adults mainly in developed economies. Some of the studies have also concentrated on the impacts of one's age of starting school on their labour market outcomes in adulthood and even on social behaviours. Unfortunately, developing countries have generally been understudied. Based on Heckman's equation, early investment in the lives of children have been found to yield greater returns (Cunha *et al.* 2006; Heckman & Kautz, 2012); while there is no consensus in the literature, Angrist and Krueger (1991), Dobkin and Ferreira (2010), Mayer and Knutson (1999), NICHD Early Child Care Research Network (2007) and Stipek (2002) found that early entrants to school tends to better performance and attainment of higher education with an improvement in earnings during adulthood. The reverse effect was found by Bedard and Dhuey (2006)**,** Datar (2006)**,** Elder and Lubotsky (2009)**,** Kawaguchi (2011) and Uphoff and Gilmore (1985) who reveal that entering school too early has a negative effect on cognitive development, thereby affecting the long-term outcomes of a child as an adult including educational attainment and lower earnings.

The National Institute of Child Health and Human Development Study of Early Child Care used data on more than 900 children in the US and found that children who enrolled in kindergarten at earlier ages had higher estimated scores on the Woodcock-Johnson Letter-Word recognition test but were rated lower on literacy and mathematical thinking assessment scales (NICHD Early Child Care Research Network, 2007). Mayer and Knutson (1999) in answering the question of whether the timing of schooling affects how children learn, concluded that children who entered school at a young age learned more, performed better at test scores and had fewer behavioral problems rivalled to older ones with same years of schooling. This they argued was because these children are exposed to formal learning early.

Dobkin and Ferreira (2010) observed in California and Texas, USA, compulsory school entry laws have the tendency to increase school attainment of children who enrolled in school early but at the same time lower their academic performance when they are still in school. Elder and Lubostsky (2009) documented that being a year older than the normal age in kindergarten is associated with an increased school achievement which tends to fizzle away in subsequent throughout the school years. A similar result is articulated by NICHD Early Child Care Research Network (2007). They found that entering kindergarten at an older age was associated with increases in cognitive performance on Woodcock-Johnson Letter-Word recognition test. Uphoff and Gilmore (1985) also established matured children were more likely to perform above average and less likely to repeat the same grade. Akin to observations made, Datar (2006) found that deferring entrance to preschool increased the test scores throughout the first 2 years in school for a child.

Angrist and Krueger (1991) in their ground-breaking paper on how compulsory school attendance affects schooling and earnings in the US found that younger students completed school at higher rates than their older colleagues in the same class. This they concluded led to higher earnings for the younger students by virtues of the extra schooling obtained. Mayer and Knutson (1999) confirm the findings of Angrist and Krueger by articulating that the increased earnings enjoyed by individuals who enrolled in school earlier are due to the additional education they enjoyed. Stipek and Byler (2001) argued that older children in classrooms performed better than younger children. Students who enrolled at a later age improved academically than those who enrolled at an early age. On the contrary, Fertig and Kluve (2005) found an inverse relationship between the school starting entry age and schooling outcomes both in terms of schooling certification and likelihood of having to repeat a grade for Germany. Their argument suggests that starting school at an older age has adverse effect on educational outcomes.

Sykes, Bird, and Kennedy (2010) revealed that enrolling in school at an early age may cause stress among young pupils' children aged four and five. This they argue is due to the fact that such children may not be ready to start formal schooling or reception class. They conclude that this may affect their cognitive skills or literacy level in later years. Sharp (2009) also indicated that the age-related disadvantages of children who enrolled in school early can result in lower self-confidence, which may further have bearings on their conduct and achievement. To the study, younger children may develop feelings of inadequacy because they have the tendency to compare themselves with older classmates, on the other hand, older children may receive more propelling criticism and assume a "leadership position". On the contrary, Tymms *et al*. (2005) conducted studying children in Scotland opines that there is no indication that children younger than five years are adversely affected for starting school early. The study again found no evidence to suggest that starting school after age five benefited such children to acquire literacy skills.

Moreover, evidence also suggests that a disproportionately high percentage of relatively young children in school are referred for special educational needs, and many of them appear to be misdiagnosed. A suggested reason according to a study by Sykes *et al*. (2009) for this is that teachers may have unrealistic expectations of younger pupils, and so may not make sufficient allowances for their level of attainment. A key hypothesis for this effect relates to the relative age of children, with the gap between the youngest and oldest pupils in a class being almost a year in many cases. Still on younger and older children, Sykes *et al*. (2009) reveal that research suggests that the youngest in the year group tends to be less mature cognitively, socially and emotionally than their older classmates. In addition, other studies such as Polizzi, Martin and Dombrowski (2007) suggest that the central nervous system of younger children is less mature, particularly in relation to self-regulation of attention, emotion and other functions. This has implications for their ability to adapt to school life and literacy skills.

Chen (2015) added to this literature by attempting to assess the impact of late children entry into school and its effect on cognitive development in rural China. He explained that there was a negative relationship between late entry and a child's cognitive development. Chen (2015) makes the assertion that older children find it difficult to comprehend the basics of whatever they are taught as compared to their younger classmates hence, the older children eventually drop out of school. Furthermore, children who happen to start school at later age found it difficult to succeed in academics. It is believed that these children spend a number of years in an unenthusiastic cognitive environment prior to formal schooling, especially when their parents are not able to provide them with the necessary and sufficient atmosphere to develop their abilities.

Baber (2016) argues that without a doubt, the importance of formal school is a helpful tool in helping children gain knowledge for future success. However, it is observed that when children are involved in a peer-oriented play, they feel confident in their abilities to try again when they fail. Since such skills are very important for the cognitive development of a child, it is, therefore, prudent that children start school at an age not less than seven years. This is because an early age of schooling may not probably give the child any academic benefit in the long term. Also, studies have shown that older students are less successful in storing information as compared to younger students. Sharp (2002) stresses that many studies assert that the curriculum for children aged below five should not emphasise formal academic teaching or focus on particular subjects, rather it should involve play and development that provide children with opportunities to socialise and take responsibility for their own learning.

Cunningham, Sanchez-Puerta, and Wuermli (2010) reveals that assessing the effect of school starting on reading development will help tackle the problem what time is best for teaching children how to read. They argued that formal instruction in reading is more effective after a set period. If her assertion is true, it suggests that one is better of waiting until such an age before reading instruction begins. On the other hand, he asserts that if instruction of younger children is equally efficient as that of older children, then age may play no vital part in the development of reading. Her study continues that to put age effects in context, it is vital to look at the length of time spent at school on academic progress. Cunningham further stresses that taking into consideration school entrance ages across Europe, it is particularly relevant to look at effects of those between the ages of four and seven.

Although Sharp (2002) believes that age has a positive relationship with cognitive skills performance, he articulates that this association may be very minimal, hence other factors such as gender and other demographic characteristics should be given attention. Luguterah and Apam (2013) hold a contrary view that age and academic performance have a negative relationship. According to them, the age of the student does not improve the academic performance of the student but rather the performance of a student depends on the entry requirements rather than the age. In a study conducted by Dalton (2011) on entry age and reading level by the end of third grade, revealed that children who started school at age five or earlier read more words and more fluently than children who started school after the age of six. However, these younger students were less proficient in understanding the sound-letter relationships. Assessing the effect of school entrance age on academic performance, Konarzewski (2014) revealed that children in the relevant age group born in the last quarter of the year, achieved significantly higher scores in mathematics than children of the same age who were born in the first quarter. The results for science were in favour of younger ones than older ones.

Tymms, Merrell and Henderson (2000) using a multilevel modelling to assess children's' academic progress in the first three of schooling in England. Their study used mathematics and reading assessments and revealed that cognitive success is positively related to pre-test scores but that there is also a large difference relating to the class children attended. Age was found to correlate strongly with educational attainment. Older children in the various year cohorts scored high in both mathematics and reading.

A study conducted by Harris, Keys and Fernandes (1997) using the TIMSS dataset finds that students from England did comparatively better in science but poorly in mathematics. The results also pointed out that there are variations in the number years of schooling of 13-year-olds sample in the participating countries. In examining the development of literacy skills in 4-8 year olds, Crone and Whitehurst (1999) used a longitudinal two group cut-off design of which 337 children were selected from the “Head start” pre-school programme and were followed until the second grade. The study revealed that the oldest children in kindergarten were better in phoneme awareness, letter recognition, and print awareness than the younger ones.

Suggate, Schaughency and Reese (2013) conducted a research using two different samples of English-speaking adolescents in New Zealand to examine whether children who learned to read earlier have an earlier reading ability than those who learned to read later. Children who started to read at age five and those who started at age seven were selected. Accounting for other factors such as income parents, parental education, classroom environment, school-community affluence and home environment, the study revealed that the Earlier Reading Instruction Age group in the beginning years had a superior reading ability, word, non-word and passage reading, but this superiority in reading skill ebbs away by age 11.

Sykes, Venkatesh and Gosain (2009) argue against children attending school young age. Their reports explained that children between the ages of four and five may not be ready for formal education. With regard to social and emotional readiness for schooling, the research indicated that a number of children aged four may not be well equipped to deal with the plethora of features of attending school, including facing separation from parents each morning; leaving recognizable environs and belongings; spending time with other adults and children and getting to know strangers; finding their position in a new hierarchy; familiarizing to new systems and rules; and becoming used to not having their own way.

Crone and Whitehurst (1999) examined the development of literacy skills in 4-8 years old. Various measures of emergent literacy – phoneme awareness, words and letters recognition and print awareness were taken at the end of pre-school and kindergarten, and measures of reading – word reading and reading comprehension were taken at the end of grades one and two. The study identified that the oldest children in class developed considerably better emergent literacy skills than their younger classmates. The effect of a year in kindergarten on emergent literacy skills, according to the study, was 1.7 times stronger than the effect of age. In connection with the measures of reading taken in grades one and two, similar results were discovered. The effect of a year in first grade on reading was more than 4 times stronger than the effect of age.

Seymour, Aro, Erskine and Network (2003) assessed the development of cognitive skills among first grade children in English and 12 other orthographies in a cross-country study. They discovered that English-speaking children who began school at age 4-5 needed, on average, three years formal schooling to achieve 85 percent accuracy on tests of familiar word and non-word reading. But their colleague children from other European countries who began learning how to read at age 6-7 needed on average, one-year formal schooling before achieving the same level of accuracy.

Seymour *et al*. (2003) added that age of starting school is confounded with orthography. They found that children from countries which use deep orthographies mostly start school earlier and take longer to learn to read. The speed of learning the English language was found to be more than twice as slow as in the shallow orthographies. They suggest that the reason for this is that deep orthographies require a dual process approach to reading (alphabetic and orthographic) which requires greater processing resources than a single alphabetic approach. These scholars reveal that it was not possible, in this instance, to determine whether the slower development was due to one's age of starting school, orthography, or both.

The Progress in International Reading Literacy study (PIRLS) in 2006 measured reading comprehension skills in children during their fourth year of formal schooling in 40 countries across the world. The results indicated that children from Russia, Canada and Singapore were among the top four countries, while England which has the lowest age (4 year) of starting formal school ranked 19th (Mullis *et al.*, 2007). The study, therefore, argues that starting formal school at an early age does not have direct impact on literacy skills and cognitive development.

Cognitive Skills and Labour Market Outcomes

The important role of education in impacting on economic growth and successes in labour market outcomes like earnings and employment prospect have been well document since Gary Becker, Jacob Mincer and T. W. Schultz. The lack of learning taking place in our education establishments have called to mind the need to look at the skills set that is imparted in our schooling systems. In view of this, over the past two decades, the literature on the effect of cognitive skills on these outcomes is growing. While the literature abounds with such works from the developed world, data limitations is making it difficult for similar studies to be conducted in developing countries.

According to Dearden, Reed and Van Reenen (2000), the studies on the effects of cognitive skills measured by literacy skills proficiency on labour market outcomes are fewer than that of educational attainment due to limited data. Chiswick, Lee and Miller (2003) argued that including literacy proficiency when analysing labour market outcomes mirrors skills beyond just educational qualification and justifies why some groups are likely to thrive in the labour market. Some of the existing contributions using non-self-assessed measures of literacy skills such as Dustmann and Fabbri (2003) and Vignoles, Schwartz and Luyckx (2011) show that literacy proficiency is positively correlated with higher employment, earnings and wages. Similarly, Chiswick *et al.* (2003) revealed that the effect of education on labour market outcomes is actually due to higher literacy and numeracy skills.

In the US, Murnane, Willett, and Levy (1995) made use of two different longitudinal data of high school final years students and reported that foundational cognitive skills significantly and positively impacted on the earnings of males and females more in 1986 than it did in 1978. They further revealed that the cognitive skills of high school student had higher impact the longer the graduation period and that women had wage premium linked to post-secondary education. Currie and Thomas (1999) using data from the British National Child Development Survey investigated the long-term consequences of early test scores. These scholars identified that cognitive skills assessment results measured by age 7 had noteworthy impact on future educational attainment and labor market outcomes. They also observed that among those who performed in the highest quartile, by age 33 they had about 20 percent more in earnings than those in the lowest quartile. The highest impact was found among those who came from the lowest socioeconomic background. This shows that poverty affects cognitive development among the disadvantaged in society.

Murnane, Willett, Duhaldeborde and Tyler (2000) showed how important cognitive skills of adolescents are in determining future earnings. This they did when answering the question, “How significant are adolescents' cognitive skills in predicting later labour market success?”. They also provided evidences to the effect that attending college with robust cognitive skills are associated with improved earnings to answer the question whether tertiary education benefit only individuals who enrolled with significantly better cognitive skills.

Hanushek and Kimko (2000) studied the effect of schooling and labour force quality on economic growth. The study integrated international differences in test scores in mathematics and science conducted since the 1960s. In addition to the prominent role of school quality in the growth of nations, cognitive skills measured by test scores in mathematics and science were very important in labour quality and hence economic growth. They also observed that immigrants who were educated in countries performing well in international cognitive assessments earned more in the US.

Hanushek and Woessmann (2008) also examined the role of cognitive skills in enriching the economic conditions of nations. They observed robust evidence showing that economic growth and well-being of a nation is influence by the level of cognitive skills development of a people but not the number of years of schooling attained. A similar evidence was found for individual earnings. The scholars concluded that emphasis in developing countries should be placed on improving school qualities to shore up the skills levels.

Woessmann (2016) in making an economic case for education articulated the view that knowledge and skills actually acquired rather than the mere years formal schooling that matters for individual improvements and societal progress (growth, employment, and earnings). In drawing this conclusion, he made used of the achievement tests such as PISA and PIAAC.

Earle (2010) analysed the labour market outcomes of educational qualifications and skills to understand how the education system benefits people and the economy. The results of the analysis showed that the benefit of increased literacy as a measure of cognitive skills without higher qualifications is limited in the New Zealand labour market. The major benefit Earle observed came from improved literacy in combination with gaining a qualification, which can result in greater prospects like moving into higher paid jobs. The results also showed that experience had a similar effect as increased qualifications. It had a large effect on employment for people with no or low qualifications, but little effect on hourly earnings for this group. It had a large effect on hourly earnings for people with qualifications at level 4 and above. Disparities by gender and first language persisted, even once qualifications and literacy are controlled for.

Hanushek, Schwerdt, Wiederhold and Woessmann (2015) investigated the returns to cognitive skill around the world using the PIAAC survey in 23 countries. Their study pointed out that focusing mainly on early career earners in estimating the returns to cognitive skills results in about one fourth underestimation in lifetime returns. Hanushek *et al.* argued that a one standard deviation hike in cognitive skills leads to about 18 percent increase in earnings for mid-career employees. They observed that especially among the Nordic countries, the returns were between 12 – 15 percent with US having the highest returns of about 28 percent. When educational attainment, parental education, or compulsory-schooling laws were accounted for in the instrumental variable models, higher estimates were obtained. The returns to cognitive skills were adversely affected in countries with high presence of unionised workers, stricter employment protection, and larger share public sector workers.

A similar result is revealed by Hanushek, Schwerdt, Woessmann and Zhang (2017) who examined the international differences in the returns to cognitive skills in 32 OECD countries. The study revealed that returns to cognitive skills are more in economies with higher growth rates showing that skills tend to benefit from economic change. It was also observed that countries with greater share of public employment and large portions of unionize workforce tend to have lower returns to cognitive skills.

Shomos (2010) studied the link between literacy and numeracy skills and labour market outcomes in Australian adult population. This study revealed that literacy and numeracy skills are significantly and positively associated with labour market outcomes. Making use of the level of proficiency, Shomos observed that an advancement in the cognitive skills from level 1 to level 3 increased the probability of participating in the labour force by about 15 percentage points among females and 5 percentage point for males. It also improved the hourly earnings by 25 percent for females and 30 percent for males. Accounting for cognitive skills reduced the effect of educational attainment on earnings and labour force participation.

Sundaram and Vanneman (2008) studied the gender differentials in literacy and its relation with women's participation in the labour force in India. They revealed a conflicting finding where women had lower literacy proficiency than with men in the work force. This they observed is also associated with higher participation in the labour force by girls even though their literacy levels are below that of the boys. Hence, the circle of gender inequality is deepening.

Earle (2009) showed that a percentage increased in cognitive skills accounted for, on average, increase hourly earnings by one-fifth. This is likened to the average increase in incomes connected with a tertiary non-degree qualification, compared with having a school level qualification, or the average increase associated with having a degree compared with a tertiary non-degree qualification. When cognitive skills and qualifications are cogitated together, then the increase in wages is attributable just to literacy or numeracy differences which reduces to around 10 percent for each standard deviation increased in literacy or numeracy skills.

Earle (2009) assessed the effect of mother tongue as first language and education on literacy proficiency, employment and wages. His investigation revealed noteworthy variation in employment and income for New Zealanders with English as an additional language, even after English-based literacy and numeracy is accounted for. Those with English as auxiliary language are more prone to experience impediments in accessing employment and more likely to have lower hourly earnings. They also get slight or no extra income benefit from acquiring a degree or postgraduate qualification.

Marks (2014) argued that success in educational attainment and career development largely depend on an individual's basic cognitive skills. In totality, the findings from an earlier research suggest that cognitive skills can partially mediate and moderate the relationship between educational attainment and earnings. Besides, Green and Riddell (2001) found a statistically significant effect of literacy skills on labour market outcomes and by extension earnings, using dataset from the International Adult Literacy Survey on immigrants into Canada. Their estimations suggest that literacy proficiency plays a critical role in labour-market adjustment of immigrants than citizens of Canadian.

Dougherty (2003) also analysed the effects of cognitive skills indicators on earnings and on the likelihood of college attainment. Using data from the US, the author proxied cognitive skills with literacy and numeracy proficient tests taken by high-school students at graduation. Dougherty revealed that numeracy affects earnings both directly and through college attainment. However, literacy does not seem to have an effect on earnings, even though it seems to increase the likelihood of attaining college.

Chiswick (2000) studied immigrant adjustment in Israel with dataset from the 1972 Census in Israel. He found that literacy proficiency in the Hebrew language of natives are associated with about 20 percentage point gains in earnings than their immigrant counterparts. He further revealed that being fluent in English among immigrants enhanced their gains by an additional 15 percent increase in earnings. To add, Bussi and Pareliussen (2017) examined the effect of education, literacy proficiency, country of origin of migrants and labour market outcomes in Sweden. Using OECD PIAAC Survey of Adult Skills, these scholars also explored how cognitive skills influence over-qualification mismatch. They observed that literacy proficiency and level of formal education significantly and positively related to employment. They revealed that a compressed earnings distribution makes thresholds to enter the labour market high for those with low education and low literacy proficiency. They argue that, the high influx of migrants who are generally less educated and less proficient, leads to increased supply of low-skilled workforce. Among migrants, the study observed high prevalence of over-qualification mismatch. They explained that migrants who participate in education and training programmes in Sweden increased their chances of getting into the labour market.

A study by de Baldini Rocha and Ponczek (2009) investigated the effects of adult literacy proficiency skills on earnings and employability in Brazil using panel data to control for unobservable fixed characteristics. The results of the study indicated that being literate is associated with a 10 percent additional returns to earnings. The results also provided evidence suggesting that the improved effects on wages were due to productivity gains rather than increased formalisation of literate worker employment. Further, the study revealed that the effect on income is more common among women, residents of Southern/Southeastern Brazil, and adults aged between of 45 and 60 years.

Using the PIAAC survey, Hampf, Wiederhold, and Woessmann (2017) probed the possible threats to causal identification of returns to cognitive skills using several approaches. Their study assessed the effect of cognitive skills on both higher wages and better employment possibilities. They adopted the instrumental-variable and standard least-squared estimation. The results from their study showed that despite the varied nature of the countries involved in the study, similar results were found across countries. Moreover, results obtained from the instrumental-variable estimates were largely bigger than those from the standard least squares regressions. Hampf *et al.* (2017) conclude that the standard least-squares estimations may be underestimating the true returns to cognitive skills in the labour market.

According to Glewwe (2002) the work by Boissiere, Knight and Sabot (1985) was perhaps the first work in a developing country to look at the effect of cognitive skills on earnings in Kenya and Tanzania. Reading and mathematics test scores were proxied for cognitive skills and raven's test to measure ability. The authors found positive and significant impact of cognitive skills on earnings. They observed that without cognitive skills, years of education as a measure of human capital over estimated earnings and that the earning differences reflected differences in cognitive skills.

By means of Ghanaian data, Glewwe (1991) studied whether failure to account for differences in innate ability and school quality prejudices the findings of the private return to education resulting from estimates of earnings equations. They made use of the GLSS of 1988-89 which included assessments on ability and cognitive skills measures. Glewwe observed no return to education when years of schooling were used to measure the of human capital. Using both literacy and numeracy skills he found significant and positive returns cognitive skills.

To assess the impact of cognitive skills on household's income, Jolliffe (1998) used literacy and numeracy assessment and estimated its returns on on-farm profit, off-farm income and total income. He made use of the Powell's censored least absolute deviations and the Heckman's two-step and observed that cognitive skills are positively and significantly associated with off-farm and total incomes of Ghanaians. Their findings suggested that the agricultural sector of Ghana had low returns to cognitive skills. Vijverberg (1999) also studied the effect of cognitive skills on self-employed Ghanaians, either in off-farm household businesses or in farming activities. He reported some evidence that cognitive skills as a measure of human capital had a positive impact on off-farm household income, even though the strength of this evidence was weak.

Blunch and Verner (2000) investigated whether functional literacy proficiency is a precondition for entry into the Ghanaian labour market. Among the factors connecting literacy and earnings included age, gender, parental education, school distance, and income. They observed that functional literacy proficiency appeared to be essential for entering the labour market. Further, they examined the effect of adult literacy programmes on the living standards of households of Ghanaians. They found that the participation in literacy proficiency programmes were positively related to increased expenses or improved living standards participants. They observed that the effect was bigger among households where no member was formally literate.

Fasih (2008) studied the link between education policy and Labour market outcomes in Pakistan and Ghana and revealed that individuals who are proficient in reading and writing are much less likely to work in the agriculture sector in both countries. Even in the informal sector, lack of basic literacy and numeracy skills were found to hinder individuals' success in the labour market. Fasih (2008) argued that the level of returns to literacy proficiency were high in both Pakistan and Ghana after accounting for the sector of employment. Older women in Pakistan had an earning premium of about 200 percent since far fewer women than men are proficient. Fasih observed that though literacy proficiency was associated with high earnings premiums, it came at a high cost to the state. Hanushek and Woessmann (2007) suggested that often even nine years of schooling in an average developing country does not necessarily mean that students had become functionally literate.

Empirical literature on soft skills and labour market outcomes

Puerto (2009) noted that although the levels on unemployment are rising in many parts of the globe, the reasons cannot uniquely be related to the unavailability of jobs but largely due to the absence of special skills employers are seeking in prospective workers. While the levels of educational attainment are increasing with the increased access to schooling, this has not been associated with a corresponding increase in both cognitive and soft skills. Bonnstetter (2012) also observed that even though many have high academic laurel (paper inflation), they lack the necessary soft skills to succeed in corporate organisations or even in their own businesses.

The effect of soft skills on the various labour market outcomes may be both direct and indirect. Directly, skills improve productivity which translate into favourable labour market outcomes. Soft skills impact labour market outcomes indirectly through increased educational attainments and social capital. Highly skilled individuals are more likely to stay in and complete school and are inclined to have contacts who will improve their chances in the labour market.

In examining the labour market returns to cognitive and soft skills in Sweden, Lindqvist and Vestman (2011) made use of Swedish military enlistment data found that cognitive and soft skills have different impact on labor market outcomes. Making use of personal interview conducted by a psychologist as a measure of soft skills, the authors found that non-cognitive skills are stronger predictor of labour market participation and earnings for workers at the low end of the earnings distribution and those untrained. They observed that soft skills enabled workers to avoid labour market failures (unemployment and low annual earnings). Lundin *et al*. (2016) estimated the effect of leadership skills, acquired through partaking in student union councils on labor market entry in Sweden. Lundin *et al*. found that students who were elected to the councils were more likely to transition faster into the labor market. Again, those who were elected had a higher likelihood of earning more in their first three years of employment.

Mohanty (2009) used the National Longitudinal Survey of Youth (1979) longitudinal data set from the United States to evaluate the effect of workers' positive attitude on earnings and happiness. He examined the indirect effect of positive attitude through happiness on earnings. Using a two-step procedure, the study articulated the view that while positive attitudes of workers affect earnings directly, workers' happiness have both direct and indirect effect on earnings.

Using self-esteem and locus of control as measures of soft skills in US, Heckman, Urzua and Sixtrud (2006) examined the direct effect of non-cognitive skills on labour market outcomes and social behaviours. They revealed that self-esteem and locus of control positively affect earnings, employment status, work experience and choice of occupation. Improvements in soft skills were observed to be associated with four times more increase in earnings for women than males. Men were 15 percent more likely to be employment by age 30 with improvements in soft skills.

Borghans, Ter Weel, and Weinberg (2014) examined the effects of skills on occupational choice and earnings from Britain, Germany, and the United States. With specially emphasis on under privileged people in these countries, the researchers noted that the gender wage gap together with the racial wage gap were closed mainly due to increases in people skills between 1970 and 1990. They also observed that sociability at a younger age correlated positively with adult workers' jobs and that jobs the involves people skills tend to employ more women.

Carneiro, Crawford and Goodman (2007) analysed the impact of early cognitive and soft skills on later life outcomes using the National Child Development Survey (NCDS) from UK. They observed that soft skills are determinant for employment status, work experience and earnings and that the effect of the soft skills do not vary when the data is disaggregated across parental education, and father's socioeconomic status. Specifically, they revealed that individuals who exhibited misbehaviour in class at age 11 had a higher likelihood of experiencing lower earnings at age 42. In addition, they showed that it was also associated with increased tendency of individuals being heavy smokers and engaging in crime by age 16.

Heckman and Rubinstein (2001) studied the importance of non-cognitive skills in US, drawing on lessons from the General Educational Development (GED) testing program. They found that GED recipients were as good as high school graduates who do not go to college but are smarter than high school dropouts who do not achieve a GED. GED recipients were observed to earned on average more than high school dropouts but when ability was accounted for, GED recipients earned less than high school dropout. This they opine was because GED recipients had lower levels of non-cognitive skills. They add that GED recipients are not persistent and discipline.

In their study on skills in the city, Bacolod and Blum (2008) revealed that there is an indirect evidence of the increasing importance of soft skills on returns to labour. They observed that the earnings premium to soft skills doubled between the years 1968 and 1990 arguing that the importance of soft skills has always existed. They revealed that workers with people skills are more likely to benefit from the earnings premium than those with motor skills and physical strength. This they attribute to urbanization enhancing thinking and social interaction. Further, Deming (2015) presented evidence on the increasing demand for social skills in the US labour market. He found that occupations that demand more social skill have increased appreciably as a share of employments in the labour force. In addition, he observed that social skills came with an earning premium in those employments.

Lippman, Ryberg, Carney and Moore (2015) examined the key soft skills that influence the workforce outcomes such as employment, work performance, earnings and entrepreneurial success among young people. Their study was based on 172 studies and established a positive relationship between soft skills and some labour market outcomes. The five preferred soft skills included social skills, communication skills, higher-order thinking skills, intrapersonal skills of self-control and positive self-concept. The study revealed that higher order thinking skills and self-control were important determinants of labour market outcomes. Communication and positive self-concept showed a striking association with participation in the informal markets. All five soft skills had positive relationship with workforce outcomes but were found to reinforced one another which means there may be some form of correlation between the variables.

Sherk (2014) investigated whether or not minimum wage jobs lead to better paying opportunities and observed that soft skills learned at entry level positions enable workers to switch to more profitable positions that go with decent earnings. This they argued are enabled by the on-the-job experiences these workers pick up. He revealed that minimum wage employments instill in these workers esteemed employment skills, including being reliable, accepting direction from a superior, and being a team player and customer oriented. He adds that job seekers especially students about to enter the labour market should use the opportunities the minimum wage affords them to learn these valuable soft skills since they will be equipped for more responsibilities in the world of work. Moreover, higher levels of socio-emotional abilities (soft skills) appear even more vital for occupations requiring low-order cognitive skills, especially in the services sector (Bowles *et al.*, 2001b).

Saltiel *et al*. (2017) examined the effects of both cognitive and soft skills on different outcomes including labour market and social success and found that soft skills have direct effect on wages and earnings. The study explained that individuals with higher soft skills are more likely to command higher wages than their counterpart with low soft skills. In Colombia, Acosta, Muller and Sarzosa (2015) looked at what matters for life success beyond qualifications and examined the returns to cognitive and socio-emotional skills. They reported that cognitive skills are greatly associated with higher earnings and holding a formal job or a high-qualified occupation. By contrast, socio-emotional skills (soft skills) appeared to have negligible direct influence on earnings, but exerted a stronger influence on participation in the labour market. Both types of skills, were observed to be generally associated with attaining tertiary education.

Soft skills measured by the big five personality traits have also been used in the literature. Fletcher (2013), using data for siblings in the US, examined the effect of personality traits on adults' labour market outcomes with emphasis on family background. They revealed that personality traits are important determinants of employment and earnings in the US among adults. Extraversion was singled out as showing significant and positive association with earnings and employment.

Nyhus and Pons (2005) analysed the effects of personality traits on earnings in the Netherlands using the DNB Household Survey (DHS). They showed that among men and women, emotional stability is significantly and positively associated earnings. Women tend to have agreeableness significantly related to lower earnings. Nyhus and Pons (2005) observed that among men, as years of experience increases, they tend to benefit from autonomy but conscientiousness results in additional rewards at the start of an employment. Further, Denissen, Bleidorn and Hennecke (2018) in uncovering the power of personality traits on earnings in Germany, using data from 8,458 employed individuals, argued that individuals' actual personality and the personality traits required of a given job were strong determinants of earnings. Even though personality traits were significant in explaining earning, they observed that the type of work one finds himself has the potential to increase earnings by more than their monthly earnings in a year. They revealed that agreeableness and negatively affects earnings by 2 to 5 percent. Among workers who exhibited higher levels of conscientiousness but whose jobs demands did not such levels, were found to earn less.

In US, Mueller and Plug (2006), explored how personality affected the earnings. The big five personality traits (extroversion, agreeableness, conscientiousness, neuroticism, and openness to experience) were all found to be statistically significant in explaining earnings. Men were found to enjoy wage premium if they were emotionally stable, less agreeable and more open to new experiences. Among women, the authors observed that conscientiousness and openness increased earnings. The gender earnings gap was mainly driven by agreeableness. This view is largely supported by Kern, Della Porta and Friedman (2013) who also articulated that compliance which is an aspect of agreeableness influences the likelihood of not being unemployment.

Braakmann (2009) investigated how differences in various personality traits add to the earnings and employment gender gaps using the 2004 and 2005 waves of the German Socio-Economic Panel. His results from regression and decomposition techniques showed earnings and employments gaps were mainly attributed to differences in personality traits. Specifically, he observed that agreeableness, conscientiousness and emotional instability were associated with earnings and employment. For employment, differences in external locus of control contributed more to the observed gap.

Heineck (2011) also assessed the relationship between individuals' personality traits and labor market outcomes with the help of the British Household Panel Study (BHPS) in the UK. He examined the effect of the big five personality traits (openness to experience, conscientiousness, extraversion, agreeableness, and emotional instability) on earnings. The findings showed that openness to experience and earnings are positively related, but between agreeableness and earnings the relationship was negative. For females in the labour force, there were a negative association between earnings and emotional instability. Heineck (2011) observed a nonlinear relationship for conscientiousness.

Nandi and Nicoletti (2014) used the British Household Panel Survey to analyse personality pay gap in the UK. Emphasis was placed on the role of factors including education and occupation and the difference among high and low paid employees. They found that while all the big five personality traits are important in explaining earnings, openness to experience was the most influential trait associated with earning, with emotional instability, agreeableness, extraversion and conscientiousness in order of importance. They observed that openness to experience and extraversion came with earnings premiums while agreeableness and emotional instability were not rewarded by the market.

A study by Saltiel, Sarzosa and Urzúa (2017) on cognitive and socio-emotional abilities and how the lead to the development of successful lives found that soft skills have direct effects on employment. The study further explains that individuals with higher soft skills are more likely to get employment than their counterparts with low soft skills with the same qualifications. In Latin America, Cunningham, Acosta and Muller's (2016) ‘Minds and behaviours at work: boosting socioemotional skills for Latin America’s workforce’ revealed that soft skills are associated with an array of positive employment and educational attainment outcomes in Latin America.

To these scholars, people with high socioemotional skills get employment more easily than people with low socioemotional skills. According to Krueger and Schkade (2008), people who were considered extrovert especially off their jobs have an extreme likelihood of being employed in jobs requiring high social interactions. Using a time-use survey from France and US, Krueger and Schkade observed that workers who interacted with colleagues at work were mostly satisfied with their jobs.

Besides, Srivastava and Khare (2012) reported that soft skills like diligence, interpersonal skills, behavioural skills, adaptability, time management, accounting skills, secretarial skills, business acumen, negotiation skills, commitment, and sincerity were priorities for employment in Bangladesh. The Economist (2014) also suggested that soft skills and communication skills in English were the "new crazes" in Bangladesh for employment. To contribute to the literature in Bangladesh, Chisty, Uddin and Ghosh (2007) in their study proposed that presentation, communication and problem solving, and analytical skills were also critical in Bangladesh for employability. For India, Srivastava and Khare (2012) in their qualitative study reported that aptitude skills, readiness to learn, appearance and personality, conscientious, multitasking skills, and problem-solving abilities were critical skills need for employment.

In the work 'leadership skills and wages', Kuhn and Weinberger (2005) provided evidence that people who were in leadership positions in high schools, earned higher wages when in the labour market. They observed that individuals who exhibited leadership skills were most likely to be employed as managers after controlling for cognitive skills. Besides, a comprehensive study by Murray and Robinson (2001) brought to bear that in addition to academic skills such as ability to use numerical data and computer competencies, communication skills, logical thinking ability, capability to learn new things, team management skills, and ability to priorities tasks, were essential attributes for entry-level jobs (employment).

Using a triangular design model to ascertain the views of students, faculty and job recruiters on the most important employability skills needed for the job market, Rosenberg, Heimler and Morote (2012) identified that among students' leadership skills, interpersonal skills, and work ethic were the most valuable skills to possess in the job market. However, their findings were based on data collected from students of a university in California, in the US. Saunders and Zuzel (2010) evaluated students and employer perception on employability skills and found that enthusiasm, dependability, teamwork, subject knowledge, commercial awareness, negotiation, and networking ability were critical employability skills in the UK. Also, Nguyen, Yoshinari and Shigeji (2005), working with students in Japan, reported that communication skills, creative thinking, thoughtfulness, desire for challenges, curiosity, entrepreneurial mind and optimism were the essential skills suggested by the graduates to be important for employment. In Sweden, Nilsson and Nyström (2013) revealed that soft skills, generic competencies, analytical thinking, critical thinking skills, ability to find and sort information, flexibility, and adaptation skills were mostly cited by the engineering graduates as requested by employers.

Using data from Tajikistan and Uzbekistan in Central Asia, Nikoloski and Ajwad (2014) studied how cognitive and non-cognitive skills affect employment outcomes. They showed that non-cognitive skills such as decision making, extent of memory and workplace attitude were positive and significant determinants of employment. Nikoloski and Ajwad's (2014) study supports the findings of Heckman, Stixrud and Urza (2006) who posit that both cognitive and non-cognitive skills impact employment, particularly through the level of schooling. Heckman, Stixrud and Urza's results, however, showed that non-cognitive skills had a greater effect than cognitive skills.

Also, Cunningham and Villaseñor (2016) use a sample of 27 studies on employer's survey and data from dozens of countries around the world. Findings reveal that employers consider socioemotional skills and higher cognitive skills as most relevant skills on the basis of regional surveys, industries and educational level. With reference to the educational background of workers, employers require the highly educated to have higher cognitive skills and technical skills than those less educated. This is because of the nature of the job task that each group of workers performed. The study further revealed that employees mostly lacked high cognitive skills and this was supported by its rank as the topmost skills gap in the labour market. Some skills classified as high cognitive skills included analysis skills, critical thinking, decision-making, entrepreneurship, foreign language among others. Although the study helped identify the skills gap, the methods of measuring these skills were not outlined. Besides, the extent of productiveness of these skills in determining wages and type of job tasks were not investigated by the study.

Additionally, a scrutiny of the gender, wage premium and soft skills relation proved that the gender wage gap has lowered due to factors such as alterations in soft skills possessed by different genders as well as development in wage returns due to adjustments in employee's requirement by employers

(Balcar, 2016; Black *et al*., 2007; Bacolod, Blum & William, 2006). A study of US males revealed that sports leaders during high school had high possibility of translating into higher hourly wage premiums along with translating into managerial roles. Hence, wage returns to soft skills are gender neutral (Balcar, 2016).

In like manner, the results from a survey of the gap existing in the Romania labour market in terms of soft skills and employability by Balcar (2012) showed that competencies in efficiency, problem solving, cooperation, planning/organizing and effective communication represent the five most important soft skills for high work performance. Balcar further indicated that tertiary graduates have marginally higher levels of soft skills than non-graduates. That notwithstanding, the study observed that these two groups had soft skills below what employers actually required.

On the contrary, Groh, Krishnan, McKenzie and Vishwanath (2016) revealed in their study in Jordan that soft skills training did not really have a significantly positive effect on the employability of females graduates. Their study articulated that giving soft skills training in effective communication and business writing, team building and team work and time management among others rather augmented their conviction and gave them a positive outlook. The research shows that job unavailability was a major constraint in Jordan, making soft skills less relevant especially among women.

The skills of individuals are trained and developed through education and work experiences. It can be rightly argued that people learn how to perform most job tasks after they are hired a company. Some companies have structures to give new recruits on the job training and this enhances both hard and soft skills (Heckman, 2012). According to Balcar (2016), the earning returns to education are mainly due to both soft and hard skills. He showed a persistent development in both soft and hard skills in the Czech educational system. He revealed that vocational schools tend to be highly active in on the development of hard skills than soft skills. According to Almlund, Duckworth, Heckman and Kautz (2011), measures of socio-emotional skills influence schooling decisions and a range of educational outcomes. Besides, Cunha, Heckman and Schennach (2010) estimated that 12 percent of the differences in educational attainment could be explained by personality traits or measures, while 16 percent could be accounted for by cognitive ability measures.

Using longitudinal surveys of children in Canada, the United Kingdom, and the US, Duncan *et al.* (2007) noted that mathematics, reading, and attention skills were strong predictors of later academic achievements. By contrast, measures of socio-emotional skills at school entry had limited power in explaining educational success. Among the big five personality traits, conscientiousness is the main determinant of overall attainment and achievement, such as college grades and schooling (Almlund *et al.*, 2011a). Heckman *et al.* (2006) explain that openness to experience affects educational attainment, predicts attendance and the difficulty of selecting courses as well. These scholars further argue that emotional stability influences educational attainment such as graduating from a four-year college.

Summary

This chapter reviewed the existing literature related to the study. The literature review had two main parts; the first part considered the theoretical views on the association between cognitive and non-cognitive/soft skills and labour market outcome and the second part looked at the empirical studies on how one's age of starting school affects literacy proficiency skills and the effects of literacy skills and personality traits on labour market outcomes.

The main theories underpinning the study are the human capital theory, signalling theory and the Heckman equation. Two other theoretical perspectives were identified as explaining cognitive skills development – Piaget's theory of cognitive development and Marsh's cognitive developmental theory. The review discovered that the majority of studies were situated on the human capital theory. Initially proposed by Becker and Rosen, the theory argued that individuals have a set of endowments in terms of skills and abilities that can be enhanced and amassed by means of education and job training. The arguments have been improved to include what is actually learnt (cognitive skills and soft skills as what matters in enhancing productivity is absent in the traditional theory). The workers' market value increases with the level of the cognitive proficiency and the personality traits that they exhibit given that the usual indicator of one's years of schooling has been found to be a poor measure of human capital. The signalling theory, on the other hand, argues that education and the certificate it gives students is what really matters to employers. The proponents opine that education serves as a signal to employers the potential skills and capabilities of individuals entering the labour market.

The Heckman equation lays credence to the need to early childhood education and the importance of teaching of soft skills in addition to the core skills as Heckman argues that early investment in children education yields greater life-long benefits. This theory supports the view that starting school at the required age leads to favourable labour market outcomes. Piaget's theory of cognitive development and Marsh's cognitive developmental theory outlined the cognitive developmental processes in early life. Their views suggest that postponing early childhood interventions and children out-of-school (or dropouts) tend to fare badly, thereby adversely impacting later life successes.

The review of the relevant empirical literature revealed a number of important issues. First, cognitive skills in all its forms – basic and higher order skills – are better measures of human capital than just school attainment. Cognitive skills are influenced by a number of factors. Among these factors are education, biological, socioeconomic and environmental characteristics, and even learning prospects available to the individual. Health status was also identified as an important determinant of cognitive skills. As regards effect of one's age of starting school on cognitive skills, the findings from the literature were varied. A number of studies found that starting school at a younger age led to better performance and results in children attaining higher education more earnings during adulthood. On the other hand, other scholars argued that entering school too early had negative effects on cognitive skills development which could affect other educational and labour market outcomes during adulthood.

Almost all the empirical literature reviewed showed a positive and significant relationship between cognitive skills and labour market outcomes. It was revealed that the incorporation of cognitive skills improved the underestimation realised when only educational levels or years of schooling are catered for. Generally, women benefited more from improvement in cognitive skills in the labour market.

In the literature, soft skills were synonymous with non-cognitive skills, and socio-emotional skills with various facets as personality traits, people skills and social skills. It was noted that soft skills were mostly associated with labour market outcomes, educational and even behavioural outcomes among adults as well as youth. Moreover, it was revealed that the gender pay gap could also be explained with differences in soft skills.

CHAPTER THREE

RESEARCH METHODS

Introduction

This chapter presents the research methods employed for the study. It is organised into five sections. The chapter begins with a discussion on research philosophy in the first section. The first section additionally emphasises the criticisms associated with the positivist research philosophy and provides justification for the selection of positivism as the philosophical position of the study. The research design of the study is covered in the second section. The measurement of the variables is discussed in the third section followed by the source of dataset used for the analysis together with issues related to the validity and reliability of the dataset in the fourth section. The analytical models are addressed in the fifth section.

Research philosophy

Saunders, Lewis, and Thornhill (2012) define research philosophy generally as the school of thought that highlights the advancement of knowledge and how that knowledge relates to research. A related term is research paradigm which Willis, Jost and Nilakanta (2007) conceptualised as the belief system or the theoretical framework that guides research in a given discipline. Kuhn (1962) proposes two ways in which research paradigm may be used. He argues that research paradigm conveys the idea of collection of beliefs, morals, procedures and all such desired traits shared by members of a given society as codes of rules. Bogdan and Biklen (1998) and Clark (1998) argued that research paradigm can be considered to be a set of cogently linked assumptions, concepts and propositions that directs opinions and research.

In the literature, four main research philosophies have been identified, namely critical theory, constructivism, positivism, and post-positivism (Della Porta & Keating, 2008; Guba & Lincoln, 1994). But in the estimations of Clark (1998) and Proctor (1998), before any meaningful decisions on research methods are made, there is the need to explore and understand first, positivism and post-positivism. According to Galliers (1991), positivism and post-positivism are the two major philosophical dimensions in the practice and discipline of science. In the same way, Proctor (1998) opines that most of the other paradigms can fundamentally be considered as derivatives of positivism and post-positivism.

Patton (2002) sought to differentiate between positivism and post-positivism by arguing that positivism do not view as absolute, insight about the real world but rather considers it to be relative and finite while post-positivism maintains the view that the real world could only be understood through the subjective interpretation and intervention. This said, Patton regarded constructivism to be a more formidable substitute due to the fact that its main proposition is that the human world is totally different from the natural science and thus studies founded on it should also be different. Constructivism hypothesises that insight into the real world is communally determined and composed by individuals grounded on their understanding and interpretations of the world based on their social experiences. Guba and Lincoln (1994) support this view of constructivism and articulate that perceptions formed about human experiences are largely based on qualitative research more than quantitative methods. This paradigm is mostly resort to individuals own lived experiences and personal value judgements. In the opinion of Friedman (1966), this has the tendency to obscure objectivity. While the criticism of value judgement and subjectivism may be true in the case of constructivism, it has been noted to provide avenues for detailed explanations and understanding of human phenomena.

The foundation of this study falls under the positivist ontology as espoused by Aliyu, Bello, Kasim and Martin (2014). Positivism as a philosophy emanate from the works of August Comte and Emile Durkheim. As espoused by Creswell (2003), positivism reveals a deterministic philosophy in which causes determine effects and outcomes. Levin (1988) therefore opines that positivists believe that reality can be described, and that it is stable, observable, and measured in a dispassionate sense with no interference in the phenomena under study. More importantly, the positivists hold the view that social sciences as a discipline have similar features or developments with natural sciences and as such can be studied in the same objective way. Moreover, the positivists rely on facts and use scientific techniques in testing hypotheses based on theories implying that the philosophy does not entertain biases or opinions of researchers in analysing economic phenomenon. As Babbie (2005) puts it, the positivists' main goal is to accurately measure, elucidate, and envisage events in the social world by espousing the regularities and causal relationship between events. Given the quantitative design and the explanatory nature of the study, positivism is appropriate for this study which sought to test hypotheses and establish relationships between quantitative variables.

From the economics discipline perspective, Hovenkamp (1990) observed that positivism mostly depends on facts accumulated through observations over time and explained via unbiased approach (objectivity).

Through the derivation of hypothesis from theories, Crowther and Lancaster (2012) noted that positivism uses deductive reasoning. By mean of empirical observation, a methodology is detailed through the construction of hypothesis and its testing for reliability. Friedman (1966) argues that the strength of positivist methodology lies in its ability to be predictive. According to Friedman, the design of positivism is:

> to provide a system of generalization that can be used to make correct predictions about the consequences of any change in circumstances. Its performance is to be judged by the precision, scope, and conformity with experience of the predictions it yields (p.4).

Therefore, the positivist paradigm relies on a method that can be described as scientific and objective by utilising facts to undertake a logical process of analysis.

Like all other research philosophies, the positivist paradigm has its own criticisms. Foremost of these critics is the fact that in social inquiries, positivism lack some measure of subjectivity. It is an established fact that every individual think, acts and perceive the world around him differently (subjectively) (Babbie, 2012). In light of this, Babbie (2010) opines that subjectivity is uniquely link to the individual; hence, any attempt for objectivity could at best be attained via the unearthing of the subjective interests between individuals.

In rebuffing the claim that positivism is a more robust paradigm, Kuhn (1962) reckoned that the gap between reasoned belief and fanatic dogma is very thin and not as clear as it is in the traditional philosophy of science as assumed by social science researchers including economists. Kuhn points out that, it is challenging to know when to hold on to an unproven hypothesis and when to discard it. Given that even objective reasonings are sometimes derived from subjective thinking, the conclusion can be made that dogmas could be better than a dedication to unproven theories for which counterevidence are not always beyond reach. In the estimation of Nigel (1961), the scientific community is not against strong believes that could be described as dogmas, especially if they are backed by integrity. What is not desired is holding on to beliefs that are based on illogical reasoning and with no statistically appealing theories. Nigel adds that the scientific community should encourage the testing of dogmas through the measuring of these dogmas against theories emanating from scientific method.

Positivists paradigm is also of the view that knowledge is attributable only to observable and empirically verifiable. This view has also earned it criticism from scholars like Popper (1959). Popper argues that there are several paths to knowledge of which dogma is part. Popper intimated that reasoning and theories can be advanced through several paths including non-scientific ways like determination, dreams, personal experiences, and beliefs. He further suggests that none of these methods should be regarded as inferior to methods proposed by the positivists in general and liberal economists in particular.

While taking note of the criticisms raised against positivism as a research philosophy, it is imperative to note that the other research philosophies have equally been criticised. Thus, what really matters is the appropriateness of a research philosophy to the type and purpose of the research. This study is therefore guided by the positivist philosophy for three main reasons. First, as enumerated in chapter one, the objectives of the thesis and the nature of the dataset being relied upon for the analysis make it impossible to resort to any other alternative paradigm. An additional benefit in employing the positivist approach, notwithstanding its shaky foundation, is that it advances the mathematical rigour of the study and could offer more nuanced results and explanations.

Research design

This study is built on the positivist philosophy which highlights the quantification of objective knowledge. This philosophy uses quantitative approach to test objective theories by investigating the association between measurable variables (Creswell, 2003). As espoused by Borg and Gall (1989) the positivist ideology is underpinned by a quantitative research approach which resorts to describing, comparing and detecting causal relationships between variables.

Based on the study's problem and objectives, the quantitative research design was adopted. The quantitative research approach is most suitable since it involves the application of econometric procedures to testing and verifying relationships between quantitatively measured variables or parameters. The study was implemented to examine the relationship among cognitive skills measured by literacy proficiency, soft skills measured by the big five personality traits and labour market outcomes among adults in Ghana. In addition, the study assesses the effect of age of starting school on literacy proficiency. The low levels of skills generally found among the labour force in developing countries and Ghana in particular has been recognised as a major issue of concern for governments and policy makers in these countries and the international community. Considering age of starting school, many in Ghana and other countries around the world, are found to start either too early or too late, with many not in schools at all. It is therefore important to know and understand how age of starting school and other factors affect the cognitive skills proficiency in Ghana, an essential ingredient in skills required to be efficient in the labour market.

To achieve national representativeness, the Skills towards Employability and Productivity (STEP) dataset, a novel internationally comparable cross-sectional household dataset collected by the World Bank was chosen for the study. STEP was designed to help participating countries understand the interaction between skills on employability and productivity of workers in the labour market. The use of this dataset also informed the choice of a quantitative approach. On age of starting school, the key hypothesis, which tests the effect of starting school at the right age on the cognitive skills proficiency, is 'best' estimated from 'facts' on the actual age of starting school and the level of cognitive proficiency. The STEP data makes this possible (World Bank, 2014).

The second empirical analysis deals with the effect of cognitive skills proficiency (measured by literacy skills proficiency levels) on different labour market outcomes. In addition, the third empirical analysis also tests the effect of soft skills (measured by the big five personality traits) on labour market outcomes. The objective measures of adults' cognitive skills and soft skills are one of its kinds in recent history measured by the STEP which offers comparability with other low-and-middle income countries.

The use of secondary datasets meant that the researcher had no influence over how the respondents were chosen and ultimately no control over the units of measurement used for the responses. It is also conceded that some particularly valuable insights from the subjective experiences of respondents may be lost as a result of the use of a purely quantitative spectrum. That notwithstanding, without the use of this novel secondary data (STEP), nation-wide scope would have been unattainable for the study.

Measurement of variables

The variables used for the study are divided into two categories namely: dependent variables, and independent variables. There were two main dependent variables (cognitive skills and labour market outcomes) and seven broad variables and their interaction terms which served as explanatory variables in the various models. The choice of the variables was based on literature and data availability.

The first empirical chapter had as its dependent variable, cognitive skills measured by literacy proficiency. Educational Testing Service (ETS) produced a lower-order cognitive skill from an advanced test to measure literacy proficiency. The study adopts the OECD (2012) definition of literacy proficiency which is "understand, evaluate, use and engage with written texts to participate in society, to achieve one's goals, and to develop one's knowledge and potential". The STEP dataset makes use of 10 different "plausible values" that are unbiased estimations of the possible range of literacy proficiency for groups of individuals who took part in the test (Von Davier, Gonzalez & Mislevy, 2009). Based on available background information including gender, age, and education, together with the test results, the plausible values are computed. This process relies on the item response theory. From the plausible values, the literacy proficiency levels were calculated from values ranging 0 – 500. A lower score indicates a lower level of literacy proficiency while a higher score denotes a higher measured literacy proficiency. The study measures cognitive skills in three ways: i) the literacy score which ranges from 0 – 500 (continuous variable). ii) whether the individual is literate or not literate (binary variable). iii) six levels of literacy proficiency ranging from below level 1 to level 5 (categorical variable). This variable becomes explanatory variables for the second and third empirical chapters.

Following the work of Acosta, Muller, and Sarzosa (2015), the dependent variable for the second and third empirical chapters was labour market outcome measured as log of hourly earnings, employment status, being a wage worker, being in the informal sector and being a managerial worker. Employment status captured whether or not an individual was employed (binary variable). It includes all paid workers, those on sick leave but are in employment or waiting to start their new job, those working for profit or self-employed, and those in apprenticeships. The log of hourly earnings was calculated as the wages for salaried workers and net profits for self-employed. To measure being in the informal sector, the question was asked whether worker found themselves in the formal or informal sector (binary variable). The informal sector includes all unpaid workers mainly engaged in family businesses and trade, self-employed and workers who do not have any social security or benefits like paid sick leave but earns wages, and informal wage workers. Being a managerial worker looked at whether a worker was in a managerial capacity, senior partner role or not and is a professional. Lastly, wage workers were captured as 1 while self-employed workers were given a value of 0.

The key independent variables are grouped into four categories, namely soft skills, cognitive skills, socio-demographic characteristics of the individual, household level characteristics; labour market factors and health status. The socio-economic characteristics of the individual comprised age, age of starting school, sex, mother tongue, education and school dropout status. Household level characteristics involved number of shocks experienced before age 15, socioeconomic status, parental involvement in education and wealth quintile. The labour market factors were the amount of reading done at work and the employment status of the individual whereas the health status was captured by whether the individual had any chronic illness. The explanatory variables were selected based on theory and empirical studies.

As the key explanatory variable for empirical chapter one, age of starting school is defined as the age at which the child started formal schooling which in Ghana is six years for primary one. While in Ghana, many attend pre-schools, officially children are expected to start primary school at age six, since these institutions are assuming simply as playgrounds and child holding outlets. The study measured age of starting first grade on two counts. One as a continuous variable and the other as a categorical variable. In the case of the categorical measure, it was captured as; less than six (6) years, exactly six (6) years and above six (6) year of starting school. In the empirical literature, this measurement concurs with the studies of Carroll, Snowling, Stevenson and Hulme (2003) and Cunningham (2012). The literature on how age of starting school affects cognitive skills especially among adults is however inconclusive.

The soft skills (personality traits) are the main independent variables of interest in the third empirical chapter. Following the works of Guerra, Modecki and Cunningham (2014) and Acosta, Muller and Sarzosa (2015), soft skills are measured using the big five personality traits namely openness to experience, conscientiousness, extraversion, agreeableness and neuroticism/emotional stability. The STEP dataset in its quest to measure these personality traits included a battery of 24 self-reported items that were mapped to the eight constructs (traits). Each personality traits had on average three question mapping to it. The response categories for each question was in Likert scale ranging from 1, "almost never," to 4, "almost always." For example, the question "Are you a talkative" mapped to extraversion as a trait. Each soft skills score is the result of the aggregation of these predefined items (Appendix A).

To examine the effect of education on cognitive skills and labour market outcomes, two measures of education were constructed. Actual years of completed schooling captured the continuous version while the level of education completed is measured categorically as 'no education', 'primary', 'JSS', 'secondary' and 'tertiary education'. Falch and Sandgren Massih (2011) and Albert and Teresi (1999) among others have all argued that more education is associated with higher cognitive skills. In the labour market, Chiswick, Lee and Miller (2003), Dearden *et al.* (2000), Hanushek and Woessmann (2008) and Woessmann (2016) have all demonstrated the important role education plays in providing favourable outcomes to individuals. Similar results are expected for the length of materials individuals read at work and parental involvement in education of wards.

To control for individual variations in cognitive skills and labour market outcomes, dummy variables were created for school dropout status, sex and whether the individual had any chronic illness. School dropout status and whether the individual had any chronic illness are expected to have a negative effect on the cognitive skills and subsequently on labour market outcomes.

Being a female is expected to improve cognitive skills especially reading abilities (Samter, 2002). But females are expected to have mixed results in terms of labour market outcomes. It is expected that females with higher education and higher literacy proficiency would earn more. This view is supported by Shomos (2010); Bonikowska *et al*. (2008) and Heckman *et al*. (2006).

Another explanatory variable used in the study is the number of shocks experienced before age 15. This variable has the tendency to adversely affect the cognitive skills and labour market outcome. Individuals from households with favourable socioeconomic conditions are more likely to be cognitively proficient than those without such capital, and are thus expected to enjoy positive labour market outcomes.

Data and source of data

The study relied on the novel Skills Towards Employability and Productivity (STEP) dataset; a World Bank led multi-country study. As the first of its kind in low-and-middle income countries, the survey sort to measure skills need in the world of work in developing countries and provide policy-relevant data to facilitate and enhance the understanding of these skill requirements in the labour market (Pierre, Sanchez Puerta, Valerio & Rajadel, 2014). The STEP program also has as its aim to assess the backward relationships between skills attainment and educational achievement, personality, and social background, and forward connections between skills attainment and living conditions, diminutions in inequality and poverty, social inclusion, and economic growth (World Bank, 2014).

The STEP program consists of two survey instruments, a household survey and an employer survey which were used to collect information on the supply and demand for skills in urban areas. The survey had a set of core questionnaires and implementation materials and this make it possible to build comparable cross-country databases on skills. STEP has been implemented in waves, the first surveys was executed in 2012, it took place in seven countries (Bolivia, Colombia, Ghana, Lao PDR, Ukraine, Vietnam, and the Yunnan Province in China), and the second wave in 2013 comprised five countries (Armenia, Azerbaijan, Georgia, Kenya, and Macedonia FYR). A third wave is currently under execution in Serbia, Kosovo, Libya, and the Philippines. The STEP microeconomic data contains information on the socio- economic, demographic, employment, education and family background characteristics of urban residents. It further surveyed and tested on information linked to basic cognitive skills, socio-emotional skills, and personal health. The STEP surveys also have a series of harmonized questions on specific tasks that the respondent uses in his or her job.

In Ghana, 2987 urban residents were involved in the survey. It randomly selects individuals between 15 to 64 years old in the urban household to complete the questionnaire. The sample design in Ghana was in four stages using implicit stratification by the 10 regions. In the first stage sample, each region selected 250 census enumeration areas (EA) using a systematic probability proportional to size (PPS) sampling method. The second stage involved the partitioning of each primary sample unit into smaller areas to help in the listing process. Then, one partition was selected for full listing. At the third stage, 15 households were selected in each selected primary sample unit using systematic random method. During the fourth stage of sampling, attention was given to all individuals 15 – 64 years in each household, after which one individual was given an equal probability to be each selected from the household for interviewing with the employment questionnaire. The Ghana STEP survey enjoyed an overall response rate of 83.2 percent. For validation seek, it was observed that the distribution in age, gender, and education attainment is comparable to the urban population for the sixth Ghana Living Standards Survey (GLSS 6). The STEP survey included two instruments. The first is the background questionnaire developed by the World Bank STEP team and second, a reading literacy assessment developed by Educational Testing Services (ETS) (Pierre *et al*., 2014).

Data quality and representativeness

As a secondary data source, the STEP survey was checked for reliability and national representativeness of the population from which the respondents were drawn. Due statistical validation processes were strictly adhered to. In order to ensure that this thesis presented results that were relevant for policy purposes, the dataset used for the empirical estimation and analysis were exposed to statistical validation in order to ensure that they met some minimum standards in terms of reliability and representativeness. To achieve this purpose, the STEP dataset was compared to GLSS 6, given that this is the only nationally representative dataset that come close to the STEP survey in terms of information on employment, education and other socioeconomic characteristics of the respondents. However, because information from GLSS 6 was national in nature, comparison is undertaken using the urban respondents and individuals aged 15 to 64 years.

Table 3 report on the results of this comparison. The mean age of individuals in the STEP dataset of about 33 years (SD = 12.15) was higher than the age of 32 years (SD = 12.26) in the GLSS dataset. It was also observed that values of the mean years of education in the STEP dataset was lower than the corresponding value in the GLSS dataset whereas the proportion of females in the STEP was higher than the figure captured by the GLSS dataset.

Table 3: Results of validity check of the dataset used for the study

Variable	STEP				GLSS 6			
	Mean	SD	Min.	Max.	Mean	SD	Min	Max.
Age	33.04	12.15	15	64	32.12	12.26	15	64
Years of edu.	8.18	4.43	0	19	9.93	3.39	0	19
Male (%)	42.85				45.49			
Female (%)	57.15				54.51			

Source: Nunoo (2020).

The evidence from Table 3 shows that the disparities between the two datasets are not so wide, implying that the STEP dataset generally exhibits features of national representativeness and hence can be used for the study.

Analytical models

Three econometric models are adapted and used as the analytical models to address the objectives of the study. This section presents the analytical models employed for the study. It is organised into three subsections. The first subsection presents the human capital model in terms of its production. Emphasis is placed on the determination of cognitive skill and how age of starting school influences its development. The second subsection builds on the human capital model and discusses how the cognitive skills influences labour market outcomes. The final subsection presents the model for soft skills and establish whether soft skills positively influence labour market outcomes.

The model for cognitive skills production among adults

In examining the effects of age of starting school and other factors on cognitive skills, the study relies on the production function of cognitive skills. Following the works by Boardman and Murnane (1979), Todd and Wolpin (2007) and Almanza and Sahn (2018) on education production function, the study builds a cognitive skills production function. The study postulates that cognitive skills are produced by a cumulative process through which adult's cognitive proficiency are determined by genetic endowment, school investment, and after-school investment (Levitt, 2003). The production function for adult cognitive skills is thus expressed as:

$$\theta_{it} = \theta_{it}^{p}(PS_{it}, Cu_{it}, \mu_{it}, \varepsilon_{it}) \qquad (1)$$

Where i denotes individuals, θ_{it} is an adults' cognitive proficiency for period t with t being the two time periods of interest (1 = day of birth to before joining the labour market, 2 = from joining the labour market to the time of the survey), and the superscript p signifies that the identity is a production function. PS_{it} denotes a vector of school investment variables, Cu_{it} signifies a vector of after-school investment factors. μ_{it} denotes genetic endowments or abilities while ε_{it} is the error term taking care of unobserved inputs and measurement error. Introducing the principal variable of interest into equation (1), we have:

$$\theta_{it} = \theta_{it}^{p}(AS_{it}, PS_{it}, Cu_{it}, \mu_{it}, \varepsilon_{it}) \qquad (2)$$

Where AS_{it} is the key explanatory variable 'age of starting school' which is measured both as continuous and categorical variables. The theoretical model allows for investments made in the past (period 1 during childhood and through school) to influence current cognitive skills. The study opines that allowing a child to start school at the required age together with other investments, has the potential for making such a child develop cognitively. Again, depending on the socio-economic status of the family, more investment may be made in a child, thereby leading to a child starting school at the required age. A family can delay a child's school attendance given it unfavourable socio-economic status.

The first empirical analysis is meant to test two main hypotheses relating to age of starting school. The two hypotheses to be tested are:

i. Starting school at the required age of six has no effect on cognitive skills;
ii. The effects of age of starting school on cognitive skills is mediated by gender, education and parental involvement.

The empirical econometric model based on equation (2) is expressed as:

$$Lit\_Pro_{i2} = \beta_0 + \beta_1 age\_start_{i1} + \beta_2 educ\_yrs_{i1} + \beta_3 dropout_{i1} + \beta_4 female_{i1} + \beta_5 parent\_invlove_{i1} + \beta_6 mother\_tongue_{i1} + \beta_7 SES\_15_{i1} + \beta_8 shock\_15_{i1} + \beta_9 asset\_index_{i2} + \beta_{10} read\_work_{i2} + \beta_{12} chronic\_illness_{i2} + \beta_{13} lmarket\_status_{i2} + \beta_{14} ageyrs_{i2} + \varepsilon_{it} \quad (3)$$

$$Lit\_Pro_{i2} = \beta_0 + \beta_1 age\_start_{i1} + \beta_2 educ\_yrs_{i1} + \beta_3 dropout_{i1} + \beta_4 female_{i1} + \beta_5 parent\_invlove_{i1} + \beta_6 mother\_tongue_{i1} + \beta_7 SES\_15_{i1} + \beta_8 shock\_15_{i1} + \beta_9 asset\_index_{i2} + \beta_{10} read\_work_{i2} + \beta_{12} chronic\_illness_{i2} + \beta_{13} lmarket\_status_{i2} + \beta_{14} ageyrs_{i2} + \beta_{15} age\_start * female_{i1} + \beta_{16} age\_start * educ\_yrs_{i1} + \beta_{17} age\_start * parent\_invlove_{i2} + \varepsilon_{it} \quad (4)$$

Where *Lit_Pro* is the proxy for cognitive skills representing literacy proficiency levels or scores; *educ_yrs* is years of education completed by the individual and the educational level completed; *female* is a dummy variable for sex of the individual; *dropout* is whether the individual dropout of the highest educational level started; *parent_involve* is the level of parental involvement in education; *mother_tongue* is the local language spoken at home; *SES_15* is the socio-economics status of the household at age 15; *shock_15* is whether the household experienced any shock at age 15; *asset_index* is that asset index of the household; *read_work* is the length of material the individual reads at work; *chronic_illness* signifies whether individual suffers from a chronic sickness; *lmarket_status* is the labour market status of the individual; *ageyrs* is the age of the individual at the time of test; *age_start*female* is the interaction between age of starting school and sex, *age_start*edu_yrs* is the interaction between age of starting school and education level completed; *age_start*parent_involve* is the interaction between age of starting school and parental involvement in education. The expectations of the variables used for the analysis are reported in Table 4.

Table 4: Expected signs of variables in cognitive proficiency skill models

Variable	Definition	Expected sign
age_start	Age started primary school	+
educ_yrs	Education in years and level	+
parent_involve	Parental involvement in education	+
age_yrs	Age of individual	-
Dropout	Dropout of highest educational level started	-
Female	Sex of individual	-

Table 4: Continued

mother_tongue	Local language spoken at home	-
SES_15	Household experienced any shock at age 15	-
shock_15	Socio-economic status of household at age 15	-
asset_index	Asset index of household	+
read_work	Length of material individual reads at work	+
chronic_illness	Individual suffers from chronic sickness	-
lmarket_status	Labour market status of individual	+
*age_start*female*	Interaction of age started school and sex	+
*age_start*edu_yrs*	Interaction of age started school and education	+
*age_start*parent_involve*	Interaction of age started school and parental involvement	+

Source: Nunoo (2020).

Estimation technique

Given that the main dependent variable in this section is measured in two ways, three different regression techniques are adopted. The ordinary least squares (OLS) regression technique is used to analyse the continuous outcome, while the ordinal probit is used for the categorical outcomes (Daykin & Moffatt, 2002). The use of a simple OLS regression of cognitive skills outcome with education as an explanatory variable could contribute to biased estimates of the impact of age of starting school. The explanatory variables and the error term are likely to be correlated due to reversed causality. Reversed causality could occur when highly proficient individual find schooling and studying easy thereby attaining more education.

Conversely, individuals with higher education tend to be more cognitively proficient (Dugan, 1976; Dugan *et al.*, 1976; and Manski & Wise, 1983). When this happens, cognitive skill is likely to also influence or determine education. This has the tendency to cause the estimates of β_2 in equation (3) to be biased upward. In other words, the coefficient β_2 becomes more positive than expected. The problem of endogeneity is also likely to arise as a result of omitted variables. There are probable variables that are likely to influence cognitive skills proficiency that are not included in the models (3) and (4). To test the presence of omitted variable bias, a stepwise model will be adopted.

Instrumental variable estimation - Two Stage Least Squares (2SLS)

Given the identified source of likely endogeneity, the use of OLS may lead to inconsistent estimates of the parameters of the model (Wooldridge, 2010). To solve the endogeneity problem and estimate the true effect of age of starting school on cognitive skills proficiency, the instrumental variable (IV) approach- two stage least squares (2SLS) procedure is employed. According to Wooldridge (2010), to apply the 2SLS procedure, it is required that we identify a variable, Z that satisfies two main conditions: (l) the variable must be uncorrelated with the error term μ; (2) the variable must be correlated with the regressors being instrumented. The first condition is satisfied by excluding the instrument from being an explanatory variable in the structural model. This is to avoid having the variable Z to be correlated the error term. The second condition requires that there is some relationship between the variable being instrumented and the instrument.

In order to prove that IV estimator is consistent, let us assume that a model is given as follows:

$$y = a_0 + a_1 x_1 + a_2 x_2 + \cdots a_k x_k + \mu \tag{5}$$

E(μ) = 0

Cov $(x_j, \mu) = 0$ j = 1,2,3………… k –1

Suppose x_k is correlated with μ, then cov $(x_j, \mu) \neq 0$. In that case, x_k is said to be endogenous. OLS estimate of the parameters x_k and μ will be inconsistent when these parameters are correlated. The IV procedure therefore provides a general solution to the endogeneity problem.

The use of an IV requires that we identify a variable z_i that satisfies two main conditions:

Cov $(x_j, \mu) = 0$ and $x_k = \gamma_0 + \gamma_1 x_1 + \gamma_1 x_2 + \cdots \gamma_{k-1} x_{k-1} + \theta_1 z_1 + v$ (6)

Where $\theta \neq 0$

The first condition requires that the identified variable is uncorrelated with the error term in the structural equation and the second condition states that z_i must be partially correlated with x_k when the other explanatory variables are partialled out. The variable that satisfies the two conditions above is an instrument for the endogenous variable. After estimating equation (6), the following is considered.

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \cdots + \beta_{k-1} x_{k-1} + \delta_1 z_1 + w \quad (7a)$$

$$w = \mu + \alpha_k v \quad (7b)$$

$$\beta_j = \alpha + \alpha_k \gamma_i \quad (7c)$$

$$\delta_i = \alpha_k \theta_i \quad (7d)$$

Given the assumptions imposed on u and v, OLS will give consistent estimates of the reduced form parameters β_j and δ_i. Since z_i is exogenous, Wooldridge, (2006) indicates that $\alpha_j s$ are also identified. Suppose

$$y = xa + \mu \quad (8)$$

$$z' = (1, x_1, x_2, \ldots . x_k, z_i) \quad (9)$$

Multiply both sides of equation (7a) by z' and take expectations to get

$$[E(z'x)]\alpha = E(z'y) \tag{10}$$

Where, $E(z'x)$ is a k×k matrix and $E(z'y)$ is a k×1 matrix. If $E[z'x] = k, \alpha$ will have a unique solution and the α_s can be estimated as

$$\alpha = [E(z'x)]^{-1}E(z^{-1}y) \tag{11}$$

Exploiting random sample of (x, y, z_1) in which case α is known, equation (11) can be estimated. Given a random sample$\{(x, y, z_{i1})i \ldots \ldots \ldots . N\}$, the IV estimator

$$\alpha_{IV} = (N^{-1}\textstyle\sum_{i=1}^{N} z'x_i)^{-1}(N^{-1}\sum_{i=1}^{N} z'y_i) = (z'x)^{-1}z'y \tag{12}$$

Where z and x are N × k data matrices and y is N×1 data vector on y_i. When there is only one valid instrument for each endogenous variable, the above process is used. However, when the instrumental variable for the endogenous variable is more than one, the 2SLS is applied. Let a set of a valid instrument for x_k be represented by $z_1, z_2, \ldots \ldots \ldots z_m$ in equation (6) such that cov (z_h, μ) = 0, h=1,2………m.

Thus, the reduced form equation of x_k can be written as

$$x_k = \gamma_0 + \gamma_1 x_1 + \gamma_1 x_2 + \cdots \gamma_{k-1}x_{k-1} + \theta_1 z_1 + \cdots \theta_m z_m + v \tag{13}$$

Since cov (z_h, μ) = 0, any linear combination of z will also be exogenous.

With the assumption of no linear dependencies among the variables under consideration, we can use the sample to estimate x_k as follows:

$$\hat{X}_{i_k} = \hat{\gamma}_0 + \hat{\gamma}_1 x_{i_1} + \cdots \hat{\gamma}_{k-1}x_{k-1} + \hat{\theta}_1 z_1 + \cdots \hat{\theta}_m z_{im} + v. \tag{14}$$

Given that the education is expected to be endogenous, the first stage equation is estimated as follows:

$$educ\_yrs_{i1} = \beta_0 + \beta_1 age\_start_{i1} + \beta_2 dropout_{i1} + \beta_3 female_{i1} + \beta_4 parent\_invlove_{i1} + \beta_5 mother\_tongue_{i1} + \beta_6 SES\_15_{i1} + \beta_9 shock\_15_{i1} + \beta_{10} age\_left\_educ_{i1} + \varepsilon_{it} \quad (15)$$

The study used age of leaving the highest levels of education (age_left_educ) as the instrument to solve the problem of reverse causality. This variable is expected to be correlated with education but not literacy skills proficiency (cognitive skills). After estimating the first stage equation, we plug the predicted values of equation (13) into the structural equation. Thus, we have

$$Lit\_Pro_{i2} = \beta_0 + \beta_1 age\_start_{i1} + \beta_2 educ\_yrs_{i1} + \beta_3 dropout_{i1} + \beta_4 female_{i1} + \beta_5 parent\_invlove_{i1} + \beta_6 mother\_tongue_{i1} + \beta_7 SES\_15_{i1} + \beta_8 shock\_15_{i1} + \beta_9 asset\_index_{i2} + \beta_{10} read\_work_{i2} + \beta_{12} chronic\_illness_{i2} + \beta_{13} lmarket\_status_{i2} + \beta_{14} ageyrs_{i2} + \varepsilon_{it} \quad (16)$$

Regression diagnostics and post-estimation tests

The following tests are carried out to ensure that the regression predictions are robust and consistent.

Hausman specification test of endogeneity

Endogeneity test was undertaken to determine whether the education variable was endogenous. Taking cues from Durbin (1954), Wu (1973) and Hausman (1978), the study used the Hausman specification test of endogeneity. To explain how the test is carried out, assume reduced form equation of the suspected endogenous variable x_k is given as

$$x_k = z\pi + v_1 \quad (17)$$

Where z is uncorrelated with v_1 and a structural model is given as

$$y = z\rho + \lambda_k x_k + \mu_1 \quad (18)$$

From equation (18) z and μ_1 are uncorrelated. If x_k is exogenous, it implies that $E(x_i, \mu_1) = 0$ and $E(\mu_1, v_1) = 0$ given that z may be uncorrelated with μ_1 and v_1. Nonetheless, if x_k is endogenous, $E(x_i, \mu_1) \neq 0$ and $E(\mu_1, v_1) \neq 0$ although z may be uncorrelated with μ_1 and v_1. Given this condition, the null hypothesis of the exogeneity tests is specified as

$H_o: E(\mu_1, v_1)$. The linear projection of the error term μ_1 is subsequently written on the reduced form residual v_1 as follows:

$$\mu_1 = \varphi_1 v_1 + \omega$$

This suggests that $E(\mu_1, v_1) = \varphi_1 {\sigma^2}_v$. Hence, the null hypothesis can be rephrased as

$H_0: \varphi_1 = 0$. Thus, x_k is said to be exogenous if and only if $\varphi_1 = 0$. To empirically test this hypothesis, let us substitute $\mu_1 = \varphi_1 v_1 + \omega$ into equation (18) to obtain

$$y = z\rho + \lambda_k x_k + \varphi_1 v_1 + \omega \tag{19}$$

Notably, v_1 is not directly perceived but it can be estimated from the reduced form equation in equation (17) as

$$\hat{v}_1 = x_k - z\hat{\pi}$$

Equation (19) can be run using OLS as

$$y = z\rho + \lambda_k x_k + \varphi_1 \hat{v}_1 + \omega \tag{20}$$

After estimating equation (20), the exogeneity test can be carried out under $H_o: \varphi_1 = 0$. Failing to reject the null hypothesis means that x_h is endogenous. The residual from equation (14) is then predict and the structural equation run with the predicted residual as an explanatory factor. Thus, we have

$$Lit\_Pro_{i2} = \beta_0 + \beta_1 age\_start_{i1} + \beta_2 educ\_yrs_{i1} + \beta_3 dropout_{i1} + \beta_4 female_{i1} + \beta_5 parent\_invlove_{i1} + \beta_6 mother\_tongue_{i1} + \beta_7 SES\_15_{i1} + \beta_8 shock\_15_{i1} + \beta_9 asset\_index_{i2} + \beta_{10} read\_work_{i2} + \beta_{12} chronic\_illness_{i2} + \beta_{13} lmarket\_status_{i2} + \beta_{14} ageyrs_{i2} + \beta_{15} v_{it} + \varepsilon_{it} \quad (21)$$

If it is observed that β_{15} is statistically different from zero, we resolve that *educ_yrs* is endogenous. Conversely, if we fail to reject the null hypothesis β_{15} is equal to zero, implies that *educ_yrs* can be treated as an exogenous variable in the cognitive skills production model.

Weak identification test

An instrument used to correct for the problem of endogeneity is deem to be valid, if it is correlated with the endogenous regressor. When a use weak instrument is used, it leads to bias of the IV estimates of the parameters of the model. The null hypothesis test whether the instrument is weak whilst the alternative hypothesis shows it is not weak. The test statistic used for this verification is proposed by Stock and Yogo (2002) and given as:

$$F = \left(\frac{N-L}{L_2}\frac{r^2K_1}{1-r^2K_1}\right) \quad (22)$$

$$L_2 = (L - L_1)$$

Where K_1, is the number of endogenous regressor, L is the number of exogenous regressors. L_1 is the number of excluded instruments. N is the number of observations and r^2K_1 is the canonical correlation (Baum *et al*., 2007). As specified by Stock and Yogo (2002), if the test statistic is less than the critical values we fail to reject the null hypothesis and this suggest that the instrument is weakly correlated with the endogenous regressors.

Ordinal regression models (probit and logit)

In testing for how literacy proficiency skills in terms of levels is influenced by age of starting school, an ordinal regression model is adopted. Ordinal regression (OR) is modelled on the binary response but has a progressive higher number of categories. According to Cameron and Trivedi (2010), the structure of the model is such that the outcomes increase sequentially as the latent variable y^*, crosses increasing thresholds (Γ_1). The tendency to move to higher literacy proficient levels is depended on the underlying continuous latent variable. Hence, in the context of the study, y^* is an unobserved indicator of literacy proficiency levels. For a particular individual, denoted as *i*, the model is specified as follows:

$$y_i^* = x_i\beta + \varepsilon_i \tag{23}$$

where i is the observation and ε is the random error. Cameron and Trivedi (2010) show that the ε term in ordered logit model is logistically distributed with $F(z) = (e^z/1 + e^z)$ while in ordered probit models, ε is standard normally distributed with $F(\cdot) = \phi(\cdot)$. Using literacy proficiency, for very low y^*, an individual score below literacy proficiency level 1; for $y^* > \Gamma_1$, the individual moves to level 1; for $y^* > \Gamma_2$, the individual moves further to level 2 and progresses to proficiency level 3 and above. The observed response categories are tied to the latent variable by the measurement method. Assuming $\Gamma_0 = -\infty$ and $\Gamma_J = \infty$, then:

For literacy proficiency levels:

$$y_i \begin{cases} 1 \longrightarrow \quad \text{Below level 1} & \text{if } \Gamma_0 = -\infty \leq y_i^* < \Gamma_1 \\ 2 \longrightarrow \quad \text{Level 1} & \text{if } \Gamma_1 \leq y_i^* < \Gamma_2 \\ 3 \longrightarrow \quad \text{Level 2} & \text{if } \Gamma_2 \leq y_i^* < \Gamma_3 \\ 4 \longrightarrow \quad \text{Level 3 \& above} & \text{if } \Gamma_3 \leq y_i^* < \Gamma_4 = \infty \end{cases}$$

Therefore, when the latent y^* crosses a cut point, the observed category changes. Ordinal probit is determined to derive the projected likelihood of moving into a higher threshold literacy proficiency. The ordinal probit model uses the categorical cognitive skills and is given as:

$$Pr(Lit\_Pro_{i2}^{*}=1/X_i)=\beta_0 + \beta_1 age\_start_{i1} + \beta_2 educ\_yrs_{i1} + \beta_3 dropout_{i1} + \beta_4 female_{i1} + \beta_5 parent\_invlove_{i1} + \beta_6 mother\_tongue_{i1} + \beta_7 SES\_15_{i1} + \beta_8 shock\_15_{i1} + \beta_9 asset\_index_{i2} + \beta_{10} read\_work_{i2} + \beta_{12} chronic\_illness_{i2} + \beta_{13} lmarket\_status_{i2} + \beta_{14} ageyrs_{i2} + \varepsilon_i \quad (24)$$

Models linking cognitive skills to labour market outcomes

Most empirical research linking cognitive skills (literacy) to labour market outcomes tend to share the human capital model (HCM) as the point of theoretical departure. Proposed by Gary Becker in the 1960s, this theory advocates that education or training imparts useful knowledge and skills to workers which in turn increase productivity and earnings. Simply put, human capital is an input of production into which additional investment yields greater returns and output (Becker, 1964). This theory views cognitive skills development through education as both a public and private investment decision that must be undertaken in order to enhance productivity and increase success in the labour market. As a public investment, the fundamental argument of HCM is that investing in education leads to greater economic growth through increased productivity, social stability, and healthier lifestyles whereas as a private investment choice, investing in education leads to increased lifetime earnings for those with more years of schooling by increasing access to better paying jobs, reduced time spent in unemployment, and fast transitions to enhanced career prospects (Lim, 2017; Wahrenburg & Weldi, 2007). As stated by Lim (2017), human capital refers to the stock of knowledge and skills embodied in an individual or person. Hence, the labour supply decision of such a person can be adequately explained within a framework that incorporates all the relevant skills or investments undertaken by the individual to raise his or her labour market opportunities through increased productivity.

Although the theory suggests that individuals invest in education in anticipation of a wide range of benefits, most empirical works focused predominantly on the monetary rewards of increased earnings. The model applied in this study is based on works by Hanushek *et al*. (2017), Hanushek *et al*. (2015), Hanushek, Peterson and Woessmann (2012), and Thrane (2010). However, unlike these studies which concentrated on only earnings, three additional outcomes are considered in this study. In addition to earnings, we investigate the role of cognitive skills in determining labour market participation as a first argument and the type of sector engaged in as the second. Following Acosta *et al*. (2015) with slight modification to fit the dataset being used, the empirical equation for the present study is expressed as:

$$Y_i = \lambda H_i + \varepsilon_i \tag{25}$$

where Y is the individual's labour market outcome variable, and H represents the human capital possessed by this individual while ε stands for the stochastic disturbance term accounting for idiosyncratic earnings differences which are orthogonal to H. Traditionally, human capital has often been conceptualised as a latent rather than a variable that can be directly observed and measured. Unfortunately, the early parts of the human capital ideas have been a subject of immense criticisms since they did not provide ways in which these concepts could be objectively measured or represented. For this model to be useful and verifiable, it is necessary to specify an objective measure of *H*. Apart from schooling, other factors affect human capital formation and can inherently also influence labour market outcomes.

As suggested by Acosta *et al.* (2015), a useful estimation approach is to begin with the conventional regression procedures such as ordinary least squares and instrumental variable estimation before moving on to a structural estimation of latent skills that corrects for possible measurement errors. Taking cues from this, the present study employs OLS, instrumental variable techniques and logit estimations to examine the effects of a set of independent factors including cognitive skills proxied by literacy and literacy levels on four different labour outcomes namely earnings, labour force participation, sector of employment, and position. For the final part, structural equation modelling is employed to examine the influence of socioemotional skills on the indicated dependent variables.

More generally, the econometric equation for the first part of the analysis is expressed as:

$$Y_i = \alpha_0 + \alpha_1 CS + \sum_{k=2}^{n} \alpha_k X_{ik} + \varepsilon_i \tag{26}$$

Where Y is the labour market outcome variable, CS represents cognitive skills proxied by literacy proficiency scores and levels of literacy, *X* is a vector of all factors other than cognitive skills that are capable of explaining differences in labour market performance; while ε measures the unbiased error term assumed to be uncorrelated with *CS* and *X*.

Bearing in mind the different labour market outcomes, OLS and 2SLS were used to estimate the effect on cognitive skills on the log of hourly earnings due to the continuous nature of the dependent variable. Given that the other labour market outcomes are binary (employment status [employed or not], employment type [formal or informal], work type [low skilled or not]) logit model is used. The following four empirical models were specified and estimated:

$$LnWage_i = \beta_0 + \beta_1 Lit\_Pro_i + \beta_2 educ\_level_i + \beta_3 dropout_i + \beta_4 female_i + \beta_5 parent\_invlove_i + \beta_7 SES\_15_i + \beta_8 chronic\_illness_i + \beta_9 \mathrm{sec\_}emp_i + \beta_{10} read\_work_i + \beta_{11} exp_i + \beta_{12} expsq_i + \beta_{13} ageyrs_i + \beta_{14} ageyrsq_i + \beta_{15} InSch_i + \beta_{16} region_i + \varepsilon_i \quad (27)$$

$$Pr(Emp\_Status_i = 1/X_i) = \beta_0 + \beta_1 Lit\_Pro_i + \beta_2 educ\_level_i + \beta_3 dropout_i + \beta_4 female_i + \beta_5 parent\_invlove_i + \beta_7 chronic\_illness_i + \beta_8 InSch_i + \beta_9 ageyrs_i + \beta_{10} ageyrsq_i + \beta_{11} read\_work_i + \beta_{12} InSch_i + \beta_{13} region_i + \varepsilon_i \quad (28)$$

$$Pr(Informal_i = 1/X_i) = \beta_0 + \beta_1 Lit\_Pro_i + \beta_2 educ\_level_i + \beta_3 dropout_i + \beta_4 female_i + \beta_5 parent\_invlove_i + \beta_7 chronic\_illness_i + \beta_8 InSch_i + \beta_9 ageyrs_i + \beta_{10} ageyrsq_i + \beta_{11} read\_work_i + \beta_{12} InSch_i + \beta_{13} region_i + \varepsilon_i \quad (29)$$

$$Pr(SkilledWk_i = 1/X_i) = \beta_0 + \beta_1 Lit\_Pro_i + \beta_2 educ\_level_i + \beta_3 dropout_i + \beta_4 female_i + \beta_5 parent\_invlove_i + \beta_6 InSch_i + \beta_7 ageyrs_i + \beta_8 ageyrsq_i + \beta_9 read\_work_i + \beta_{10} \mathrm{sec\_}emp_i + \beta_{11} exp_i + \beta_{12} expsq_i + \beta_{13} region_i + \varepsilon_i \quad (30)$$

Table 5: Expected signs of variable in the models linking cognitive skills and labour market outcome

Variable	*LnWage*	*Emp_Status*	*Informal*	*SkilledWk*
Lit_Pro	+	+	-	+
educ_yrs	+	+	-	+
parent_involve	+	+	+	+
age_yrs	+	+	-/+	+
ageyrsq	-			
dropout	-	-	-/+	-
Female	-	-	+	-
mother_tongue	-	-	+	+
SES_15	+			
read_work	+	+	-	+
chronic_illness	-	-	-	-
sec_emp	+			+
Exp	+	+	-	+
Expsq	-			+
Region	-/+	-/+	-/+	-/+

Source: Nunoo (2020).

The expected signs of the variables used in the estimation of the effect of cognitive skills proxied as literacy proficiency on labour market outcomes are shown in Table 5. The dependent variables are the log of hourly earnings (*LnWage*), employment status measured as whether one is employed or not (*Emp_Status)*, sector of employment proxied as formal or informal (*Informal)*, and the skills level of the individual measured as a binary variable being highly skilled or low skilled (*SkilledWk*).

The explanatory variables include; *Lit_Pro* is the proxy for cognitive skills representing literacy proficiency levels or scores; *educ_yrs* measured both as years of education completed by the individual and the educational level completed; *female* is a dummy variable for sex of the individual; *dropout* is whether the individual dropout of the highest educational level started; *parent_involve* is the level of parental involvement in education; *mother_tongue* is the local language spoken at home; *SES_15* is the socio-economics status of the household at age 15; *read_work* is the length of material the individual reads at work; *chronic_illness* signifies whether individual suffers from a chronic sickness; *sec_emp* is the sector of employment of the individual; *ageyrs* is the age is the individual at the time of test; *ageyrsq* is the square of age in years, *exp* is the experience of the individual; *expsq* is the square of experience.

According to Hanushek *et al.* (2015) and Green and Riddell (2001), cognitive skills proxied by literacy proficiency is expected to be endogenous with hourly earnings as a result of reverse causality. They argue that highly skilled individuals are likely to be in good employments while being in a good job has the potential to enhance one's skills through practice and further investment in professional development and lifelong education. To address the problem of reverse causality, instrumental variables that are related to cognitive skills but experienced before participation in the labour market can be used. *Age of starting school* is used as the instrument. Acosta *et al.* (2015) and Carneiro and Heckman (2004) opine that literacy proficiency is developed early in a child's life therefore, when one starts school will influence his level of proficiency but might not directly affect his earnings later in life. Following the precedents established under the model for cognitive skills development, a 2SLS procedure will be adopted with all the relevant regression diagnostic and post estimation tests.

The logit models are estimated using the maximum likelihood estimation technique. The coefficients of the explanatory variables from maximum likelihood estimation cannot be explicitly interpreted and hence, marginal effects are estimated. The marginal effects are estimated using the approach proposed by Long and Freese (2001).

Model linking soft skills to labour market outcomes

The third empirical analysis tests two hypotheses relating how soft skills measured as personality traits affect labour market outcomes. The hypotheses to be tested are:

i. Soft skills (personality traits) have an effect on log of hourly earnings, employment status, being in the informal sector and being highly skilled;

ii. There is a significant difference in the effect of soft skills (personality traits) on hourly earnings of males and females.

Following the arguments by Acosta *et al.* (2015) and Borghans *et al.* (2008), true skills of soft skills or socioemotional skills (personality traits) are latent and therefore unobserved. Hence, a set of measures that capture various dimensions of a personality traits are used. These latent factors are treated as understandings of the score-production function. Each latent factor (personality traits) is determined by a set of exogenous factors. To deal with this problem, the structural equation model (SEM) is adopted. This model is a multivariate statistical analysis technique that is used to analyse structural relations. This technique combines factor analysis and multiple regression analysis, and it is used to analyse the structural connection between measured variables and latent constructs (Heckman *et al*., 2006 and Espinoza *et al*., 2016).

SEM models mostly includes two types of sub-models - structural model and measurement model. The structural model examines the associations among latent variables and observed variables that are not indicators of latent variables (Hoyle, 1995). In an event a SEM model comprises only a structural model, it becomes a path analysis model. On the other hand, measurement model deals with the relationship between a latent variable and observed indicator variables. A SEM model which includes only one kind of measurement model is known as a confirmatory factor analysis model.

The reduced-form structural equation from (25) is expressed as follows:

$$Y = \alpha_A^Y \theta_A + X_Y \beta^Y + e^Y \quad (31)$$

Here, θ_A is a latent factor of unobserved heterogeneity, α_A and β^Y are the constant parameters to be estimated, X_Y is the vector of observable controls whereas e^Y is a vector of independently distributed error terms assumed to be orthogonal to both θ_A and β^Y. *Y* is the dependent variable of interest.

Based on insights from the Heckman equation, the human capital model and reviewed literature, the following hypothesised paths is developed. The hypothesised paths are illustrated in Figure 2:

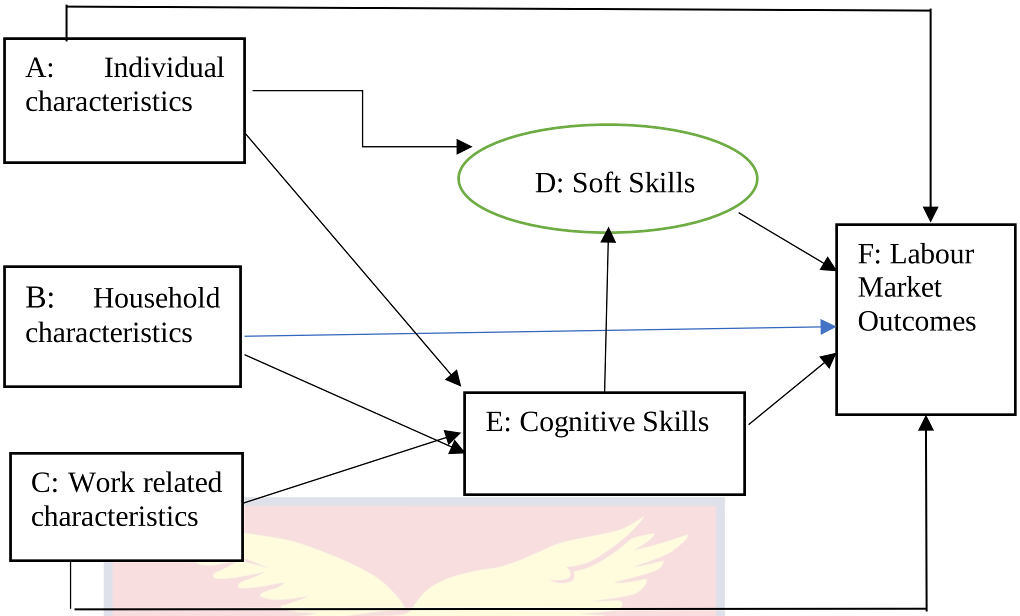

Figure 2: Hypothesised paths for the SEM regression

Source: Nunoo (2020).

From Figure 2, the path diagram illustrates the channels through which skills influence labour market outcomes of individuals in urban Ghana. It is argued that soft skills measured as personality traits has direct effect on labour market outcome like earnings and employment status. In Box A, individual characteristics includes years of schooling, sex, age, the square of age, age of starting school and whether the individual attended preschool. These variables are expected to have direct effect on labour market outcomes but indirectly influence our outcome variables through it influence on soft skills and cognitive skills. Of these variables, years of schooling and whether the individual attended preschool is hypothesized to influence soft skills measured as personality traits. Household characteristics are captured in Box B, which includes father and mother in the house and parental education. It is expected that these household variables will directly affect labour market outcome, but indirectly through cognitive skills measured as literacy proficiency. Box C comprises all work-related characteristics – read at work and tenure. Again, these variables have direct effect on labour market outcomes but indirectly through cognitive skills.

The variable of interest – soft skills captured as personality traits – is observed to directly influence the labour market outcomes. This is found in the circle labelled D which signify the fact that they are latent in nature. The personality traits used includes openness to experience, conscientiousness, extraversion, agreeableness and emotional stability. Each of the constructs are mapped to three questions that are measured as Likert scales ranging from 1, "almost never," to 4, "almost always." Box E contains the cognitive skills (literacy proficiency scores) variable. It is hypothesized to directly influence the outcome variables and indirectly through the personality traits.

Following equation (31), the full econometric models are specified:

$$LnWage_{1i} = \gamma_{10} + \beta_{11}Open_{1i} + \beta_{12}Cons_{1i} + \beta_{13}Extra_{1i} + \beta_{14}Agree_{1i} + \beta_{15}Emo\_Sta_{1i} + \gamma_{11}Lit\_Pro_i + \gamma_{12}educ\_yrs_i + \gamma_{13}female_i + \gamma_{14}ageyrs_i + \gamma_{15}ageyrsq_i + \gamma_{16}parent\_edu_i + \gamma_{17}age\_start_i + \gamma_{18}exp_i + \gamma_{19}expsq_i + \gamma_{20}attend\_presch_i + \gamma_{21}fat\_mot\_h_i + \gamma_{22}read\_work_i + \zeta_{1i} \quad (32)$$

$$Open_{1i} = \gamma_{10} + \gamma_{11}educ\_yrs_i + \gamma_{12}attend\_presch_i + \zeta_{1i} \quad (33)$$

$$Cons_{1i} = \gamma_{10} + \gamma_{11}educ\_yrs_i + \gamma_{12}attend\_presch_i + \zeta_{1i} \quad (34)$$

$$Extra_{1i} = \gamma_{10} + \gamma_{11}educ\_yrs_i + \gamma_{12}attend\_presch_i + \zeta_{1i} \quad (35)$$

$$Agree_{1i} = \gamma_{10} + \gamma_{11}educ\_yrs_i + \gamma_{12}attend\_presch_i + \zeta_{1i} \quad (36)$$

$$Emo\_Sta_{1i} = \gamma_{10} + \gamma_{11}educ\_yrs_i + \gamma_{12}attend\_presch_i + \zeta_{1i} \quad (37)$$

$$Lit\_Pro_{1i} = \gamma_{10} + \gamma_{11}educ\_yrs_i + \gamma_{12}attend\_presch_i + \gamma_{13}read\_work_i + \zeta_{1i} \quad (38)$$

$$Pr(Emp\_Status_i = 1/X_i) = \gamma_{10} + \beta_{11}Open_{1i} + \beta_{12}Cons_{1i} + \beta_{13}Extra_{1i} + \beta_{14}Agree_{1i} + \beta_{15}Emo\_Sta_{1i} + \gamma_{11}Lit\_Pro_i + \gamma_{12}educ\_yrs_i + \gamma_{13}female_i + \gamma_{14}ageyrs_i + \gamma_{15}ageyrsq_i + \gamma_{16}parent\_edu_i + \gamma_{17}age\_start_i + \zeta_{1i} \quad (39)$$

$$Pr(Informal_i = 1/X_i) = \gamma_{10} + \beta_{11}Open_{1i} + \beta_{12}Cons_{1i} + \beta_{13}Extra_{1i} + \beta_{14}Agree_{1i} + \beta_{15}Emo\_Sta_{1i} + \gamma_{11}Lit\_Pro_i + \gamma_{12}educ\_yrs_i + \gamma_{13}female_i + \gamma_{14}ageyrs_i + \gamma_{15}ageyrsq_i + \gamma_{16}parent\_edu_i + \gamma_{17}age\_start_i + \zeta_{1i} \quad (40)$$

$$Pr(SkilledWk_i = 1/X_i) = \gamma_{10} + \beta_{11}Open_{1i} + \beta_{12}Cons_{1i} + \beta_{13}Extra_{1i} + \beta_{14}Agree_{1i} + \beta_{15}Emo\_Sta_{1i} + \gamma_{11}Lit\_Pro_i + \gamma_{12}educ\_yrs_i + \gamma_{13}female_i + \gamma_{14}ageyrs_i + \gamma_{15}ageyrsq_i + \gamma_{16}parent\_edu_i + \gamma_{17}age\_start_i + \zeta_{1i} \quad (41)$$

Table 6: Expected signs of variable in the models linking soft skills and labour market outcome

Variable	*LnWage*	*Emp_Status*	*Informal*	*SkilledWk*
Open	+	+	-	+
Cons	+	+	-/+	-/+
Extra	+	+	-/+	+
Agree	-/+	+	-/+	-/+
Emo_Sta	+	+	-/+	+
Lit_Pro	+	+	-	+
educ_yrs	+	+	-	+
parent_edu	+	+	+	+
age_yrs	+	+	-/+	+
Ageyrsq	-			
Female	-	-	+	-
read_work	+	+	-	+
Exp	+	+	-	+
Expsq	-			
age_start	-/+	-/+	-/+	-/+
attend_presch	+	+	+	+
fat_mot_h	+	+	-/+	+

Source: Nunoo (2020).

Table 6 details the expected signs of the variables used in the estimation of the effect of personality traits on labour market outcomes. The dependent variables include the log of hourly earnings (*LnWage*), employment status measured as whether one is employed or not (*Emp_Status*), sector of employment proxied as formal or informal (*Informal)*, and the skills level of the individual measured as either being highly skilled or low skilled (*SkilledWk*).

Among the independent variables used in the SEM models include; openness to experience *(Open*), conscientiousness *(Cons)*, extraversion *(Extra)*, agreeableness *(Agree)* and emotional stability *(Emo_Sta)*. *Lit_Pro* is the proxy for cognitive skills representing literacy proficiency levels or scores; *educ_yrs* measured both as years of education completed by the individual and the educational level completed; *female* is a dummy variable for sex of the individual; *parent_edu* is the level of parental education of both mother and father; *read_work* is the length of material the individual reads at work; *fat_mot_h* denotes whether the individual had both parents in the house while growing up; *attend_presch* show whether the individual attended preschool; *ageyrs* is the age is the individual at the time of test; *ageyrsq* is the square of age in years, *exp* is the experience of the individual; *expsq* is the square of experience; *age_start* denotes the age at which individual start primary school.

Model Fit

Generally, the following criteria are used to measure model fit (Myers *et al*., 2013): The chi-square (χ^2) likelihood ratio statistic, the goodness-of-fit index (GFI), the normed fit index (NFI), the comparative fit index (CFI), the root mean square error of estimation (RMSEA), the coefficient of determination (R^2), and standardized root mean square residual (SRMR). In this study, the choice of statistical software – STATA – and sample weight meant that R^2 and SRMR were finally used to assess the models. SRMR measures the average difference between the observed and model implied correlations. When it is close to 0, it denotes that the model fits well. Hu and Bentler (1999) propose values close to .08 or below to indicate good fit. The coefficient of determination (R^2) represents the proportion of the total variance of the indicator explained by the latent variable. Values closer to 1 indicates that the model is good fit.

The STATA software command "*sem*" is used to analysed equations (32) to (38). This is due to the fact that the dependent variables in these models are continuous. In addition to a general model, different models are run separately for males and females. The "*Gsem*" command is used for all the binary dependent outcomes (equations 39 – 41). The marginal effects are estimated and reported employing the approach proposed by Long and Freese (2014).

Summary

In this chapter, the research methods used were introduced and discussed. In addition to the rationale for the methods and variables selected, the theory and methodology used for the analysis are also examined. Along with examples of the strengths and limitations associated with the positivist philosophy driving this study. The chapter also outlined the theoretical constructs and analytical models used in the study and identified the different dependent and independent variables employed in the empirical analysis. The data used along with the descriptive statistics of the empirical research variables were clarified in the chapter. Results of the empirical estimation of the effects of age of starting school on cognitive skills are discussed in the following chapter.

CHAPTER FOUR

AGE OF STARTING SCHOOL AND COGNITIVE SKILL PROFICIENCY

Introduction

This chapter presents and discusses the empirical results of the effect of age of starting school on the cognitive skills proficiency of adults. This chapter provides an answer to the first objective of the study using the hypotheses: starting school at the required age of six has no effect on the literacy proficiency level and that the effect of age of starting school on literacy proficiency levels is mediated by gender and education. The chapter is organised into three sections. The first section presents summary statistics and the bivariate analyses on the key variables while the second section provides the estimated results. The third section concludes the chapter and highlights the main findings.

Summary of statistics on literacy score and key explanatory variables

This section presents a description of the proxy for cognitive skills (literacy scores) in relation to the key variables. This is shown in Table 7. The mean literacy score of the respondents in various categories are presented. With regards to age of starting primary one, individuals who started schooling at exactly age six (6) obtained the higher literacy scores (154.43), with individuals who started earlier than age six obtaining a mean score of 148.88 and 123.03 for those who starter later than age six (123.03). The result revealed that comparatively, in Ghana, individuals who started school later than age six (6) constitute 46% of the sample. Nonetheless, this group had the least mean literacy score as well as the least variability in the scores.

The results, further, showed that on the average, males had a higher literacy score than females and this is coupled with a higher variability in the scores. On the labour market participation and literacy scores, about 72% of the respondents were employed while approximately 23% of them were inactive and the remaining 5% of the respondents being unemployed. However, on the average, those who were employed recorded the lowest literacy score followed by the unemployed respondents, and, lastly, the inactive respondents. One of the chief indicators of cognitive skills proficiency and academic performance is the socioeconomic background of pupils. As shown in Table 7, individuals from the middle-class and high-class socioeconomic families reported higher literacy scores than their counterparts from disadvantaged families. From the data, it was evident that in Ghana, people from the middle class with mean literacy score of 146.82 perform better than those from high socioeconomic families (143.86). Generally, compared to other countries that took part in the STEP program, individuals in Ghana performed the worse (Pierre, 2014).

From the descriptive statistics, as shown in Table 7, approximately 83% of Ghanaian parents were observed to be involved in the education of their wards when their wards were growing up. Also, the results revealed that individuals whose parents got involved in their education reported a mean literacy score of 145.49 compared to 110.80 among those whose parents did not get involved in their education. Another important observation from the summary statistics is that, on the average, individuals whose parents had higher levels of education scored higher in the literacy assessments. It was observed that at all levels of education, mother's education appeared to be a favourable indicator of literacy proficiency score. This supports the general proposition that higher levels of parental education enhance literacy proficiency.

Another pressing observation from the summary statistics is the revelation that respondents without chronic diseases had a mean literacy score of 140.08 compared to their counterparts with chronic diseases (134.60). An additional observation from the results is that individuals who experienced economic shocks prior to age fifteen (15) performed badly in the literacy proficiency assessment (133.96 for those who experienced one shock, and 130.48 for those who experienced two or more shocks) relative to their counterparts who did not (145.26) experience any shock. Another interesting observation from the data is that on the average, respondents who dropped out of school performed badly (87.50) relative to their counterparts who never dropped out of school (155.3).

Table 7: Summary statistics on literacy score

	Mean	Standard Deviation	Frequency
Age of starting first grade			
Less than 6 years	148.88	95.04	92
Exactly 6 years	154.43	93.05	1356
More than 6 years	123.03	86.55	1244
Gender			
Male	163.57	91.28	1206
Female	120.37	86.96	1486
Highest Education level completed			
No education	80.68	47.86	300
Primary	96.05	74.98	394
MSLC/JSS/JHS	110.94	83.28	1074
Secondary	188.77	74.17	522
Tertiary	239.83	57.78	402
Length of material read overall score			
skill not used	82.21	60.24	653
Low	120.51	89.08	987
Medium	181.38	82.79	458
High	204.54	75.82	565
Mother Tongue			
Akan only	134.42	91.07	1532
Akan and other	136.85	94.20	210
Other only	148.42	91.37	936
Labor Market Status			
Employed	129.62	90.94	1936
Unemployed	153.52	91.57	145
Inactive	168.22	86.94	605
Socioeconomic Status			
Low	116.41	86.63	562
Middle	146.82	91.35	1512
High	143.86	93.64	592
Parental Involvement in Education			
Parents not involved	110.80	82.83	445
Parents involved	145.49	92.00	2229
Father's Education			
No education	120.63	85.95	98
Basic	118.67	81.77	64
Secondary	149.28	91.59	1160
Tertiary	185.59	89.62	324

Table 7 Continued

Mother's Education			
No education	136.50	89.00	214
Basic	146.85	93.36	127
Secondary	167.12	91.54	871
Tertiary	211.52	80.23	106
Asset Wealth Index Quintiles			
Poorest	98.08	76.17	417
Poorer	110.45	82.97	511
Middle	128.91	84.83	568
Richer	152.77	92.54	663
Richest	195.68	84.85	533
Chronic Illness			
Does not have Chronic Illness	140.08	91.59	2460
Has Chronic Illness	134.60	90.64	227
Age in Completed Years			
15-24	165.51	86.66	784
25-34	138.08	93.30	934
35-44	112.20	85.95	523
45-54	123.28	88.54	259
55-64	139.60	92.71	192
Number of Economic Shocks before age 15			
No shock	145.26	93.49	1458
One shock	133.96	89.39	752
Two or more shocks	130.48	88.15	468
Dropped out of highest educational level started			
Did not dropout	155.30	92.42	2070
Dropped out	87.50	65.21	620

Source: Nunoo (2020).

In delving much deeper into the data, the percentage distribution of the respondents per literacy proficiency level was analysed using bivariate analyses. This was done using chi-square test to establish if there were some statistical associations between literacy levels and the key covariates. The results of the bivariate analyses of all the independent variables are reported in Table 8. The evidence shows that the age of starting first grade (primary 1) matters for the level of literacy in that it has a significant effect in explaining cognitive skills levels. It is observed that, in Ghana, the proportion of individuals in all the categories decreases with increasing levels of literacy proficiency. At lower levels of literacy, those who started schooling at age greater than six (6) are more (67.26%) than their counterparts who started school at exactly six years (6) (50.34), but greater than those who started at an age less than six (6) (53.85%). Interestingly, the picture is a bit different for those at the higher levels of literacy. The results revealed that the proportion of people who started schooling at an age lesser than six (6) are more (1.10%) in level 4 proficiency followed by those who started at exactly age six (6) (0.52%). However, none of those who started later than age six (6) were found able to perform at level 4 proficiency.

Moreover, it was observed that gender has significant association with the level of literacy proficiency. As it is evident from Table 8, females tend to do well at lower levels of literacy proficiency (68.57) compared to their male counterparts (45.59). However, the proportion of females performing at higher levels of literacy reduces more steadily than their male counterparts – from 11.50 percent in level 2 to 0.2 percent in level 4 for females as against 26.03 percent in level 2 to 0.42 percent in level 4 for males.

As expected, higher levels of education of respondents are observed to be enhancing literacy proficiency. It is observed to be statistically significant in predicting changes in literacy proficiency levels. The results showed that higher levels of literacy are attained as individuals attain higher levels of education. In other words, there is a positive relationship between the levels of education and the literacy proficiency levels. Among those who attained tertiary education, over 70 percent of them performed at level 2 proficiency and above; while individuals who had no schooling or attained primary education had about 98 percent and 80 percent below level 1 proficiency respectively. No observations were recorded for level 4 proficiency for JHS, Primary, and no educations groups. Labour market status was also found to be significant in explaining literacy proficiency levels. It was observed from the study that individuals in the inactive category relatively performed better at higher levels of literacy proficiency than those in the other groups. This could be due to the fact that many in the inactive group are still in school studying.

One of the significant revelations from the study is the observation that mother's education is a strong predictor of literacy levels of individuals compared to father's education. The study found that when mother's education is at lower level, a chunk of the population is found at below level 1 literacy proficiency, thus, respondents with no education (59.24%), basic (52.38%), and secondary (43.63%). However, among individuals whose parents had tertiary education, over 52 percent performed at level 2 and above proficiency levels. The only variable that was found to be insignificant statistically in impacting literacy proficiency was chronic illness. The distribution reduces steadily for both groups towards higher levels of literacy.

One of the most debated issues in the literature is the link between the number of economic shocks one suffers before age 15 and its impact on the level of literacy proficiency. This study found that, it is significant in explaining the outcome variable. Though most of the respondents with 'no shock', 'one shock', and 'two or more shocks' are concentrated in the lower levels of literacy, 55.51%, 60.70% and 63.56% respectively, about 26 percent of individuals who experienced no shock at age 15 performed at level 2 and above proficiency levels. Actual age categorised in groups was observed to significantly influence literacy proficiency. For the various age groups, individuals between the ages of 15 – 24 performed better, with about 30 percent of them performing at level 2 proficiency level and above. Interestingly, the age group between 34 – 44 had the worst performance at all the levels of proficiency.

Lastly, the results showed that dropout status and parental involvement in education significantly affect literacy proficiency levels. Among individuals who dropped out of their highest level of schooling, about 89 percent of them could only performed at below level 1 proficiency. Those who experienced parental involvement in their education tend to perform better on an average than individuals who did not experience their parents' involvement in their schooling. In addition, the study found statistical significant evidence regarding the association between father's education, socioeconomic status, asset wealth quintile and the mother tongue variables with the literacy proficiency levels.

These findings are consistent with literature. Kenn (2016), in comparing the cognitive skills levels (literacy proficiency) of seven STEP survey and the score of the working age population in Germany, Republic of Korea, and the United States, observed that the average literacy proficiency levels were generally high for the OECD countries than the countries from the STEP survey. It was revealed that the worst participating countries were the two sub-Saharan countries – Ghana and Kenya – because more than 50 percent of all the participants scored on the average below level 1. The next worst performing country was Bolivia with a proficiency score at level 1. This shows that on the average, urban workers in Ghana, Kenya and Bolivia are able to only process simple texts in the literacy proficiency scale (OECD, 2013). Regarding educational level, Kenn (2016) showed that literacy proficiency varied widely across participating countries. For Ghana, Kenya and Bolivia, even among those with secondary education, these countries exhibited the least performance with a mean score of literacy proficiency level 2 compared with the other countries at level 3.

On the gender dimension, contrary to the situation in Ghana, Grinyer (2006), using the Skills for Life Survey, reported that in England, females generally performed better at the various literacy levels than males. Green and Riddell (2001) articulated similar findings from Canada. They revealed that from prose to document on the literacy assessment profile, women in Canada outperformed men. In Australia, Shomos and Forbes (2014), using the PIAAC data of 2011/12, observed similar trends with women assessed at each literacy skill level to be doing better than their male counterparts. These findings show that, especially among the OECD countries, women on average perform as well as their male counterparts or even better. Lee and Miller (2000), Shomos and Forbes (2014) and Grinyer (2006) corroborated the results of this study that education has an increasing effect on literacy proficiency scores and levels. The various authors showed from the different surveys that while literacy scores and levels increase with the education levels attained, those with higher education tend to perform at the higher levels of education, and this confirms the findings of this study.

The literature is mixed on how age of starting school affects cognitive skills. Confirming the works of Stipek (2002), Elder and Lubotsky (2009) and

Chen (2015), this study showed that individuals who start school at the required age of six years attain better cognitive skills outcome. On the contrary, Bedard and Dhuey (2006) argue that individuals who start school at older ages tend to perform well on literacy proficiency. Baber (2016) also articulates that for individuals to develop cognitively, it will be prudent for children not to start school until after age seven (7). In addition, the age effect on cognitive skills especially among adults has been observed to be negative. While this study showed a concave shape effect of age on literacy proficiency, Barrett and Riddell (2019) found the literacy skills decline with age for OECD countries. Shomos and Forbes (2014) also made similar observations for Australia.

Table 8: Bivariate analysis of factors affecting cognitive skills proficiency level

	Literacy Level					P-Value	Total
	Below Level 1 %	Level 1 %	Level 2 %	Level 3 %	Level 4 %		
Age of starting first grade						0.000	
Less than 6 years	53.85	21.98	16.48	6.59	1.10		91
Exactly 6 years	50.34	21.43	21.36	6.35	0.52		1339
More than 6 years	67.26	16.25	14.46	2.03	0.00		1232
Gender						0.000	
Male	45.59	21.58	26.03	6.38	0.42		1192
Female	68.57	17.01	11.50	2.72	0.20		1470
Highest Education level completed						0.000	
No education	98.33	1.00	0.67	0.00	0.00		299
Primary	79.85	14.80	5.10	0.26	0.00		392
MSLC/JSS/JHS	70.80	18.87	9.39	0.94	0.00		1066
Secondary	31.04	31.83	33.01	3.73	0.39		509
Tertiary	8.08	20.96	47.73	21.72	1.52		396
Length of material read overall score						0.000	
skill not used	91.88	5.51	2.45	0.15	0.00		653
Low	65.40	18.89	14.27	1.33	0.10		974
Medium	37.17	26.33	29.87	6.64	0.00		453
High	24.73	27.80	33.57	12.64	1.26		554
Mother Tongue						0.005	
Akan only	60.82	18.27	16.94	3.90	0.07		1512
Akan and other	58.94	20.77	14.98	5.31	0.00		207
Other only	54.25	19.59	20.45	4.95	0.75		929
Labor Market Status						0.000	
Employed	63.81	16.29	16.08	3.60	0.21		1916
Unemployed	51.39	20.83	23.61	4.17	0.00		144
Inactive	42.79	26.85	22.82	6.88	0.67		596
Socioeconomic Status						0.000	
Low	70.43	14.87	12.01	2.51	0.18		558
Middle	54.45	20.40	20.47	4.41	0.27		1496
High	56.36	19.07	17.87	6.19	0.52		582

Table 8 continued

Parental Involvement in Education						0.000	
Parents not involved	74.72	11.74	11.96	1.58	0.00		443
Parents involved	55.05	20.45	19.23	4.91	0.36		2201
Father's Education						0.000	
No education	70.53	15.79	11.58	2.11	0.00		95
Basic	70.31	14.06	15.63	0.00	0.00		64
Secondary	52.87	21.43	20.38	4.79	0.52		1149
Tertiary	34.28	24.84	27.67	12.89	0.31		318
Mother's Education						0.000	
No education	59.24	21.80	16.59	2.37	0.00		211
Basic	52.38	21.43	22.22	3.17	0.79		127
Secondary	43.63	22.57	26.08	7.13	0.58		855
Tertiary	20.75	25.47	32.08	20.75	0.94		106
Asset Wealth Index Quintiles						0.000	
Poorest	81.16	10.39	8.21	0.24	0.00		414
Poorer	72.30	15.91	10.81	0.98	0.00		509
Middle	65.19	19.18	13.14	2.31	0.18		564
Richer	50.00	23.92	20.06	5.56	0.46		648
Richest	29.60	22.77	35.29	11.57	0.76		527
						0.544	
Chronic illness							
Does not have chronic illness	57.99	19.07	18.13	4.52	0.29		2434
Has chronic illness	62.78	17.49	16.59	2.69	0.45		223
Age in completed years						0.000	
15-24	43.98	26.78	23.29	5.43	0.52		773
25-34	58.53	17.28	19.44	4.54	0.22		926
35-44	74.47	11.61	11.03	2.71	0.19		518
45-54	67.58	19.14	8.59	4.69	0.00		256
55-64	58.73	16.40	21.16	3.17	0.53		189
Number of economic shocks before age 15						0.003	
No shock	55.51	18.92	19.54	5.68	0.35		1444
One shock	60.70	19.65	16.42	3.10	0.13		743
Two or more shocks	63.56	17.79	15.84	2.39	0.43		461
Dropped out of highest educational level started						0.000	
Did not dropout	49.05	22.47	22.52	5.58	0.39		2044
Dropped out	89.12	7.63	2.92	0.32	0.00		616

Source: Nunoo (2020)

Results of Multivariate Regression Analysis - OLS and 2SLS Results

Multivariate analyses were undertaken to examine the relationship between the age of starting school and cognitive skills (literacy proficiency scores and levels). In responding to the first objective, OLS technique and 2SLS are employed in this section while ordinal probit and IV probit are used in the next section. The study sought to find out whether the age at which one starts schooling, treated as either continuous or categorical variables, matters for cognitive skills proficiency.

The Variance Inflation Factor (VIF) values of the explanatory variables were used in accordance with normal econometric procedures (Pallant, 2007; Cameron & Trivedi, 2010). Pallant maintains that the VIF value for each independent variable should not exceed 10.00, if multicollinearity does not exist. The absence of multicollinearity also requires the tolerance of each independent factor which is the inverse of the VIF value to not be less than 0.10. Results shown in Appendix B indicate that all the variables met these criteria, which means that there is no problem of multicollinearity between the explanatory variables. In addition, the results of the link test indicate the correct specification of models and the fact that they are statistically stable.

The estimated effect of age of starting school together with other covariates on literacy proficiency skills are shown in Appendix C and Table 9. Thirteen different models are presented for the OLS regression with the 13th model being the 2SLS. With regards to the positive and statistically significant coefficients, they denote improvements in literacy proficiency (cognitive skills), while negative coefficients indicate a decreasing effect on literacy proficiency. It is evident from Appendix C and Table 9 that there is a negative relationship between the age of starting school and the literacy proficiency scores. This result hold true whether age of starting school is measured as continuous or categorical variables. In the simplest models 1 and 2 in Appendix C, literacy proficiency is regressed on age of starting school with no other covariates. Model 1 shows that, if one delays the age of starting school by one year, literacy proficiency scores reduce by approximately 12 points. To assess the effect of starting school at the required age of 6 years as opposed to either earlier or later than 6, model 2 was estimated. The results revealed that starting school before age 6 has an adverse effect on the literacy but results is not statistical significant. However, statistically significant negative results are found for individuals who start school at ages greater than 6. It shows that literacy scores decreased by about 31 points compared to their counterparts who started school at exactly 6 years.

In models 3 and 4 presented in Appendix C, the number of years spent in school is added to the model. The study found statistically significant evidence that a year increase in the age of starting school reduces one's literacy score by approximately 3 points. At the same time, compared to individuals who started school at the required age of 6, starting school after six years is associated with about 8 points reduction in literacy scores. This is reinforced by the effect of number of years spent in school on literacy proficiency scores. The study revealed that in Ghana, one more year spent in school increases one's literacy score by 13.6 points. We show that age of starting school considered as either continuous or categorical, and number of years spent in school are significant indicators of the level of one's literacy. The fall in coefficients indicate the important role schooling plays in cognitive skills development.

Table 9: Results of OLS and 2SLS regression on age of starting school and literacy proficiency

	OLS	OLS	OLS	OLS	IV2SLS
	(9)	(10)	(11)	(12)	(13)
Age started first grade	-2.32^{b}	-3.14^{a}			-5.61^{a}
	(0.98)	(0.95)			(1.11)
Age started first grade (Exactly 6=0)					
Less than 6			-12.02	-9.45	
			(7.56)	(7.30)	
Greater than 6			-5.94^{b}	-7.15^{a}	
			(2.86)	(2.77)	
Education					
Educ in years	10.34^{a}		10.44^{a}		
	(0.54)		(0.54)		
Educational Levels (No Schooling =0)					
Primary		-12.28^{b}		-11.34^{b}	
		(5.56)		(5.56)	
JHS		-0.08		1.39	
		(5.99)		(5.97)	
Secondary		62.75^{a}		64.58^{a}	
		(6.82)		(6.79)	
Tertiary		97.43^{a}		99.29^{a}	
		(7.38)		(7.36)	
Length of material read (Skill not used=0)					
Low	-3.96	5.46	-3.91	5.49	4.14
	(3.93)	(3.85)	(3.93)	(3.85)	(4.22)
Medium	29.26^{a}	34.09^{a}	28.90^{a}	33.70^{a}	42.11^{a}
	(5.00)	(4.81)	(5.00)	(4.82)	(5.63)
High	38.64^{a}	41.51^{a}	38.54^{a}	41.52^{a}	56.04^{a}
	(5.08)	(4.86)	(5.08)	(4.86)	(5.85)
Dropped out of highest educational level started (N0=0)					
Dropped out	8.93^{b}	-5.74	9.07^{b}	-5.36	-9.40^{b}
	(3.97)	(4.40)	(3.97)	(4.40)	(3.99)
Wealth quintile (Poorest=0)					
Poorer	2.68	4.17	3.23	4.84	3.90
	(4.68)	(4.53)	(4.68)	(4.53)	(5.44)
Middle	7.81^{c}	7.92^{c}	8.35^{c}	8.67^{c}	13.39^{b}
	(4.67)	(4.52)	(4.66)	(4.51)	(5.44)
Richer	14.22^{a}	12.42^{a}	14.82^{a}	13.31^{a}	21.25^{a}
	(4.75)	(4.61)	(4.73)	(4.59)	(5.51)
Richest	34.65^{a}	29.42^{a}	34.99^{a}	30.03^{a}	48.10^{a}
	(5.22)	(4.61)	(5.21)	(5.06)	(6.06)

Table 9 continued

Gender (Male=0)					
Female	-22.61[a]	-23.09[a]	-22.59[a]	-22.94[a]	-20.37[a]
	(2.86)	(2.76)	(2.86)	(2.76)	(3.38)
Number of economic shocks before age 15	-1.27	-0.79	-1.30	-0.86	-1.36
	(1.32)	(1.28)	(1.32)	(1.28)	(1.52)
Mother tongue (Akan only=0)					
Akan and other	8.22	5.81	8.83c	6.39	6.82
	(5.12)	(4.95)	(5.13)	(4.96)	(5.81)
Other only	14.77[a]	9.12[a]	14.51[a]	8.71[a]	15.04[a]
	(2.94)	(2.87)	(2.94)	(2.86)	(3.45)
Labour market status (Employed=0)					
Unemployed	11.79[c]	12.85[b]	11.75[c]	12.86[b]	19.40[a]
	(6.03)	(5.83)	(6.03)	(5.83)	(6.57)
Inactive	28.94[a]	35.14[a]	29.31[a]	35.61[a]	12.18[b]
	(3.65)	(3.58)	(3.65)	(3.58)	(4.95)
Socioeconomic Status (Low=0)					
Middle	0.48	1.09	0.34	1.03	4.57
	(3.52)	(3.40)	(3.53)	(3.41)	(3.94)
High	-7.46[c]	-7.18[c]	-7.53[c]	-7.17[c]	-8.96[c]
	(4.25)	(4.10)	(4.25)	(4.11)	(4.83)
Parental involvement (Not involved=0)					
Involved	-0.90	2.43	-0.72	2.63	-0.47
	(3.76)	(3.63)	(3.76)	(3.64)	(4.13)
Chronic illness (Not present=0)					
Present	8.54[c]	7.90	8.72[c]	8.08[c]	6.97
	(5.03)	(4.85)	(5.03)	(4.86)	(5.52)
Age in years	-0.68[a]	-0.56[a]	-0.69[a]	-0.57[a]	-0.51[a]
	(0.13)	(0.13)	(0.13)	(0.13)	(0.15)
Predicted education					7.49[a]
					(0.67)
Constant	59.61[a]	127.43[a]	45.59[a]	107.37[a]	87.67[a]
	(11.73)	(11.61)	(8.72)	(8.78)	(12.98)
R^2	0.44	0.48	0.44	0.48	0.35
Log likelihood	-2929.66	-2897.74	-2794.28	2887.68	-11868.71
F Stats.	189.22[a]	179.56[a]	157.25[a]	268.46[a]	279.67[a]
_hat	0.44	0.97	2.45	0.93	1.89
	(0.17)	(0.02)	(0.31)	(0.01)	(0.18)
hatsq	0.16	0.07	0.02	0.03	0.02
	(0.11)	(0.17)	(0.11)	(0.53)	(0.09)
Mean VIF	1.88	2.05	1.61	2.14	1.56
N	2,631	2,631	2,631	2,631	2,167

Robust standard errors in brackets, a $p<0.01$, b $p<0.05$, c $p<0.1$

Source: Nunoo (2020).

The introduction of additional covariates observed to be associated with literacy proficiency in the bivariate analysis from the model can be found in models 9 to 12. In Table 9, (model 9), it was revealed that an increase in the age of starting school by one additional year decreases individual's literacy score by 2.32 points. The result is statistically significant at 5 percent. In the same model, the results also showed that an increase in the number of years spent schooling enhances one's literacy score by 10.34 points, and this is statistically significant at 1 percent. From models 11 and 12, the results showed that starting school later than the required age of 6 results in about 6 and 7 points reduction in literacy scores compared to individuals who started school at the required age of six years.

Education as a categorical variable was introduced in models 10 and 12. Interestingly, while dropped out shows statistical significance, it indicated the wrong signs in models 9 and 10. Of all the levels a respondent can complete, completing junior high school was found not to be significant in influencing literacy scores similar to no schooling. Though primary school has an effect on literacy scores, it is observed to negatively influence cognitive skills. Completing secondary and tertiary education compared to no schooling resulted in increased literacy scores of between 62 and 99 points. This give indication of the importance of higher education in cognitive skills. The negative and insignificant effect of primary and JHS gives indication of the poor quality of education at these levels of education. It, therefore, suggests that if an individual who has never been to school takes advantage of other forms of learning, they can perform better than those who have benefitted from lower levels of schooling in Ghana. Individuals who drop out of school were observed to positively increase literacy score compared to their counterparts who did not drop out of school.

The results support the Heckman equation that argues for early intervention in children cognitive skills development through investments in schooling. In addition, as proposed by the various cognitive development theories, taking advantage of the development stages in childhood by enrolling a child in an educational institution at age six enhances cognitive skills development. As revealed in the various models in Table 9, starting school later than the required age of 6 years leads to reduced literacy proficiency scores, and this indicates that entering school at the approved age benefit children positively. Starting school later than the required age, we argue has the potential of harming these individuals through the way their colleagues at school receive and interact with them. Many endure ridicules at the hands of peers. This, together with unenthusiastic school environments, lead to, in most cases, dropouts.

This finding corroborates the results of Angrist and Kruger (1991), Fertig and Kluve (2005) and Dobkin and Ferrerira (2010) who found positive effects of starting school at the required age on learning outcomes and cognitive skills development. Chen (2015) also gives credence to the findings of this study in that he asserts that late entry to school had a negative relationship with children's cognitive skills development. It can be observed too that the current results run contrary to the outcome of studies by Lubotsky and Kaestner (2016), Cook and Kang (20016), Depew and Eren (2016), Elder and Lubotsky (2009) and Kwaguchi (2011). These studies revealed that entering school too early adversely affect cognitive development, thereby, giving support to late entry to school. Interestingly, this study saw no significant effect of starting school early than the required age of 6 on cognitive skills. This observation is also made by Mullis *et al.* (2007). They revealed that among the countries that took part in the 2006 PIRLS, starting school early had no direct effect on literacy proficiency and cognitive skills development.

Education, measured as years of schooling completed, has a positive effect on literacy proficiency scores. This finding conforms to literature. Among others, Glewwe and Jacoby (1994), Glewwe (1996), Blunch and Verner (2000) showed positive relationship between years of schooling and cognitive skill proficiency in Ghana. Glewwe (1996) argues that while education generally results in improved cognitive skills proficiency, the interaction of years of schooling with age gives the indication of the gradual decline in the quality of education in Ghana. This assertion is due to the fact that older ones performed relatively better than younger ones denoting the decline in quality of education in the country. Desjardins (2003) and Boudard (2001) found that educational attainment remains the strongest determinant of literacy proficiency among adult, and that, it is mediated through continuous reading and use of the skills at work and home.

From Table 9, statistical evidence was found to support the general argument that wealth status of the household influences the literacy proficiency levels of individuals. Being in the middle, richer, and richest wealth quintile improves one literacy scores compared to those in the poorest quintile. The result shows that in Ghana, those from the middle, richer, and richest wealth quintile have higher literacy scores of 7.81, 14.22, 34.65 respectively than their counterparts in the poorest quintile. Similar findings are made in model 10. It was also observed that socio-economic status (SES) was a key determiner for literacy proficiency scores of individuals in household with high SES juxtaposes to individuals in households with low SES levels. This is because the more family resources are available to an individual, the higher the likelihood for such individual to attain higher levels of literacy (Trusty, 2000). The argument stems from the intuition that the home has a great influence on the students' psychological, emotional, social and economic state. In the view of Ajila and Olutola (2000), the state of the home affects the individual since the parents are the first socializing agents in an individual's life. Disadvantaged children, especially, have been observed not to perform well academically as their elite peers (Reardon, 2011; Steele, 2010). In addition to the debate on the effect of wealth and SES on literacy levels, is whether the gender of an individual matters for literacy proficiency levels. Campbell, Hombo and Mazzeo (1999) asserts that gender is a good predictor of academic skills, interest or even emotional characteristics. It was observed in the full models 9 and 10 that being a female compared to being a male reduces literacy proficiency scores by 22.61 and 22.59 points respectively.

In addition, the study looked at the effect of labour market participation on the literacy scores. Results from Table 9 (models 9 to 12) displays quite surprising association with respect to being unemployed and inactive compared to being employed. Literacy proficiency scores of those unemployed and inactive is shown to increase by about 12 and 30 points higher respectively than those employed. This could be because the unemployed have enough time to study and improve their cognitive skills while many among the inactive cohort are still in school studying. This affords individuals in these cohort to improve their cognitive skills through reading and learning. The question of whether chronic diseases have implications for literacy proficiency has also gained much traction in the literature. The study found that individuals who had suffered some form of chronic diseases in their lifetime had literacy score of about 9 points higher than their counterparts who had not battled chronic diseases. This observation run counter-intuitive to the expected result. The possible reason could be that these individuals are not saddled with too much extra duties, thereby, giving them time to develop their cognitive skills more fully.

Statistically significant results were found for those speaking non-Akan mother tongues at home and those speaking the Akan language. Compared to not using the reading skills at work, individuals who indicated making use of it (medium and high) had significantly positive impact on literacy proficiency. This ranged from as much as about 29 points increased in literacy score to about 62 points. Unfortunately, parental involvement in education variable was found to be insignificant in explaining literacy proficiency. This could be due to the general low levels of parental education and lower literacy proficiency levels of most these guardians themselves as shown in Table 8.

A challenge with the OLS estimates is the possible problem of endogeneity caused by the reversed causality between education as an explanatory variable and cognitive skills proxied by literacy proficiency. The implication of this is that the OLS coefficients will be potentially biased. To obtain unbiased coefficients, it was imperative to correct the likely problem of endogeneity. The study explored the option of two-stage least squares (2SLS) as seen in model 13, Table 9. The age of leaving school is used as the instrument. It is argued that while the age of leaving school is dependent on first enrolling in an educational system, it does not directly influence the literacy proficiency level of an individual. The post estimation tests are presented in Appendix D.

The 2SLS estimation shows that delaying the age of starting school a year reduces one's literacy score by 5.61 points. The result is statistically significant at 1 percent and about 3 bases points higher than the magnitude of coefficient in model 9. Unlike the full model for the OLS, dropping out of school is observed to have a dampening effect on one's literacy score. The evidence shows that in Ghana, individuals who drop out of school have literacy score of 9.4 point less than individuals who never drop out of school. This finding is statistically significant at 5 percent. In addition, individuals who find themselves in the middle, richer, and richest wealth quintile have literacy scores greater than those in the poorest wealth quintile. Specifically, in respective terms, the results revealed that literacy proficiency score increases with increase in the wealth status of the household, and this resulted in those in the richest quantile comparatively having about 48 more literacy proficiency scores than individuals in the poorest quantile. The length of materials read at work had strong positive and significant effect on literacy proficiency scores.

Contrary to the literature, parental involvement in education is found to be statistically insignificant with the wrong sign. Parents have a profound influence on whether a home provides intellectual stimulation, physical and psychological safety, an appropriate degree of structure, and supportive relationships for children to thrive academically. Children with more opportunities at home to build academic skills tend to be better at integrating family, school and community efforts (Ferguson, 1995). Parental involvement has shown a positive relationship with children's academic achievement

(Barnard, 2004; Bower, 2011; Desimone, 1999; Hill & Craft, 2003; Hill & Taylor, 2004; Zellman & Waterman, 1998). Westerlund *et al.* (2013) opine that parental involvement in their child's studies, particularly in terms of academic socialization, improves academic achievement and impacts the overall health and cumulative well-being of lower SES pupils. Parental support acts as a buffer between SES and academic achievement (Little-Harrison, 2012; Liu & Wang, 2008).

Additionally, SES has been repeatedly linked with parental involvement; the higher the socioeconomic status, the higher the parental involvement level is anticipated to be (Altschul, 2011; Lau, Li, & Rao, 2011). Moreover, numerous studies have found that higher SES is related to higher parental involvement levels, and in return, it leads to higher academic achievement and success (McNeal Jr, 2001; Vellymalay, 2012). However, the wrong sign observed for higher SES could be due to the fact that, as argued in the bivariate analysis in Table 8, individuals among the highest SES and those whose parents were involved in their education both performed worse compared to those in the lower brackets. Related to this are the arguments articulated by Glewwe (1996) and Blunch and Verner (2000), who both observed that, parental education was not significant in explaining cognitive skills of Ghanaians. The low levels of SES lead to lower investments in education. This, they opine could be accounting for the insignificant effect of parental education on cognitive development.

On the issue of whether gender matters for literacy proficiency, we found that females had literacy score of 20.37 points lower than their male counterparts. This study corroborates the work of Glewwe (1996) on Ghana, who assessed the determinants of cognitive skills. He found that females compared to male performed worse in both reading and mathematics assessments. In addition, Blunch and Verner (2000) also observed that among the adult population, females are less likely to be literate compared to males in Ghana. There is, however, evidence that females tend to excel in verbal fluency tasks (Buchmann, DiPrete, & McDaniel, 2008), complex text, perceptual speed (Halpern, 1997), and long-term memory (Buchmann *et al*. 2008; Halpern, 1997). On the other hand, boys tend to excel in tasks of verbal analogies, mathematical word problems (Buchmann *et al*. 2008), rapid response and aim, fluid reasoning in mathematical and scientific domains (Halpern, 1997), and working memory (Buchmann *et al*. 2008). These gender differences are observed when looking at grades and test scores, which display different features of academic performance and capability. It has been indicated that boys generally obtain higher scores on standardized tests; while girls, generally, get higher grades in terminal examinations (Aulette & Wittner, 2012).

However, according to Buchmann *et al*. (2008), girls from kindergarten through high school, receive better grades in all major subjects compared to boys. Even as early as kindergarten, girls have been found to have more advanced reading and writing skills; while boys have more difficulties and learn to read and write more slowly than girls. Boys are also more likely to have learning and developmental disabilities that make them more likely to be held back in a grade or in programs for children with special needs (Buchmann *et al.* 2008; Connell, 1996; Clements & Sarama, 2007; Crosnoe & Cooper, 2010; Halpern, 1997).

Very unexpectedly, the results showed that the number of economic shocks experienced before age15 had no statistical significance on literacy proficiency scores, even though it showed evidence of the right sign. Similar findings are observed for whether an individual suffers from a chronic sickness or not. The study again showed that the inactive group have a mean literacy score of 12.18 points greater than those who are gainfully employed; while the unemployed group also has about 19 points more than individuals who are employed. This finding is also statistically significant at 5 percent. The result is plausibly due to the fact that majority of Ghanaians who have completed secondary school or tertiary level education are not working (GSS, 2017). Actual age in years is revealed to be inversely related with literacy proficiency scores at 1 percent level of significance. This shows that aging adversely affects cognitive skills proficiency. This can be boosted with life-long learning and continuing education at all ages. The result is similar to the results of Glewwe (1996) and Blunch and Verner (2000) who also reported significant negative relationship between actual age and cognitive skills in Ghana. Lavy *et al.* (1995) made related observation in Morocco.

Regression results of interaction terms testing the moderating effect of gender and education on cognitive skills

To address the second hypothesis of whether the effect of age of starting school on cognitive skills proficiency is moderated by gender or education, the results in Table 10 is presented. While the variables of interest are presented, the two models contain all the variables used in the full model in Table 9. The two models satisfy all the post estimation test required for OLS analysis. Significantly high proportion of the variations in the dependent variable was explained as reflected by the relatively high Pseudo R-squared values. Model fit indices associated with the results in Table 10, such as the Log-Likelihood and F statistics are within good statistical estimates, indicating that the models are fit for explaining the effects of the various factors on cognitive proficiency.

From Table 10, it can be observed that the coefficient of age of starting school was negative and highly significant in the two models, be it continuous or categorical. This shows that delay in school enrolment adversely affected cognitive skills proficiency of adults in Ghana. Especially, starting school after age 6 results in about 24 points less on the literacy proficiency assessment. The educational level completed in model 1 is found to positively and significantly affect literacy proficiency scores at the tertiary level when compared to individuals with no schooling. Completion of tertiary education results in about 96 more points increase on the literacy score. In model 2, even though primary education is significant in explaining cognitive skills proficiency, it does not have the expected sign, suggesting that those with no formal education tend to perform better compared to this group. Positive and significant coefficients are observed for both secondary and tertiary levels. The results from Table 10 further show that women on the average score have about 53 and 27 points less than men on the STEP literacy proficiency assessment, and the results are highly significant.

Table 10: Age of starting and literacy proficiency with interaction

	OLS	OLS
	(1)	(2)
Age started first grade	-5.18[b]	
	(2.28)	
Age started first grade (Exactly 6=0)		
Less than 6		-35.33
		(32.05)
Greater than 6		-23.94[a]
		(9.40)
Educational Levels (No Schooling =0)		
Primary	-21.73	-20.16[b]
	(22.21)	(9.27)
JHS	11.34	-4.50
	(19.48)	(8.63)
Secondary	38.95	51.67[a]
	(24.36)	(9.41)
Tertiary	95.55[a]	88.27[a]
	(28.99)	(9.73)
Gender (Male=0)		
Female	-52.73[a]	-27.32[a]
	(12.84)	(3.86)
Age started first grade*Gender		
Female	4.21[b]	
	(1.82)	
Age started first grade (levels)*Gender		
Less than 6*Female		-13.47
		(14.98)
Greater than 6*Female		8.82[b]
		(5.47)
Age started first grade*Education		
Primary	1.35	
	(2.84)	
JHS	-1.64	
	(2.48)	
Secondary	3.59	
	(3.28)	
Tertiary	0.32	
	(4.15)	

Table 10 continued

Age started first grade (levels)*Education		
Less than 6*Primary		30.71
		(36.08)
Less than 6*JSS		26.32
		(33.03)
Less than 6*Secondary		24.68
		(35.23)
Less than 6*Tertiary		55.15
		(34.58)
Greater than 6*Primary		12.64
		(11.06)
Greater than 6 *JSS		6.62
		(9.46)
Greater than 6*Secondary		23.96[b]
		(10.50)
Greater than 6*Tertiary		17.74
		(11.63)
Other Explanatory Variables	Yes	Yes
Constant	141.57[a]	118.33[a]
	(19.47)	(10.57)
R^2	0.48	0.47
Log likelihood	-2929.66	-2897.74
F Stats.	189.22[a]	179.56[a]
_hat	1.05	1.05
	(0.11)	(0.00)
hatsq	-0.00	-0.00
	(0.00)	(0.00)
Mean VIF	4.34	4.34
N	2,643	2,643

Note: Both models contain all the variables in the full model in Table 9. Robust standard errors in brackets, [a] p<0.01, [b] p<0.05, [c] p<0.1

Source: Nunoo 2020

On the moderating effect of gender and education, interacting terms were created and added as explanatory variables in the two models. According to Wooldridge (2010), the statistical significance of interacting variables is examined using the *testparm* command in Stata to test the joint significance of the interaction between age of starting school and gender; and age of starting school and education. The results of this procedure, as displayed in Appendix E, show that the null hypothesis of no interaction cannot be rejected for age of starting school and education, but can be rejected for age of starting school and sex. More specifically, with a probability value less than the minimum acceptable level in all models ($P \leq 0.10$), the null hypothesis that the coefficient of the interaction between age of starting school and sex is equal to zero was rejected for both models.

The coefficient of the interacting term - age of starting school and sex – is positive and significant at 5 percent in model 1 and for females who started school after the required age of 6 in model 2. This is contrary to earlier studies suggesting females perform relatively lower than males. The plausible explanation for this finding is that it pays to educate women. The benefit is observed in the increased literacy proficiency score of about 9 points. This view supports the school of thought that argues for massive investment in the girl child education since it leads to improved outcomes. It is, therefore, important to get girls and women into school since all they need is to get enrolled. This result confirms the work of Upadhayay and Guragain (2014), who observed that females on the Stroop Test showed higher accuracies in reading than males. Again, Anggraini, Budiyono and Pratiwi (2011), in examining the cognitive differences between men and women, found that in the five indicators used to measure higher order thinking skills; women performed better in four indicators than men. Andrietti (2015) also found positive effects in reading and science literacy skills for females when reforms in education were in the favour of females. This study, however, differs from Doolittle (1989) who opines that male tend to perform better than females no matter the school starting age.

Of all the interaction terms for education, only the variable on the interaction term between starting school at an age greater than 6 and completing secondary school was significant and positive in explaining literacy skills proficiency scores in model 2. However, as shown in Appendix E, the joint effect between educational level and age of starting school was not significant. The plausible reason could be that what really matters for the cognitive proficiency skills of adults is what they learnt at whatever level of education they completed.

Marginal analysis of age of starting school by educational level and gender

An important finding emanating from the study is the predicted average literacy proficiency scores between age of starting school and the educational level completed by individuals. This is presented in Table 11. From Table 11, it is evident that at all levels of education, starting school at the required age of 6 results in better predicted of literacy proficiency scores, followed by starting school at an age greater than 6, and lastly, starting school at less than 6 leading to the worse performance in literacy proficiency scores. The result also revealed that among those with no education, if they are to start school, at all, in any of the categories, they will perform better than individuals with primary education. This translates into a negative gap between the primary education group and no education group of 11 points. The highest gap is observed between individuals with secondary education and those with JHS (about 63 points). Generally, the pattern confirms the view that starting school at the required age of 6 and attaining higher education result in higher cognitive skills proficiency. This result is similar to the findings of Falch and Sandgren (2006), Rivkin, Hanushek and Kain (2005) and Winship and Korenman (1997) who observed that higher education improves cognitive skills proficiency.

Table 11: Margins between age of starting school and educational level

	Margins	Robust Std. Err.
No education and less than 6	107.54	8.86
No education and equal to 6	116.99	5.51
No education and greater than 6	109.83	5.35
Primary and less than 6	96.19	7.98
Primary and equal to 6	105.64	4.18
Primary and greater than 6	98.49	4.06
JSS and less than 6	108.93	7.27
JSS and equal to 6	118.37	2.56
JSS and greater than 6	111.22	2.66
Secondary and less than 6	171.12	7.65
Secondary and equal to 6	181.57	3.46
Secondary and greater than 6	174.41	3.55
Tertiary and less than 6	206.83	7.87
Tertiary and equal to 6	216.28	4.08
Tertiary and greater than 6	209.12	4.35
	Contrast	
Primary vs No education	-11.34	5.56
JSS vs primary	12.73	4.62
Secondary vs JSS	63.19	3.80
Tertiary vs Secondary	34.71	4.65

Source: Nunoo 2020

Following the analysis of the joint effect of age of starting school and gender, the predicted literacy proficiency scores for each year of starting school by gender is presented in Table 12.

Table 12: Margins for age of start starting school by gender

	Margins	Robust Std. Err.
Male*Started school at 5	162.06	3.26
Female*Started school at 5	130.36	3.10
Male*Started school at 6	157.16	2.39
Female*Started school at 6	129.67	2.10
Male*Started school at 7	152.27	2.02
Female*Started school at 7	128.99	1.86
Male*Started school at 8	147.37	2.42
Female*Started school at 8	128.30	2.61
Male*Started school at 9	142.48	3.31
Female*Started school at 9	127.61	3.80
Male*Started school at 10	137.59	4.41
Male*Started school at 10	126.92	5.13
Female*Started school at 11	132.69	5.60
Male*Started school at 11	126.23	6.52

Source: Nunoo 2020

From Table 12, the general trend observed is that males tend to perform better than females on the STEP literacy assessment no matter the age of starting school. In support of the cognitive development theories and the Heckman equation, it is again revealed that, for both males and females, the predicted literacy proficiency scores decline with age of starting school. This gives credence to the observation that starting school at the required age is important for cognitive skills proficiency. The literacy proficiency score gap between both sexes declines with the age of starting school. This is reflected in Figure 3.

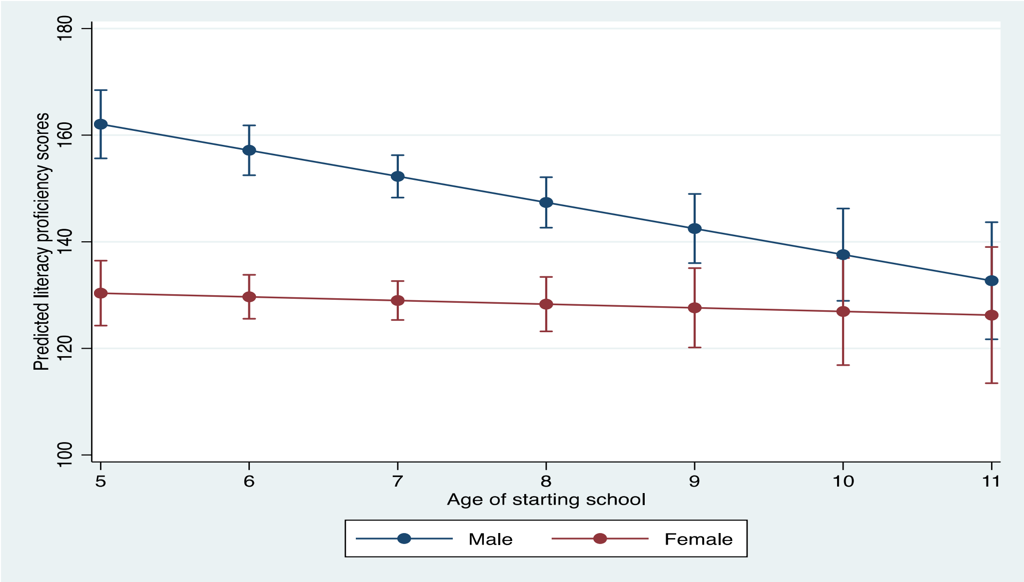

Figure 3: Literacy proficiency gap between males and females by age of starting school

Source: Nunoo, (2020).

Results from the ordered logit regression

In responding to the first objective, the study again employed the ordered logit (Ologit) estimation technique to examine the effect of school starting age on the different levels of literacy proficiency. The analyses of the Ologit estimates follows that of the OLS in terms of its focus. This result is presented in Appendix E and Table 13. First, the Brant test was conducted to test the parallel lines assumption for ordered logit. With a Brant test of X^2 (df =10) = 13.16, and p-values = 0.121, which is not significant, it was concluded that the ordered logit assumptions are satisfied. The simplest models are presented in Appendix F where in model 1 the results showed that an additional year of delay in enrolling in school decreases the odds of attaining higher literacy levels (level 2 and above) by 0.73. The result is statistically significant at 1 percent. In model 2, age of starting grade is treated as categorical. With the age of starting first grade at exactly 6 as the base category, the study provides empirical evidence to show that, the likelihood of attaining higher levels of literacy proficiency is less for those who start first grade before or after age 6 with an odds ratio of 0.89 times.

In model 3, literacy proficiency level is regressed on age of starting first grade and years of education. Again, there is empirical evidence at 1 percent level of significance that the odds of attaining higher levels of literacy reduce with age of starting first grade but rise with education. This finding is intuitive in that starting school at a latter age may affect one’s cognitive development. An addition year of schooling results in about 1.6 times likelihood of an adult performing at literacy proficiency level 2 and above compared to literacy level 1 and below level 1 combined. The introduction of educational levels in models 5 and 6 still reveals that age of stating school inversely influence literacy proficiency levels. Level of education one completes positively influence the proficiency level of the individuals. It can also be observed that the likelihood of attaining a higher literacy proficiency level increases with higher educational levels. With tertiary education, an individual has about 500 more chance of being in literacy proficiency level 2 and above. All the educational variables are significant at 1 percent.

These results confirm the work of Fredriksson and Öckert (2005) who revealed that there are strong effects of age at school entry around age 7, which is the compulsory age of starting school in Sweden, on cognitive skills at age 13. Contrary to this finding, Ponzo and Scoppa (2014) argue that individuals who entered school older than the official age performed relatively better on cognitive tests in Italy than their peers who were younger. In support of the finding on education, Carlsson, Dahl, Öckert and Rooth (2015), in assessing the effect of schooling on cognitive skills in Sweden, observed that an increase in instructional day with students by 10 days led to about 1 percentage points on test scores of students. This suggests that more schooling and higher levels of schooling positively influence cognitive skills. Banks and Mazzonna (2012) and Glymour *et al*. (2006) also found positive and significant effects of educational levels on literacy proficiency levels. The results from Cliffordson and Gustafsson (2008) also agree with this study in that they found education to strongly influence intellectual performance, especially, among males.

Based on intuition and empirical evidence, the study explored the influence of other variables in the model. For instance, the length of materials read together with drop out of highest educational level variable was included in models 7 through 11. For the length of material read, it is observed that the more an individual uses this ability, the greater the odds of attaining higher levels of literacy proficiency compared to colleagues who do not use the skills of reading at work. Appendix F also revealed that drop out increases the odds of one being in a lower literacy proficiency bracket.

Table 13: OLogit Regression Results (Dependent Variable: Literacy Level)

	OLogit Odds Ratio	OLogit Odds Ratio	OLogit Odds Ratio	OLogit Odds Ratio
	(12)	(13)	(14)	(15)
Age started first grade	0.87[a]	0.86[a]		
	(0.03)	(0.03)		
Age started first grade (Exactly 6=0)				
Less than 6			0.69	0.71
			(0.18)	(0.18)
Greater than 6			0.80[a]	0.77[a]
			(0.08)	(0.07)
Educ_yrs	1.52[a]		1.53[a]	
	(0.03)		(0.03)	
Education levels				
Primary		4.90[a]		5.08[a]
		(2.40)		(2.49)
JHS		8.91[a]		9.44[a]
		(4.32)		(4.56)
Secondary		39.91[a]		42.95[a]
		(19.70)		(21.15)
Tertiary		139.41[a]		150.61[a]
		(70.34)		(75.84)

Table 13 Continued

Length of material read overall score (Skill not used=0)				
Low	1.95[a]	2.06[a]	1.94[a]	2.04[a]
	(0.35)	(0.36)	(0.34)	(0.36)
Medium	3.21[a]	3.46[a]	3.13[a]	3.38[a]
	(0.62)	(0.66)	(0.60)	(0.65)
High	3.90[a]	4.48[a]	3.85[a]	4.44[a]
	(0.75)	(0.86)	(0.74)	(0.85)
Dropped out of highest educational level started (No=0)				
Dropped out	0.66[b]	0.68[b]	0.66[b]	0.68[b]
	(0.11)	(0.12)	(0.11)	(0.12)
Wealth quintile (Poorest=0)				
Poorer	1.30	1.28	1.33	1.32
	(0.25)	(0.24)	(0.25)	(0.24)
Middle	1.25	1.22	1.28	1.25
	(0.23)	(0.22)	(0.23)	(0.23)
Richer	1.63	1.61	1.69	1.67[a]
	(0.29)	(0.29)	(0.29)	(0.30)
Richest	2.67[a]	2.72[a]	2.67[a]	2.76[a]
	(0.50)	(0.51)	(0.50)	(0.52)
Gender (Male=0)				
Female	0.44[a]	0.43[a]	0.44[a]	0.45[a]
	(0.04)	(0.04)	(0.04)	(0.04)

Table 13 Continued

Number of economic shocks before age 15	1.00	0.98	1.00	1.00
	(0.04)	(0.14)	(0.04)	(0.04)
Mother tongue (Akan only=0)				
Akan and other	1.21[a]	1.23[a]	1.23[a]	1.26
	(0.21)	(0.22)	(0.22)	(0.22)
Other only	1.47	1.43	1.45	1.40[a]
	(0.15)	(0.14)	(0.14)	(0.14)
Labour market status (Employed=0)				
Unemployed	1.33	1.32	1.34	1.33
	(0.26)	(0.26)	(0.26)	(0.26)
Inactive	2.77[a]	2.93[a]	2.81[a]	2.99[a]
	(0.33)	(0.36)	(0.34)	(0.37)
Socioeconomic Status (Low=0)				
Middle	0.88	0.89	0.87	0.88
	(0.11)	(0.11)	(0.11)	(0.11)
High	0.71[b]	0.71[b]	0.70[b]	0.71[b]
	(0.11)	(0.11)	(0.11)	(0.11)
Parental involvement (Not involved=0)				
Involved	1.10	1.10	1.13	1.13
	(0.16)	(0.16)	(0.16)	(0.16)
Chronic illness (Not present=0)				
Present	1.23	1.17	1.23	1.17
	(0.22)	(0.21)	(0.22)	(0.21)

Table 13 Continued

Age in years	0.98[a]	0.98[a]	0.98[a]	0.98[a]
	(0.00)	(0.00)	(0.00)	(0.00)
cut1	3.73[a]	2.48[a]	4.60[a]	3.47[a]
	(0.45)	(0.63)	(0.34)	(0.55)
cut2	5.32[a]	4.05[a]	6.19[a]	5.04[a]
	(0.46)	(0.63)	(0.36)	(0.55)
cut3	7.91[a]	6.62[a]	8.79[a]	7.60[a]
	(0.48)	(0.63)	(0.38)	(0.56)
N	2,601	2,601	2,601	2,601
Brant test X^2 (df =10) = 13.16				
p-values = 0.121				

Robust standard errors in brackets, a p<0.01, b p<0.05, c p<0.1

Source: Nunoo (2020)

From Table 13, the full models all show that, age of starting school is statistically significant in explaining literacy proficiency levels. It is evident that a year increase in the age of staring school reduces the odds of attaining higher literacy proficiency level. While there is no statistical evidence that starting school at any age less than 6 has a dampen effect on literacy proficiency levels in Ghana; it carries the expected negative sign. However, statistical evidence is provided to show that starting school at an age greater than 6 reduces the odds of being in a higher literacy proficiency group as compared to their counterparts who start school at the official age of 6. A similar result is found when an instrumental variable is employed to correct the possible problem of endogeneity as the result of reversed causality between education and literacy proficiency levels showed. All the findings are consistent.

The results of Zhang, Zhong and Zhang (2017) from China support the present study by showing that each additional year of delaying school entry leads to about 0.303 standard deviation decrease in cognitive skills score. The finding is also in agreement with De Felício, Terra and Zoghbi (2012) who found that for Brazilians, starting school at the required age results in up to about 18 percentage points higher literacy scores more than those who entered school at an older age. However, the result is at variance with La Paro and Pianta (2000) who provided evidence to show that older children fare better academically than their younger age peers. Additionally, Uphoff and Gilmore (1985) argued that the older and more matured students in a class fare better than younger classmates. Nonetheless, other studies like Demeis and Stearns (1992) and Dietz and Wilson (1985) found no significant relationship between age of starting school and cognitive skills achievement.

The findings with respect to education shows a reinforcing effect on cognitive skills proficiency. All the education variables both educational levels completed and years of education were statistically significant at 1 percent. From the results, it is evident that an additional year spent in school increases the odds of performing at higher literacy proficiency level. Even though the evidence shows all levels of education have a positive effect on literacy proficiency, models 13 and 15 in Table 13 reveal that completing tertiary education compared to no schooling increases the odds of performing at higher literacy proficiency levels (level 2 and above) from 139 to 150 times.

Negative relationships were found for being female and whether an individual dropped out of the highest level of education he/she started. The findings showed that compared to individuals who never drop out of school, those who dropped out from school had higher odds of performing in the lower literacy proficiency levels. Females had a higher likelihood of performing in a lower literacy proficiency level compared to males. In defends of this finding, McGeown, Goodwin, Henderson and Wright (2012) argued that males perform better than females mainly due to the difference in motivation between men and women in reading, reading choice, frequency, attitudes towards reading, competency and the value of reading. Contrary to this view, Wheldall and Limbrick (2010), Siegel and Smythe (2005) and Hyde (2005) found no significant difference between men and women in literacy proficiency.

Table 13 further shows that the amount of material read at work, the socioeconomic status and labour market status increase the likelihood of an individual being in a higher literacy proficiency group. Actual age in years had a negative effect on performing at a higher literacy proficiency level; while parental involvement was not significant in determining the level of literacy proficiency of individuals.

Summary

This chapter reported empirical results and discussion of findings on the effect of age of starting school on cognitive skills proficiency using literacy proficiency as a proxy. The empirical analyses were guided by the Heckman equation and cognitive development theories with OLS, 2SLS and ordered logit regression methods serving as the estimation techniques. The main focus of the analysis in this chapter was to examine whether or not there is a significant positive relationship between starting school at the required age of 6 and literacy proficiency. It also probed the moderating role of sex and education in the effect of age of starting school and literacy proficiency. Results revealed that, in line with the hypothesis, starting school at an age greater than 6 compared to the required age of 6 had a significant negative impact on the probability of performing at higher literacy proficiency level. It was also observed that a year delay in starting school negatively affect literacy proficiency scores. Women enrolment in school, no matter the age of starting, was found to positively and significantly affect literacy proficiency scores. Cognitive skills proxied by literacy proficiency was significantly and positively explained by education, length of materials read at work and wealth.

CHAPTER FIVE

COGNITIVE SKILLS PROFICIENCY AND LABOUR MARKET OUTCOMES

Introduction

This chapter looks at how cognitive skills proficiency impacts individuals' labour market outcomes. Five labour market outcomes are examined: hourly earnings, employment status (employed or unemployed), skills level (lower and middle level personnel or managerial position), sector of employment (formal or informal) and worker status (wage worker or self-employed). The chapter tests the hypotheses that there is a significant positive relationship between cognitive skills proficiency proxied by literacy proficiency and all the labour market outcomes under consideration. In pursuit of this goal, the OLS, IV and logit regression models were estimated linking literacy proficiency scores and levels to labour market outcomes.

The chapter is organised into three sections. The first section presents the descriptive analysis of the respondents based on their labour market characteristics using bivariate analysis; while the second section covers the estimated econometric results. The third section provides the summary to the chapter.

Descriptive statistics of variables

This section presents the descriptive statistics of the variables used for the second empirical chapter. Table 14 presents summary statistics of hourly earnings for different sub-groups of the study sample. The mean hourly earnings for the total study sample is GHC 3.07 (SD = 8.49). This large standard deviation is indicative of the vast heterogeneity in earnings among workers in

Ghana with a large proportion of workers, especially in the informal and private sector, earning below the minimum wage (Darvas, Favara, & Arnold, 2017).

Table 14: Summary statistics by hourly earnings

	Mean	Standard Deviation	Frequency
Hourly earnings	3.07	8.49	1765
Literacy proficiency level			
Below level 1	2.39	6.02	1100
Level 1	3.54	8.44	277
Level 2	4.17	12.16	282
Level 3 & 4	7.42	18.24	65
Education level			
No education	2.27	5.13	225
Primary	2.87	8.15	193
MSLC/JSS/JHS	2.29	5.62	688
Secondary	2.77	7.15	368
Tertiary	6.10	15.04	286
Length of material read at work score			
Skill not used	2.19	4.13	1012
Low	2.91	5.29	465
Medium	3.68	4.84	141
High	4.33	6.08	106
Parental involvement education			
Not involved	2.41	4.06	334
Involved	2.69	4.84	1390
Dropped out of highest educational level started			
Did not dropout	2.75	4.50	1278
Dropped out	2.31	5.23	446
Currently in school			
No	2.59	4.76	1625
Yes	3.47	3.61	99

Table 14 Continued

Age_group			
15-24	3.02	12.19	246
25-34	2.81	5.42	711
35-44	2.81	5.78	462
45-54	3.91	9.95	215
55-64	4.13	15.91	131
Permanent position			
Not permanent	2.44	4.39	457
Permanent	2.71	4.81	1267
Region			
Western	3.57	6.01	150
Central	2.59	3.88	162
Greater Accra	2.81	5.00	540
Volta	2.08	2.65	106
Eastern	2.16	4.41	129
Ashanti	2.63	4.69	409
Brong Ahafo	2.04	3.63	137
Northern	2.61	5.87	61
Upper East	1.84	4.68	23
Upper West	2.52	2.01	7

Source: Nunoo (2020)

From Table 14, it is clear that the average hourly earnings of the study sample increase with higher literacy proficiency levels. Individuals whose literacy proficiency level is below level 1 on the average earn GHc2.39 per hour. In the case of those at levels 1 and 2 literacy proficiency, hourly earnings are GHS3.54 and GHS4.17 respectively. Those at literacy proficiency levels 3 and 4 had the highest hourly earnings of GHS7.42. In studies conducted by Dustmann and Fabbri (2003) and Vignoles *et al.* (2011), similar associations were found between literacy and earnings. These studies found that literacy proficiency is positively correlated with earnings and wages. The positive correlation between earnings and wages, and literacy proficiency is explained by Schultz (1961). According to Schultz (1961), high cognitive skills improve human efficiency, thereby, increasing productivity of the individuals. That is, intelligent and level-headed individuals contribute more to the national income. Schultz (1961), in effect argued that, any form of cognitive training has positive effect on the cognitive abilities of individual because it makes them appreciate things better than that of the uneducated.

Level of education, length of material read and age were also found to be positively associated with hourly earnings. From Table 14, individuals who have completed tertiary education are observed, on the averaged, to earn about GHc6.10 hourly. Among those who read at work, individuals who highly use their reading skills tend to earn GHc4.33 per hour. Workers who reported their parents were involved in their education on the average earned higher than those whose parents did not. Individuals who did not drop out of school as well as those who are currently attending school have higher hourly earnings than their counterparts.

In terms of regions, earning is highest among workers in the Western region and least among residents of the Upper East region. The causal effects of these variables on earnings are discussed at next section of this chapter. The finding of the correlation between education and earnings corroborates the results of Darvas, Favara, and Arnold (2017) and Jollife (1998) who found strong positive relationship between the educational level and earnings in Ghana.

The mean t-Test of difference between hourly earnings across literacy proficiency and educational levels is presented in Table 15. From Table 15, it is evident that, there are discernible differences between the various means of the hourly earnings by levels of literacy proficiency which are statistically significant at 1 percent. The only insignificant difference is observed between level 1 and level 2. Among the different educational levels, completing tertiary significantly affected the results of earning outcomes above all the other levels of education. These trends add to the argument of the signaling theorists that the educational level, and for that matter a certificate, signals to employers about the potential of workers. This finding resonates with the work by Ackah *et al.* (2014) who also observed incremental significant difference in log of real earnings as one attains higher levels of education.

Table 15: Mean t-Test of difference between hourly earnings across literacy proficiency and educational levels

	Mean hourly earning difference	P-Val
Literacy proficiency level		
Below level 1 – Level 1	-1.15	a
Below level 1 – Level 2	-1.78	a
Below level 1 – Level 3	-5.03	a
Level 1 – Level 2	0.63	
Level 1 – Level 3	-3.87	a
Level 2 – Level 3	-3.25	a
Education level		
No education – Primary	-0.61	
No education – MSLC/JSS/JHS	-0.03	
No education – Secondary	-0.51	
No education – Tertiary	-3.83	a
Primary – MSLC/JSS/JHS	0.58	
Primary – Secondary	0.10	
Primary – Tertiary	-3.22	a
MSLC/JSS/JHS – Secondary	-0.48	
MSLC/JSS/JHS – Tertiary	-3.80	a
Secondary – Tertiary	-3.33	a

[c]p<.1; [b] p<.05; [a] p<.01

Source: Nunoo (2020)

The percentage distributions of selected demographic characteristics and employment status are presented in Table 16. The significance levels of the cross-tabulations of each of the demographic characteristics and employment status using chi-square are also presented. The employment status of individuals are classified as either being employed or not employed. Following internationally recommended guidelines, the study considered individuals employed, if the person was actually engaged in any work during the past one year, or had an attachment to a job or business but for some reasons did not work during the period. The individual is considered as currently not employed, if he/she was not engaged in any work (as defined above), had no attachment to a job or business, reported that he/she was available for work and had taken some specific steps to look for work (ILO, 2013).

The findings, from Table 16, show that 92.05 percent of the study sample among the urban population in Ghana are employed while the remaining 7.95 percent are not employed. This level of unemployment is found to be above the proportion of Ghanaians who were reported as not employed in 2013 (the same year the STEP survey was conducted) by the Ghana Statistical Service (GSS) as 5.20 percent (Ogah & Rayner, 2013). Differences of employment proportions reported by the different surveys might be due to sampling biases during the surveys.

To ascertain the association between literacy and employment, Table 16 shows that though employment levels tend to be high among all the sub literacy levels subsamples, categories of people who had attained higher levels of literacy tend to have a greater portion of the group being employed compared to persons at relatively lower levels of literacy. For instance, while all who are at level 4 literacy proficiency are employed, 89.63 percent, 89.46 percent and 90.54 percent of individuals at levels 1, 2 and 3 literacy proficiency levels respectively are employed. This shows a positive association between literacy and employment. This finding is found to be statistically significant at 5 percent. Blunch and Verner (2000) and Glewwe (2002) find similar results to support the view of the human capital theory that improvement in skills increases productivity, thereby, making such individuals more employable. In addition, Abrassart (2013) and Carbonaro (2007) highlight the important role cognitive skills improvement plays in giving employment opportunities to the low-educated individuals.

As expected, Table 16 shows a positive significant association between educational level and employment. Surprisingly, however, the proportion of people who were employed and had their parents getting involved in their education or those who did not dropped out of the highest level of education they started tend to be lesser in employment compared to those whose parents were not involved in their education or who dropped out of the highest level of education they started. This finding might be biased because of the big difference between the subsamples within each of these two variables. For instance, the proportion of people within the study subsample whose parents did not get involved in their educational activities is more than four times that of those whose parents were involved in their education. Also, the proportion of people within the study subsample who reported dropped out of the highest level of education they started is almost thrice that of those reported they never dropped out of school.

Age is found to have a positive association with employment. That is, the proportion of older category of individuals who are employed is higher than that of individuals who are relatively younger. Possibly accounting for this trend is the fact that many in the 15-24 age group still find themselves in training or educational establishments. This view is supported by Darvas, Favara, and Arnold (2017) who revealed that about 32 percent of all adults in urban Ghana continue their skills development through apprenticeship training or formal certification processes.

Table 16: Bivariate analysis by employment status

	Not Employed	Employed	P-Value	Freq.
Literacy proficiency level				
Below level 1	6.56	93.44	0.042	1296
Level 1	10.37	89.63		347
Level 2	10.53	89.47		342
Level 3	9.46	90.54		74
Level 4	0.00	100.00		4
Education level				
No education	2.78	97.22	0.006	252
Primary	9.77	90.23		256
MSLC/JSS/JHS	9.10	90.90		813
Secondary	9.15	90.85		426
Tertiary	6.01	93.99		316
Length of material read at work score				
Skill not used	8.41	91.59	0.550	1236
Low	7.69	92.31		546
Medium	5.13	94.87		156
High	8.00	92.00		125

Table 16 Continued

Parental in involvement education				
Not involved	4.46	95.54	0.005	381
Involved	8.74	91.26		1682
Dropped out of highest educational level started				
Did not dropout	8.45	91.55	0.148	1538
Dropped out	6.48	93.52		525
Currently in school				
No	6.17	93.83	0.000	1881
Yes	26.37	73.63		182
Age_group				
15-24	21.23	78.77	0.000	391
25-34	6.56	93.44		793
35-44	3.07	96.93		489
45-54	3.40	96.60		235
55-64	3.87	96.13		155
Region				
Western	9.89	90.11	0.007	182
Central	2.16	97.84		185
Greater Accra	7.51	92.49		626
Volta	5.65	94.35		124
Eastern	9.20	90.80		174
Ashanti	11.55	88.45		485
Brong Ahafo	6.29	93.71		175
Northern	2.86	97.14		70
Upper East	6.06	93.94		33
Upper West	11.11	88.89		9

Note: The p-values are for chi-square test

Source: Nunoo (2020)

Percentage distribution of respondents by skills level is presented in Table 17. It is observed from Table 17 that about a third of the study sample is employed in high skilled jobs; while the remaining of the sample are in jobs that require either low or medium skills. The association between literacy proficiency and skill levels reveals a positive relationship for individuals who perform at higher levels and are employed at the managerial level. Low and medium skilled workers tend to perform at the lower levels of literacy proficiency. The Table 17 shows that at below level 1, about 95 percent of them are in the low skilled category; while at the level 4 about 75 percent of such workers are in the high skilled category. This finding is statistically significant at 1 percent. Nikoloski and Ajwad (2014), Abrassart (2013) and Carbonaro (2007) provide evidence in support of positive relationship between literacy proficiency level and skills level of workers.

Table 17: Bivariate analysis by skills level

	Low Skill	High Skill	P-Value	Freq.
Literacy proficiency level				
Below level 1	95.44	4.56	0.000	1295
Level 1	75.50	24.50		347
Level 2	56.14	43.86		342
Level 3	27.03	72.97		74
Level 4	25.00	75.00		4
Education level				
No education	98.41	1.59	0.000	252
Primary	97.66	2.34		256
MSLC/JSS/JHS	95.94	4.06		812
Secondary	79.81	20.19		426
Tertiary	29.75	70.25		316
Length of material read at work score				
Skill not used	97.65	2.35	0.000	1235
Low	74.54	25.46		546

Table 17 Continued

Medium	37.18	62.82		156
High	32.00	68.00		125
Parental involvement in education				
Not involved	88.19	11.81	0.003	381
Involved	81.80	18.20		1681
Dropped out of highest educational level started				
Did not dropout	78.40	21.60	0.000	1537
Dropped out	96.38	3.62		525
Currently attending school				
No	84.79	15.21	0.000	1880
Yes	64.29	35.71		182
Age_group				
15-24	87.72	12.28	0.000	391
25-34	79.04	20.96		792
35-44	87.73	12.27		489
45-54	83.40	16.60		235
55-64	75.48	24.52		155
Region				
Western	88.46	11.54	0.002	182
Central	78.92	21.08		185
Greater Accra	82.91	17.09		626
Volta	86.29	13.71		124
Eastern	81.61	18.39		174
Ashanti	82.47	17.53		485
Brong Ahafo	89.66	10.34		175
Northern	70.00	30.00		70
Upper East	78.79	21.21		33
Upper West	55.56	44.44		9
Total	25.00	75.00		2063

Note: The p-values are for chi-square test

Source: Nunoo (2020)

There is also a positive significant association between educational level and skills level for higher skilled workers. At the tertiary level, about 70 percent of workers are observed to be highly skilled. Length of material read at work is positively associated with skills level. That is, people who tend to read more or lengthier prints at work get engaged as high skilled workers compared to those who either do not read at all or read less often. It could also be that because high skilled workers act in managerial positions, they tend to read more at work, therefore, to reinforce their cognitive skills. Also, from Table 17, people whose parents tend to be involved in their education or those who did not drop out of the highest level of education they started tend to be highly skilled workers compared to those whose parents were not involved in their education or individuals who drop out of highest level of education they started.

Age is found to have a positive association with skills level. That is, the proportion of older individuals who are in the higher skilled category are relatively higher than their younger counterparts. This could be attributed to the fact that older workers have longer years of experience, thereby, qualifying them for more responsibility at the workplace.

The distribution of various groups across worker status is presented in Table 18. It is observed that about 62 percent of the study sample was self-employed; while the remaining 38 percent were wage workers. This result is close to the figure reported by the GSS (2014) of 33 percent wage employment in urban Ghana. A wage worker is an employee who works for somebody else and receives a salary or wage. Self-employed, on the other hand, is made up of those who are business owners with or without hired labour. The findings show that most individuals who have attained high levels of literacy proficiency (levels 2, 3 and 4) were employees or wage workers. On the contrary, those who performed at lower levels of literacy proficiency are mostly self-employed. This might be because; people with low cognitive skills are less employable relative to their counterparts with higher cognitive skills. Thus, due to the low employability of the less literate, they tend to go into small and medium scale businesses as source of livelihood. Similar findings are made by Darvas, Favara, and Arnold (2017).

It is also evident in Table 18 that, there is a positive relationship between being a wage worker and educational level completed. On the other hand, being a self-employed is inversely related to the level of education completed. Individuals with tertiary education are mostly wage workers; while those who had completed relatively lower levels of education are self-employed. This finding is expected since individuals with tertiary certificates are offered jobs with good working conditions and are thus more likely to go into salary paying works. Abrassart (2013) and Carbonaro (2007) found similar results and argue that in economies with a smaller informal base, education is positively correlated with wage employment. It was also found that the lengthier one reads at work, the higher the likelihood of being in a wage employment. There was no clear-cut association found between parental involvement and worker type. Similar unclear association was observed between school dropout and worker status and age group.

Table 18: Bivariate analysis by worker status

	Self Employed	Wage Worker	P-Value	Frequency
Literacy proficiency level				
Below level 1	74.83	25.17	0.000	1212
Level 1	50.00	50.00		312
Level 2	33.01	66.99		306
Level 3	16.42	83.58		71
Level 4	0	0		0
Education level				
No education	79.59	20.41	0.000	245
Primary	75.76	24.24		231
MSLC/JSS/JHS	72.94	27.06		739
Secondary	50.90	49.10		389
Tertiary	23.23	76.77		297
Length of material read at work score				
Skill not used	75.49	24.51	0.000	1134
Low	49.80	50.20		504
Medium	24.32	75.68		148
High	28.70	71.30		115
Parental involvement in education				
Not involved	69.32	30.68	0.001	365
Involved	60.09	39.91		1536
Dropped out of highest educational level started				
Did not dropout	56.85	43.15	0.000	1409
Dropped out	76.22	23.78		492
Currently attending school				
No	63.44	36.56	0.000	1767
Yes	41.04	58.96		134

Table 14 Continued

Age_group				
15-24	52.27	47.73	0.000	308
25-34	55.93	44.07		742
35-44	72.42	27.58		475
45-54	68.72	31.28		227
55-64	67.11	32.89		149
Region				
Western	56.71	43.29	0.076	164
Central	60.77	39.23		181
Greater Accra	59.24	40.76		579
Volta	58.12	41.88		117
Eastern	66.46	33.54		158
Ashanti	64.50	35.50		431
Brong Ahafo	71.95	28.05		164
Northern	55.88	44.12		68
Upper East	61.29	38.71		31
Upper West	50.00	50.00		8
Total	61.86	38.14		1901

Note: The p-values are for chi-square test

Source: Nunoo (2020)

This section ends with the description of the percentage distribution of the study sample across the sector of employment. Table 19 shows that about 82 percent of the study sample were in informal employment; whereas, 18 percent of the sample were in formal employment. The evidence from Table 19 shows that there is a positive relationship between formal employment and literacy proficiency; whereas, an inverse association is observed for literacy proficiency levels and employment in the informal sector. For instance, while 68.66 percent of individuals are at levels 3 literacy proficiency in formal employment, about 93 percent of all individuals at below level 1 literacy proficiency are found in informal sector employments. This finding is statistically significant at 1 percent. Education exhibits a similar trend with a greater proportion of highly educated individuals found in the formal sector.

The inability for the formal sector to generate more jobs have exacerbated the problems of informality in Ghana. This is reflected in the relatively large percentages of secondary and tertiary educated individuals found in the informal sector. According to Osei-Boateng and Ampratwum (2011) and Nunoo, Darfor, Koomson and Arthur (2018), because many in the informal sector do not have employment security, workers in the sector tend to earn little and this consigns them to a cycle of poverty. The finding in Table 19 further shows that, among workers in the informal sector, greater proportion do not have to read anything at all or they use that ability scantly. Among dropouts, about 95 percent of them are found in informal employments. There is no discernible pattern observed for the age groups and the regional effects. The percentage differences in all the variables are statistically significant.

Table 19: Bivariate analysis by sector of employment

	Formal Employment	Informal Employment	P-Value	Freq.
Literacy proficiency level				
Below level 1	7.02	92.98	0.000	1211
Level 1	23.79	76.21		311
Level 2	44.12	55.88		306
Level 3	68.66	31.34		71
Education level				
No education	2.45	97.55	0.000	245
Primary	2.60	97.40		231
MSLC/JSS/JHS	8.39	91.61		739
Secondary	23.26	76.74		387
Tertiary	59.60	40.40		297
Length of material read at work score				
Skill not used	4.95	95.05	0.000	1132
Low	27.78	72.22		504

Table 19 Continued

Medium	56.08	43.92		148
High	53.91	46.09		115
Parental involvement in education				
Not involved	11.54	88.46	0.000	364
Involved	19.48	80.52		1535
Dropped out of highest educational level started				
Did not dropout	22.59	77.41	0.000	1408
Dropped out	4.68	95.32		491
Currently attending school				
No	16.66	83.34	0.000	1765
Yes	35.07	64.93		134
Age_group				
15-24	7.47	92.53	0.000	308
25-34	21.59	78.41		741
35-44	14.77	85.23		474
45-54	22.03	77.97		227
55-64	25.50	74.50		149
Region				
Western	12.80	87.20	0.076	164
Central	17.13	82.87		181
Greater Accra	21.59	78.41		579
Volta	20.51	79.49		117
Eastern	21.52	78.48		158
Ashanti	13.75	86.25		429
Brong Ahafo	10.37	89.63		164
Northern	30.88	69.12		68
Upper East	16.13	83.87		31
Upper West	50.00	50.00		8
Total	17.96	82.04		1899

Note: The p-values are for chi-square test

Source: Nunoo (2020)

Effect of literacy proficiency on earnings (Returns on cognitive skills)

This section primarily looks at the effects of literacy proficiency scores and levels on hourly earnings. In addition, it examines the degree to which various socioeconomic conditions of individuals affect earnings. That is, it investigates how, on the average, changes in each of the included covariates cause changes in earnings of the individuals. The estimated econometric results of this analysis are reported in Table 20. According to Hanushek *et al.* (2015), the literacy proficiency score is standardized to a mean of zero and standard deviation of 1. This enables for the parameter of interest, β, to be interpreted as the percentage increase in hourly earnings, and it is associated with a one-standard-deviation increase in literacy proficiency scores. The diagnostic statistics associated with the results such as the Log Likelihood and Pseudo R-squared indicate that the models are within the thresholds of correctly specified and fitted models.

The results are presented in 7 nested models with log of hourly earnings of the individual as the dependent variable and literacy proficiency scores or levels as the independent variable of interest. Models 1 and 2 are the single variable regression models; whereas, the remaining 5 models are multiple regressions with different numbers of regressors. All the 7 models presented in Table 20 are OLS models. Generally, the findings showed that the study's null hypothesis of no significant positive relationship between cognitive skills proficiency and log of hourly earnings can be rejected. In support of the hypothesised positive relationship between cognitive skills proficiency and log of hourly earnings, the results showed that cognitive skills proficiency measured as literacy proficiency scores or levels have a positive and significant effect on individuals' earnings. The results support the view of the human capital theory in which skills enhance productivity and are rewarded with higher earnings.

It is evident from model 1 that one-standard-deviation increase in literacy proficiency skills is associated with an average increase in hourly earnings of about 25 percent in the absence of other covariates. The introduction of the experience and age variables increases a one-standard-deviation change in cognitive skills to 26 percent in model 3. However, the effect reduces to 6 and 7 percent with the inclusion of sex and years of education for models 4 and 5 respectively. This shows that a greater proportion of the skills-earnings effect is driven by education. It affirms the proposition that highly skilled individuals end up with higher education, thereby, making such individuals more productive which leads to higher earnings (Hanushek *et al*., 2015). The use of literacy proficiency levels yield similar results. From models 2 and 7, it is observed that higher levels of literacy proficiency compared to below level 1 literacy proficiency increases hourly earnings by between 14 and 122 percent. The higher the level; the greater the returns to skills on earnings.

This study confirms the works of Hanushek *et al.* (2015) and Hampf *et al.* (2017) who found significant and positive effect of skills on hourly earnings using the PIAAC data for OECD countries. In addition, Glewwe (1996) and Jolliffe (1998) found that cognitive skills like mathematics skills had strong positive effect on earnings for government jobs; while reading skills were found to have positive and significant effect for private sector jobs in Ghana. Again, Kingdon and Soderbom (2007) also observed that literacy skills among wage workers moderately, but positively, influence earnings. Contrary to this study, Blunch and Verner (2000) observed that while being functionally literate is a prerequisite for entering the labour market, it had no significant effect on earnings. They argued that this could be as a result of the poor quality of education in Ghana in the 1980s through to the 1990s.

The education-earnings relationship is also observed to be positive and significant from Table 20. It is observed that an additional year of education increases hourly earnings by about 7 percent. To assess the non-linearities of the education-earnings relationship, educational level completed is introduced in models 6 and 7. The findings show that compared to no education, completing secondary and tertiary education increases earnings by about between 18 and 100 percent. The importance of education and certification to the actors in the labour market in developing countries like Ghana is seen here in the increase premium paid to those with higher education. This finding supports the signalling theory that education beckons to employers that holders have the potential of performing efficiently. Similar results are revealed by Perez-Alvarez (2017), Hanushek *et al.* (2015) and Hampf *et al.* (2017) who observed positive and significant effect of education on earnings. This study is consistent with the work of Kingdon and Soderbom (2007) who found a positive and significant education-earnings relationship among secondary and tertiary educated individuals. Ackah, Adjasi, Turkson and Acquah (2014) also observed that the higher the educational level; the greater the benefit to the individual in terms of earnings.

In the standard Mincerian equation for analysing returns to education, experience features as an important determinant of earnings. It is argued by the signalling theorists that if education indeed signals to employers about the capabilities of employees then experience should have a positive effect on earnings, especially among mid-career workers. The findings from Table 20 show that a month of experience gained increases earnings by about 0.2 percent. However, though the earnings-experience relationship exhibits concave nature due to the negative coefficient of the square of experience, it is not significant. This result adds to the literature that have widely reported a significant positive earnings-experience relationship (Campbell, 2013; Hanushek *et al.* 2015;

Hampf *et al.* 2017; Ferrer, Green & Riddell 2006; Robinson & Sexton 1994; Lemieux, 2006). Nonetheless, Ackah *et al.* (2014) found a concave relationship between earnings and experience, although the experience square was not significant. However, Glewwe (1996) found no significant relationship between experience and earnings when cognitive skill was accounted for.

On the average, the age variable suggests a significant concave earnings–age relationship. A year increase in age is associated with between 4 and 5 percent increase in hourly earnings. The quadratic age terms all have significant negative coefficients. The concave earnings-age relationship was estimated to determine the turning point for age to decline. This was done using the *utest* and *wherext* commands in Stata. The overall test of the presence of an inverse U-shape was significant ($p > t = 0.0072$). The age 41.43 years was found to be the age beyond which earnings begins to fall.

The results also show that there is gender earnings gap in Ghana. From models 4 to 7, the findings show that females earn between 37 and 40 percent less than males. Ackah *et al.* (2014), Kingdon and Soderbom (2007), Glewwe 1996 and Blunch and Verner (2000) observed similar trends in the age, gender and earnings relationships.

Table 20: Baseline OLS results of effect of cognitive skills on hourly earnings

	OLS (1)	OLS (2)	OLS (3)	OLS (4)	OLS (5)	OLS (6)	OLS (7)
Literacy score	0.25[a] (0.03)		0.26[a] (0.03)	0.06[c] (0.04)	0. 07[c] (0.04)	0. 009 (0.04)	
Literacy level (Below level 1=0)							
Level 1		0.37[a] (0.08)					0.14[c] (0.09)
Level 2		0.62[a] (0.08)					0.14 (0.10)
Level 3 or 4		1.22[a] (0.15)					0.39[b]
Education (Years)				0.07[a] (0.01)	0.07[a] (0.01)		
Education level (No education = 0)							
Primary						-0.02 (0.11)	-0.03 (0.11)
MSLC/JSS/JHS						0.04 (0.09)	0.01 (0.09)
Secondary						0.18[c] (0.10)	0.12 (0.10)
Tertiary						1.00[a] (0.12)	0.84[a] (0.13)
Sex (Male = 0)							
Female				-0.37[a] (0.06)	-0.38[a] (0.06)	-0.40[a] (0.06)	-0.38[a] (0.06)

Table 20 Continued

Experience			0.002^{b}	0.002^{a}	0.001	0.002^{c}	0.002^{b}
			(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Exp_Sq/1000			-0.002	-0.004	-0.001	-0.002	-0.003
			(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Age			0.05^{b}		0.05^{a}	0.04^{b}	0.04^{b}
			(0.02)		(0.02)	(0.02)	(0.02)
Age squared			-0.00^{b}		-0.001^{a}	-0.001^{b}	-0.001^{b}
			(0.00)		(0.00)	(0.00)	(0.00)
Constant	0.28^{a}	0.05	-0.74^{b}	-0.29^{a}	-1.16^{a}	-0.65^{c}	-0.69^{b}
	(0.28)	(0.04)	(0.35)	(0.10)	(0.34)	(0.34)	(0.34)
R^2	0.04	0.07	0.05	0.11	0.11	0.13	0.14
N	1,709	1,709	1,709	1,709	1,709	1,709	1,709

Robust standard errors in brackets, ^{a} $p<0.01$, ^{b} $p<0.05$, ^{c} $p<0.1$

Source: Nunoo (2020).

To examine the effects of the inclusion of other covariates on hourly earnings, the full models in Table 21 were estimated. The key variables of interest still revealed consistent results. Literacy proficiency score still shows that one-standard deviation increase in literacy scores will result in about 6 percent increase in the log of hourly earnings. Again, an increasing positive and significant effect of literacy proficiency levels are observed when compared to individuals performing at below literacy proficiency level 1. This ranges from between 15 percent to 55 percent increase in log of hourly earnings for individuals performing at level 3 in models 3 and 4. These findings are consistent with those of Nordman, Sarr, and Sharma (2018), Cunningham *et al.* (2016), Zhou (2019), Biyase and Zwane (2015), Barone and Van de Werfhorst (2011), Blunch and Pörtner (2005), and Rocha and Ponczek (2009).

Perez-Alvarez (2017) and Cunningham *et al*. (2016) assert that cognitive skills are positively and significantly associated with earnings when reading proficiency and numeric abilities are accounted for. Blunch and Pörtner (2005) attributed improvements in the living standards of households whose individuals participated in adult literacy programs to the increase in their literacy proficiency skills which leads to increase earnings. Barone and Van de Werfhorst (2011) and Rocha and Ponczek (2009) also showed that the effect of improved cognitive skills on earnings is due to productivity gains rather than increased formalization of literate workers in employment. They argue that the effect of literacy on earnings is not only due to the fact that high literacy proficiency causes one to gain formal employment, but also, because cognitive skills lead to increase in output per hour which then translates to increase in earnings.

The education-earnings relationship in the full models continues to be positive and significant leading to between 6 and 7 percent increase in hourly earnings with each additional year of school. The work of Nordman *et al.* (2018) confirms the current study in that they also found education to positively and significantly influence earnings. This is closely link to the length of material an individual read at work. It reveals a positive correlation with earnings when compared to those who do not read at all at work (between 21 and 27 percent). Gender-earning gap exists for all the models. Females on the average earn between 27 and 28 percent less than their male counterpart.

The relationship between earnings and age is observed to be non-linear and significant in model 1, but not significant in model 3. An increase in age by a year leads to about 6 percent increase in log of hourly earnings. As shown in the baseline models, age begins to decline at age 41. A similar trend is seen when age categories are used. Using the age group of 15- 24 as the base category, the coefficient of the age group variables increases from 26 percent to 30 percent for the prime age group of 35-44, and then, decreases to 24 percent and further to 15 percent for the exit group of 55-64. Clearly, the age 41 is where earnings begin to fall within the prime age group (35-44).

Contrary to expectation, Table 21 shows that workers who drop out of the highest level of education they started, when compared to those not dropping out, were found to have about between 18 and 20 percent increase in earnings. The plausible explanation could be that those who drop out of education early tend to accumulate more experience, thereby increasing their earning through experience and age. Unfortunately, parental involvement in education was not significant in influencing earnings. The economic sector of employment was also revealed to have no association with hourly earnings. All the regression had the regional dummies included.

Table 21: Full models of the effect of literacy proficiency on hourly earnings

	OLS (1)	OLS (2)	OLS (3)	OLS (4)
Literacy score	0. 006	0.06[c]		
	(0.00)	(0.00)		
Literacy proficiency level (Below level 1= 0)				
Level 1			0.15[c]	0.15[c]
			(0.08)	(0.08)
Level 2			0.21[b]	0.22[b]
			(0.10)	(0.10)
Level 3 or 4			0.55[a]	0.55[a]
			(0.17)	(0.17)
Education (Years)	0.07[a]	0.07[a]	0.06[a]	0.06[a]
	(0.01)	(0.01)	(0.01)	(0.01)
Length of material read at work (Skill not used = 0)				
Low	-0.01	-0.01	-0.02	-0.02
	(0.07)	(0.07)	(0.07)	(0.07)
Medium	0.21[c]	0.21[c]	0.18	0.18
	(0.12)	(0.12)	(0.12)	(0.12)
High	0.27[b]	0.27[b]	0.22[c]	0.23[c]
	(0.13)	(0.13)	(0.13)	(0.13)
Parental involvement (Not involved = 0)				
Involved	-0.02	-0.02	-0.02	-0.02
	(0.07)	(0.07)	(0.07)	(0.07)
Dropped out of highest educational level started (No = 0)				
Dropped out	0.20[b]	0.20[b]	0.18[b]	0.18[b]
	(0.08)	(0.08)	(0.08)	(0.08)

Table 21 Continued

Currently attending school (No = 0)				
Yes	0.32[a]	0.30[b]	0.28[b]	0.26[b]
	(0.12)	(0.12)	(0.13)	(0.12)
Experience	0.001[a]	0.002[a]	0.002[a]	0.001[a]
	(0.00)	(0.00)	(0.00)	(0.00)
Exp_Sq/1000	0.00	0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)
Age	0.06[a]		0.06[a]	
	(0.02)		(0.02)	
Age squared	-0.00[a]		-0.00[a]	
	(0.00)		(0.00)	
Economic sector (Agriculture, fishery, mining = 0)				
Manufacturing & construction	0.12	0.12	0.13	0.13
	(0.12)	(0.12)	(0.12)	(0.12)
Commerce	-0.13	-0.14	-0.13	-0.13
	(0.12)	(0.12)	(0.12)	(0.12)
Other services	-0.07	-0.08	-0.08	-0.09
	(0.12)	(0.12)	(0.12)	(0.12)
Gender (Male = 0)				
Female	-0.28[a]	-0.27[a]	-0.28[a]	-0.27[a]
	(0.06)	(0.06)	(0.06)	(0.06)
Age category (15-24 = 0)				
25-34		0.26[a]		0.27[a]
		(0.09)		(0.09)
35-44		0.30[a]		0.31[a]
		(0.10)		(0.10)
45-54		0.24[b]		0.25[b]
		(0.12)		(0.12)
55-64		0.15		0.16
		(0.14)		(0.14)

Table 21 Continued

Regional fixed effect	YES	YES	YES	YES
Constant	-1.18[a]	-0.28	-1.10[a]	-0.19
	(0.35)	(0.18)	(0.35)	(0.19)
R^2	0.15	0.15	0.16	0.15
N	1,709	1,709	1,709	1,709

Regional dummies are included in all the models. The experience squared is divided by 1000. Robust standard errors in brackets, [a] $p<0.01$, [b] $p<0.05$, [c] $p<0.1$

Source: Nunoo (2020)

Marginal analysis on the effect of literacy proficiency levels on hourly earnings

This subsection focuses on digging deeper into the dynamics in the skills-earning relationship. The estimates reported under this subsection are based on the results from Table 22. This was done to make it possible to examine the differences that might exist in the hourly earnings of individuals at different literacy levels, but who have the same level of education. Two key dynamics of the effect of literacy proficiency levels on hourly earnings are examined. First, a pairwise difference in earnings among individuals at the different literacy proficiency levels is evaluated and the predicted effect on earning when all individuals are considered to be at a given skills level. Second, the effect of literacy level on hourly earnings for people with the same level of education is examined. Last, a graph is also presented to show the trends.

The findings from Table 22 show that the predicted effect of literacy proficiency levels is positive and significant at 1 percent. However, between level 1 and 2, there is no change in how literacy proficiency affects hourly earnings. Between level 1 and below level 1 proficiency, there is a difference of about 14 percentage points. However, moving from level 2 to level 3 and beyond increases earnings by about 24 percentage points.

Table 22: Difference in the effect of earnings at different literacy proficiency levels

	Margins	Std. Err.	t-test	P-Val
Below level 1	0.20	0.04	4.86	0.00
Level 1	0.34	0.07	4.71	0.00
Level 2	0.34	0.08	4.10	0.00
Level 3	0.58	0.60	3.63	0.00
	Contrast	Std. Err.		
Level 1 vs Below level 1	0.14	0.09		
Level 2 vs Level 1	-0.00	0.10		
Level 3 & 4 vs Level 2	0.24	0.16		

Source: Nunoo (2020)

Table 23 presents the different effects each of the literacy proficiency levels have on hourly earnings at given education levels. The margins reported are predicted averages of the natural logs of hourly earnings for the various categories. To obtain the actual predicted earnings, the margins reported are used as exponents of the natural number ***e***. For instance, the predicted hourly earnings for the category ‘No education vs Below level 1’ is estimated as *e*^ (-0.002); this shows that the average hourly earnings of a person with no formal education and at below level 1 proficiency is about GHc0.99.

Table 23: Effect of literacy proficiency levels on earnings by education

	Margin	Std. Err.	t-value	P-val
Education vs literacy level				
No education vs Below level 1	-0.002	0.108	-0.02	0.984
No education vs Level 1	0.157	0.139	1.13	0.258
No education vs Level 2	0.142	0.147	0.97	0.334
No education vs Level 3	0.362	0.204	1.77	0.076
Primary vs Below level 1	-0.009	0.100	-0.09	0.930
Primary vs Level 1	0.150	0.131	1.15	0.252
Primary vs Level 2	0.135	0.140	0.96	0.336
Primary vs Level 3	0.355	0.200	1.78	0.076
MSLC/JSS/JHS vs Below level 1	0.041	0.053	0.77	0.439
MSLC/JSS/JHS vs Level 1	0.200	0.087	2.30	0.021
MSLC/JSS/JHS vs Level 2	0.185	0.103	1.79	0.073
MSLC/JSS/JHS vs Level 3 & 4	0.405	0.175	2.31	0.021
Secondary vs Below level 1	0.165	0.085	1.94	0.053
Secondary vs Level 1	0.324	0.087	3.73	0.000
Secondary vs Level 2	0.309	0.092	3.35	0.001
Secondary vs Level 3 & 4	0.529	0.172	3.07	0.002
Tertiary vs Below level 1	0.907	0.116	7.83	0.000
Tertiary vs Level 1	1.066	0.114	9.37	0.000
Tertiary vs Level 2	1.051	0.102	10.29	0.000
Tertiary vs Level 3 & 4	1.270	0.157	8.08	0.000

Source: Nunoo (2020)

It can be observed that among workers with either no formal education or primary education, only the relationship with level 3 literacy proficiency is statistically significant. For each of the higher levels of education either than primary education (i.e. MSLC/JSS/JHS through to tertiary), it is observed that an individual at higher level of literacy proficiency earns more comparatively than workers at relatively lower levels of literacy. For instance, while the average hourly earnings of people with tertiary education and literacy proficiency level below level 1 is GHS 2.47, the hourly earnings of people with tertiary education and level 1 literacy level is GHS 2.90. Also, the average earning per hour of individuals at level 2 literacy and levels 3 literacy are GHc2.86 and GHc3.56 respectively. That is, though they all have tertiary education, those who are at higher literacy levels earn more from their work. Figure 4 gives a pictorial explanation of the trends revealed in Table 23. Figure 4 shows a positive relationship between literacy proficiency levels and hourly earnings based on the educational level. This is an indication that while education is an important determinant for hourly earnings, the differences in earnings for individuals with the same level of education is driven by cognitive skills proficiency.

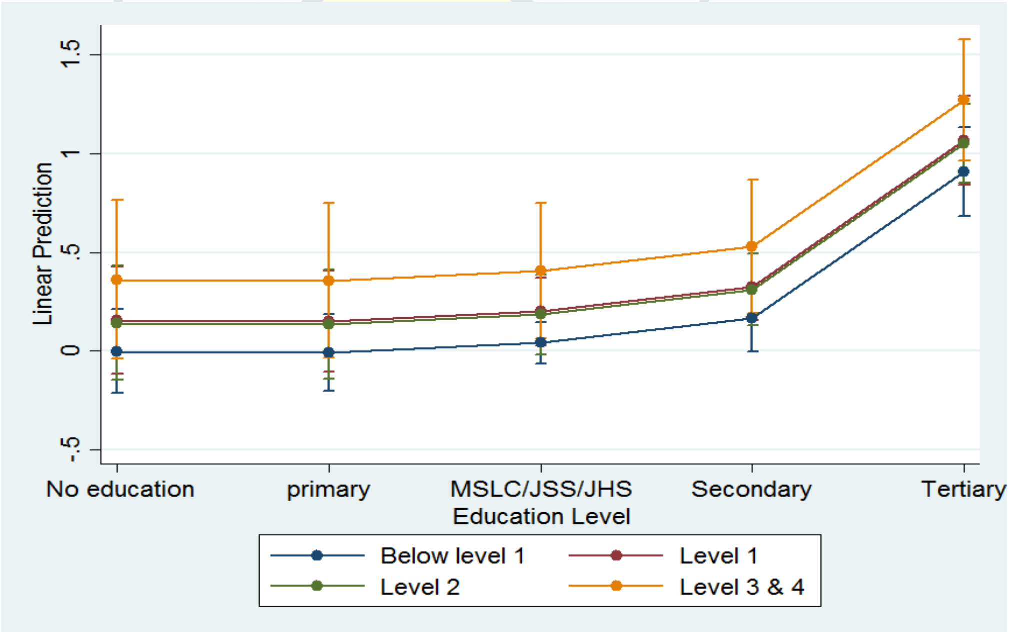

Figure 4: Predicted hourly earnings for literacy proficiency levels by educational levels

Source: Nunoo (2020)

Solving the problem of endogeneity in the earnings model

The argument has been made in the literature concerning the endogeneity between earnings and cognitive skills proficiency (Wiley, 1998; Green & Riddell, 2001; Hanushek *et al.* 2015). This is because of the possible problem of reverse causality between literacy proficiency skills as proxy for cognitive skills and earnings. Higher cognitive skills enable one to find a well-paying job which in turn gives one the arsenals to develop intellectually through further training. Thus, there exist a bi-causality between earnings and literacy skills. The likely problem of endogeneity, thus, has the potential of upwardly biasing the results of the literacy proficiency coefficients in Tables 20 and 21. To go around this, a set of three (3) Instrumental Variable (IV) regression models were run and the results are presented in Table 24.

In each of these models, literacy proficiency scores become the endogenous variable with age of starting school as the instrumental variable. This is because, as already established in chapter four, the age one starts schoolings significantly affects the individual's literacy proficiency level, and this indicates a significant association between the two variables. However, the age one starts school has no established relationship with earnings. This assertion is supported by Acosta *et al.* (2015). Again, Hampf *et al.* (2017) opines that using variables that reflect the condition individual before joining the labour will serve as good instruments. The instrument passed the Sargan-Hansen test of overidentified restrictions, and the first stages show they are not weak, as argued by Stock, Wright, and Yogo (2002). The study found a significant association between age of starting school and literacy proficiency scores, but insignificant association between age of starting school and earnings.

This makes age of starting school a good instrument as stated by Woodridge (2014).

From Table 24, model 1 is a simple regression with literacy score as the dependent variable. Models 2 and 3 have the same number of covariates and only differ in the measurement of age as an independent variable. From models 2 and 3, it is evident that one-standard-deviation increase in literacy proficiency scores increases earnings by about 3 percent. Compared with the coefficients of the literacy skills variables in Tables 20 and 21, the results in Table 24 show a reduction in the magnitude of the estimated coefficient. The trends in the other covariates remain similar to what is observed in Tables 20 and 21.

Table 24: IV results on the relationship between literacy and earnings

Dependent variable: Log of hourly earnings			
	(1)	(2)	(3)
Predicted literacy score	0.02[b]	0.03[c]	0.03[c]
	(0.01)	(0.02)	(0.02)
Length of material read overall score (Skill not used=0)			
Low		-0.56	-0.61
		(0.42)	(0.43)
Medium		-1.35	-1.39
		(1.36)	(1.38)
High		-1.77	-1.82
		(1.67)	(1.70)
Socioeconomic status at age 15 (Low=0)			
Medium		0.17	0.16
		(0.36)	(0.36)
High		0.15	0.17
		(0.37)	(0.37)

Table 24 Continued

Dropped out of highest educational level (No = 0)			
Dropped out		0.62	0.64
		(0.55)	(0.56)
Gender (Male = 0)			
Female		-0.32[a]	-0.33[a]
		(0.09)	(0.09)
Has a chronic disease (No=0)			
Yes		0.51	0.52
		(0.42)	(0.42)
Experience		0.002[b]	0.003[b]
		(0.00)	(0.00)
Exp_Sq/1000		0.00	0.00
		(0.00)	(0.00)
Age		0.25[b]	
		(0.11)	
Age squared		-0.00[b]	
		(0.00)	
Age category (15-24=0)			
25-34			1.26[a]
			(0.44)
35-44			1.48[a]
			(0.57)
45-54			1.75[a]
			(0.56)
55-64			0.96[b]
			(0.57)
Region fixed effects		YES	YES
Constant	0.49	-4.12	-0.39
	(0.97)	(3.13)	(1.72)
R^2	-0.02	-0.13	-0.13
N	1,708	1,708	1,708

Table 24 Continued

Under-identification test	0.799	14.441	13.905
Chi (1) P-Value	0.000	0.000	0.000
Weak identification test	0.789	14.385	13.830
Sargan statistic (P-value)	0.000	0.000	0.000

Note: Standard errors in parentheses; [a] p<0.01, [b] p<0.05, [c] p<0.1; the instrumented variable is literacy score while the instrument is age of starting formal education. Models 2 and 3 includes regions fixed effects.

Source: Nunoo (2020)

Relationship between cognitive skills and employment status, skills level, sector of employment and worker status

Beside earnings of the individual, the study examined the effect of literacy proficiency skills on other labour market outcomes. These labour market outcomes are employment status (i.e. employed or unemployed), skills level (i.e. medium and low skilled worker or high skilled worker), sector of employment (i.e. formal or informal) and worker status (i.e. wage worker or self-employed). Each of these four (4) labour market outcomes are binary in measurement. Logit regression was estimated and their marginal effects discussed. Results obtained from the estimates are presented on Tables 25 – 28.

Table 25 presents the marginal effects (ME) of four (4) nested binary logistic models with employment status as the dependent variable, and the base categories being the employed. It is evident on Table 25 that individuals with higher levels of literacy proficiency are more probable to be employed. For instance, from Model 4, individuals who performed at level 1 literacy proficiency are about 5 percent less likely to be unemployed compared to those with literacy skills below level 1. Similarly, those who performed at literacy proficiency levels 2 and 3 are about 8 and 12 percent respectively less likely to be unemployed than being employed. That is, the higher the literacy, the lower the probability of being unemployed. Cognitive skills proficiency increases the likelihood of getting employment.

In support of the findings, Kingdon and Soderbom (2007) showed that being literate in Ghana positively influence entry into the labour market and the employability of individuals. In addition, across the OECD countries, Hanushek et al. (2015) revealed that cognitive skills measured by numeracy proficiency positively determine the employment status of workers. Abrassart (2011) also argued that individuals with low cognitive skills are disadvantaged in the labour market with respect to their prospect of finding jobs. However, Acosta *et al.* (2015) found no statistical significance between reading proficiency and being employed in Colombia.

Table 25: Results on the effect of literacy proficiency on employment status

Dependent Variable: Employment status (Base category = employed)					
	(1)	(2)	(3)	(4)	(5)
	ME	ME	ME	ME	ME
Literacy score	-0.002[a]	-0.003[a]			
	(0.00)	(0.00)			
Literacy level (Below level 1=0)					
Level 1			-0.04[b]	-0.05[b]	-0.02
			(0.02)	(0.02)	(0.02)
Level 2			-0.04[b]	-0.08[a]	-0.01
			(0.02)	(0.03)	(0.02)
Level 3 or 4			-0.02[b]	-0.12[c]	0.004
			(0.03)	(0.06)	(0.03)
Education					
No education		0.002		-0.003	
		(0.02)		(0.02)	
Primary		-0.09[a]		-0.09[a]	
		(0.03)		(0.03)	
MSLC/JSS/JHS		-0.07[a]		-0.07[a]	
		(0.02)		(0.02)	
Secondary		-0.04[b]		-0.04[b]	
		(0.01)		(0.02)	
Education (Years)					-0.002
					(0.003)
Length of material read overall score (Skill not used=0)					
Low					-0.02
					(0.01)
Medium					-0.05[a]

Table 25 continued

					(0.02)
High					-0.03
					(0.02)
Parental involvement (Not involved=0)					
Involved					-0.02
					(0.01)
Dropped out of highest educational level started (N0=0)					
Dropped out					-0.01
					(0.02)
Currently attending school (No=0)					
Yes					-0.12 ^{a}
					(0.03)
Gender (Male=0)					
Female					-0.01
					(0.01)
Chronic illness (Not present=0)					
Present					-0.00
					(-0.01)
Age in years					-0.005 ^{a}
					(0.00)
Region fixed effect					YES
N	2063	2063	2063	2063	2063

Regional dummies are included in all model 5. Robust standard errors in brackets, ^{a} p<0.01, ^{b} p<0.05, ^{c} p<0.1

Source: Nunoo (2020).

Similarly, it was found that, higher levels of education reduce the probability of not being employed. That is to say that, an additional year of education, at a relatively higher level of education, reduces the probability of being unemployed. Kingdon and Soderbom (2007) support this finding by arguing that while education positively influence the likelihood of being employed, it tends to favour men more than women in Ghana and Pakistan. Individuals who reported they read lengthier materials either at work or at home were also found to be less likely to be unemployed than being employed. Gender-employment gap is observed in Table 25. Women are about 1 percent less likely to be employed compared to men. This reflects the general employment rate in urban areas in Ghana where about 73 percent men as opposed to 67 percent women are employed (GSS, 2013). Older individuals also have higher chances of being employed than younger ones. If an individual gets a year older, the probability of getting employed increases by 0.47 percent.

To examine the effect of cognitive skills on the sector of employment (formal or informal), the result in Table 26 is presented. The Marginal Effects (ME) obtained from the binary logit models are discussed with the sector of employment as the dependent variable and formal employment as the base category. From Table 26, it is evident that workers performing at higher literacy proficiency levels are less likely to seek employment in the informal sector than in the formal sector. For instance, individuals at level 2 literacy proficiency are about 7 percent less likely to be in informal employment than to be in formal employment. Also, individuals at level 3 literacy proficiency levels are about 10 percent less likely to be in the informal sector as opposed to the formal sector.

Even though the urban areas (63 percent) have more informal sector employment opportunities than the rural areas (23 percent) in Ghana (GSS, 2013), individuals with higher cognitive skills tend to prefer working in the formal sector where they can have much more employment security (Nunoo *et al.* 2018). Nordman, Sarr, and Sharma (2018) argue that cognitive skills accounts for a greater share of the reasons individuals might work in the formal sector. Acosta *et al.* (2015) also observed that the more proficient the reading skills of a worker in Colombia, the higher the probability that, the individual will be in a formal work establishment.

Table 26: Results on the effect of literacy proficiency on the sector of employment

Dependent Variable: Sector of employment (Base category = formal)				
	(1)	(2)	(3)	(4)
	ME	ME	ME	ME
Literacy score	-0.003[a]	-0.003[a]		
	(0.00)	(0.00)		
Literacy level (Below level 1=0)				
Level 1			-0.03[c]	-0.03
			(0.02)	(0.02)
Level 2			-0.08[a]	-0.07[a]
			(0.03)	(0.03)
Level 3 or 4			-0.11[b]	-0.10[b]
			(0.04)	(0.04)
Education (Years)	-0.02[a]	-0.02[a]	-0.02[a]	-0.02[a]
	(0.00)	(0.00)	(0.00)	(0.00)
Length of material read (Skill not used = 0)				
Low	-0.07[a]	-0.07[a]	-0.07[a]	-0.07[a]
	(0.02)	(0.02)	(0.02)	(0.02)
Medium	-0.12[a]	-0.13[a]	-0.13[a]	-0.13[a]
	(0.03)	(0.03)	(0.03)	(0.03)
High	-0.08[a]	-0.08[a]	-0.08[b]	-0.08[a]
	(0.03)	(0.03)	(0.03)	(0.03)
Parental involvement (Not involved=0)				
Involved	-0.02	-0.02	-0.02	-0.02
	(0.02)	(0.02)	(0.02)	(0.02)
Dropped out of highest educational level started (No = 0)				
Dropped out	0.02	0.02	0.02	0.02
	(0.02)	(0.02)	(0.02)	(0.02)

Table 26 Continued

Currently attending school (No=0)				
Yes	-0.001	-0.003	0.003	0.002
	(0.02)	(0.02)	(0.02)	(0.02)
Experience	0.00	0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)
Age	-0.02[a]		-0.02[a]	
	(0.00)		(0.00)	
Age squared	0.00[a]		0.00[a]	
	(0.00)		(0.00)	
Economic sector (Agriculture, fishery, mining = 0)				
Manufacturing & construction	0.08[b]	0.08[b]	0.08[b]	0.08[b]
	(0.04)	(0.04)	(0.03)	(0.03)
Commerce	0.16[a]	0.16[a]	0.16[a]	0.16
	(0.04)	(0.04)	(0.04)	(0.04)
Other services	-0.05	-0.04	-0.05	-0.04
	(0.04)	(0.03)	(0.04)	(0.04)
Gender (Male = 0)				
Female	0.04[a]	0.04[b]	0.04[b]	0.0[b]
	(0.01)	(0.01)	(0.01)	(0.01)
Age category (15-24=0)				
25-34		-0.08[a]		-0.08[a]
		(0.02)		(0.02)
35-44		-0.09[a]		-0.09[a]
		(0.02)		(0.02)
45-54		-0.14 [a]		-0.14 [a]
		(0.03)		(0.03)
55-64		-0.10 [a]		-0.11 [a]
		(0.03)		(0.03)
Region fixed effects	Yes	Yes	Yes	Yes
N	1899	1899	1899	1899

Regional dummies are included in all model 5. Robust standard errors in brackets, [a] $p<0.01$, [b] $p<0.05$, [c] $p<0.1$

Source: Nunoo (2020).

It is again evident from Table 26 that the longer the number of years one spends in school, the less probable the individual will prefer to work in informal sector. An additional year of schooling increases the probability of working in the formal sector by about 2 percent. In support of this findings, Lupeja and Gubo (2017) observed that in Tanzania, individuals with at least secondary education are less likely to work in the informal sector. Contrary to the current study, Mok and Qian (2018) revealed that in China, recent college graduates are more disposed to work in the urban informal sector than older college graduates. Interestingly, females are more likely to work in the informal sector than their male counterparts. This supports the report from the GSS (2013) which observed that among those who were currently employed in the informal sector of urban Ghana, about 69 percent were females; while males constituted about 53 percent.

Table 27 presents results on the effect of literacy proficiency on workers' skills. Workers' skills captured as binary (1 = managerial position, 0 = lower and middle level personnel) is the dependent variable. The findings from the estimations show that there exists a positive relationship between literacy proficiency and workers' skills. Improvements in workers' literacy proficiency score is associated with increased probability of being in a managerial position than being in a lower or medium level personnel. A similar trend is observed when attention is given to the level of proficiency. The higher the level of proficiency the higher the likelihood of being at a position of management. The finding is consistent with the works of Acosta *et al.* (2015) and Hanushek and Woessmann (2008). They showed that reading proficiency is positively associated with being a highly skilled worker at the managerial level.

From Table 27, education positively influences the propensity to be a highly skilled worker by about 2 percent. In addition, the amount of materials read at work also has a positive likelihood for an individual to be in a managerial position. However, females are observed to be more likely to work as lower and middle level personnel than to be at a managerial position. While this could be explained as resulting from the poor performance of women in general on the literacy scores, it possibly can reflect the gender discrimination that exists in the work place.

Table 27: Results on the effect of literacy proficiency on workers' skills

Dependent Variable: Workers' skills (Base category = lower & middle level personnel)				
	(1)	(2)	(3)	(4)
	ME	ME	ME	ME
Literacy score	0.002[b]	0.002[b]		
	(0.00)	(0.00)		
Literacy level (Below level 1=0)				
Level 1			0.05[b]	0.05[b]
			(0.02)	(0.02)
Level 2			0.03[c]	0.03[c]
			(0.02)	(0.02)
Level 3 or 4			0.08[b]	0.08[b]
			(0.03)	(0.03)
Education (Years)	0.02[a]	0.02[a]	0.02[a]	0.02
	(0.00)	(0.00)	(0.00)	(0.00)
Length of material read (Skill not used = 0)				
Low	0.10[a]	0.10[a]	0.10[a]	0.10[a]
	(0.02)	(0.02)	(0.02)	(0.02)
Medium	0.18[a]	0.18[a]	0.18[a]	0.18[a]
	(0.03)	(0.03)	(0.03)	(0.03)

Table 27 Continued

High	0.18[a]	0.18[a]	0.18[a]	0.18[a]
	(0.04)	(0.04)	(0.03)	(0.03)
Parental involvement (Not involved=0)				
Involved	-0.00	-0.00	-0.00	-0.00
	(0.02)	(0.02)	(0.02)	(0.02)
Dropped out of highest educational level started (N0=0)				
Dropped out	0.00	0.00	0.00	0.00
	(0.02)	(0.02)	(0.02)	(0.02)
Currently attending school (No=0)				
Yes	0.04[c]	0.04[b]	0.04[b]	0.04[c]
	(0.02)	(0.02)	(0.02)	(0.02)
Experience	0.00	0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)
Age	-0.001		-0.001	-0.001
	(0.004)		(0.004)	(0.004)
Age squared	0.00		0.00	0.00
	(0.00)		(0.00)	(0.00)
Economic sector (Agriculture, fishery, mining =0)				
Manufacturing & construction	-0.02	-0.02	-0.02	-0.02
	(0.03)	(0.03)	(0.03)	(0.03)
Commerce	-0.04	-0.04	-0.04	-0.04
	(0.03)	(0.03)	(0.03)	(0.03)
Other services	0.11[a]	0.11[a]	0.11[a]	0.11[a]
	(0.03)	(0.03)	(0.03)	(0.03)
Gender (Male=0)				
Female	-0.03[b]	-0.03[b]	-0.03[b]	-0.03[b]
	(0.01)	(0.01)	(0.01)	(0.01)

Table 27 Continued

Age category (15-24=0)				
25-34		0.007		0.007
		(0.01)		(0.02)
35-44		-0.00		0.002
		(0.02)		(0.02)
45-54		0.02		0.02
		(0.03)		(0.03)
55-64		0.08		0.02
		(0.03)		(0.03)
Region fixed effects	Yes	Yes	Yes	Yes
N	1899	1899	1899	1899

Regional dummies are included in all model 5. Robust standard errors in brackets, [a] p<0.01, [b] p<0.05, [c] p<0.1

Source: Nunoo (2020).

The relationship between workers' status (wage worker or self-employed) and cognitive skills proficiency is examined in Table 28. The results revealed that literacy proficiency increases the likelihood of being a wage worker. Compared to being self-employed, performing at higher literacy proficiency levels increases the propensity to be a wage worker. This result agree with the works of Acosta *et al.* (2015), Altonji and Pierret (2001) and Hanushek and Woessmann (2008). Kingdon and Soderbom (2007), in Ghana, observed a similar trend where both reading and numeracy proficiencies are positively related to wage employment but inversely to self-employment.

Table 28: Results on the effect of literacy proficiency on workers' status

Dependent Variable: Worker status (Base category = self-employed)				
	(1)	(2)	(3)	(4)
	ME	ME	ME	ME
Literacy score	0.006[a]	0.006[a]		
	(0.00)	(0.00)		
Literacy level (Below level 1=0)				
Level 1			0.08[a]	0.08[a]
			(0.03)	(0.03)
Level 2			0.14[a]	0.15[a]
			(0.04)	(0.04)
Level 3 or 4			0.25[a]	0.26[a]
			(0.08)	(0.08)
Education (Years)	0.02[a]	0.02[a]	0.02[a]	0.02[a]
	(0.003)	(0.003)	(0.00)	(0.00)
Length of material read (Skill not used = 0)				
Low	0.09[a]	0.09[a]	0.10[a]	0.09[a]
	(0.03)	(0.03)	(0.03)	(0.03)
Medium	0.23[a]	0.23[a]	0.23[a]	0.23[a]
	(0.05)	(0.05)	(0.05)	(0.05)
High	0.17[b]	0.17[b]	0.17[a]	0.16[a]
	(0.05)	(0.05)	(0.05)	(0.05)
Parental involvement (Not involved=0)				
Involved	-0.00	-0.00	-0.00	-0.00
	(0.03)	(0.03)	(0.03)	(0.03)
Dropped out of highest educational level started (N0=0)				
Dropped out	0.03	0.03	0.03	0.03
	(0.03)	(0.03)	(0.03)	(0.03)
Currently attending school (No=0)				
Yes	-0.02	-0.02	-0.05	-0.03[c]

Table 28 Continued

	(0.04)	(0.04)	(0.04)	(0.04)
Experience	0.00	0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)
Age	-0.02		-0.02[a]	
	(0.007)		(0.004)	
Age squared	0.00		0.00[a]	
	(0.00)		(0.00)	
Economic sector (Agriculture, fishery, mining =0)				
Manufacturing & construction	-0.19	-0.02	-0.02	-0.02
	(0.02)	(0.03)	(0.03)	(0.03)
Commerce	-0.04	-0.04	-0.04	-0.04
	(0.03)	(0.03)	(0.03)	(0.03)
Other services	0.11[a]	0.11[a]	0.11[a]	0.11[a]
	(0.03)	(0.03)	(0.03)	(0.03)
Gender (Male=0)				
Female	-0.19[b]	-0.19[b]	-0.19[b]	-0.19[a]
	(0.02)	(0.02)	(0.02)	(0.02)
Age category (15-24=0)				
25-34		-0.07[b]		-0.08[b]
		(0.01)		(0.03)
35-44		-0.17[a]		-0.17[a]
		(0.02)		(0.03)
45-54		-0.17[a]		-0.17[a]
		(0.04)		(0.04)
55-64		-0.20[a]		-0.20[a]
		(0.04)		(0.04)
Region fixed effects	Yes	Yes	Yes	Yes
N	1899	1899	1899	1899

Regional dummies are included in all model 5. Robust standard errors in brackets, [a] $p<0.01$, [b] $p<0.05$, [c] $p<0.1$

Source: Nunoo (2020).

As in the works of Acosta *et al.* (2015) and Kingdon and Soderbom (2007), the study found that education positively increases the likelihood of an individual working in a wage employment as opposed to working as a self-employed. Females are also found to be engaged in self-employment more than their male counterparts. This confirms the observation from GSS (2013) which revealed that about 61 percent of all females employed were in self-employment as against about 43 percent of males.

Summary

This chapter reported empirical results and discussion of findings on the effect of literacy skills proficiency on labour market outcomes. The labour market outcomes included log of hourly earnings, being employed, being a wage worker, being at a managerial level and the sector of employment (informal or formal). The empirical analyses were guided by the human capital theory and signalling theory with the OLS, IV and Logit regression models as the estimation techniques. It was established that the null hypothesis that cognitive skills is not a significant positive determinant of labour market outcomes is rejected. The results revealed that in line with the hypothesis, literacy proficiency had positive significant effect on hourly earnings. Compared to being unemployed, literacy proficiency positively influence employment. In addition, individuals with higher cognitive proficiency skills are more likely to be in wage employment than to be self-employed. Again, literacy proficiency is positively linked to being in formal employment and working at the managerial level.

Other significant findings of the study included the positive relationship between education and the labour market outcomes. For females, irrespective of the educational level, being highly skilled improved labour market outcomes like earnings. However, females were less likely to work in wage employment; to be in formal establishments; to be at managerial positions, and to be employed compared to males. Age was observed to have a concave relationship with earnings with the turning point age being 41 years.

CHAPTER SIX

SOFT SKILLS, LITERACY AND LABOUR MARKET OUTCOMES

Introduction

This chapter presents and discusses the empirical findings on the effect soft skills have on individual's labour market outcomes, with special emphasis on the big five personality trait. The chapter will answer the third objective of the study, which is to test the hypothesis of whether or not, there is a significant positive relationship between soft skills and hourly wage, being employed or not, sector of employment and skills level in the labour market. The gender dimension is also given attention. Structural equation model (SEM) is the main estimation technique used in the chapter. The chapter is organized into three sections. The first section presents the descriptive statistics and partial correlation of the key variables with the soft skills. The second section provides estimated results of the soft skills on the log of hourly earnings while controlling for literacy proficiency, socio-demographic, educational and work-related characteristics. The third section presents results of effects of soft skills on being employed, sector of employment and skills level in the labour market.

Descriptive statistics and partial correlation between measures of soft skills

Table 29 presents the descriptive statistics for the variables used for the analyses in this Chapter. As evident from Table 29, the mean hourly earnings was GH¢ 3.38 in 2013 with a standard deviation (SD) of GH¢ 9.35. This shows how low workers on the average are generally paid in Ghana compared to many advanced economies. The exchange rate of the Ghanaian cedi to the dollar was US$1 to GH¢ 2.09 when the survey was conducted (https://www.exchange-rates.org/Rate/USD/GHS/8-11-2013). While the minimum hourly earnings in US was about US$ 7.25, the Ghanaian worker was paid just about US$ 1.62 an hour in 2013, less than a quarter of a US worker's minimum hourly wage.

It can also be seen that about 72 percent of the sample were in some form of employment. This figure compares favourably with the report of GSS (2014) that the employment-to-population ratio for Ghana in 2013 was 75.4 percent. Of those who are currently employed, wage workers accounted for 38.3 percent of the sample; while about 81.8 percent were in the informal sector. The GLSS 6 shows that, nation-wide, about 20.2 percent were in wage employment with about 42 percent of the total workers in the country found in the informal sector (GSS, 2014). Table 29 shows that just about 17.3 percent of workers were classified as skilled or being in the managerial role. On the average, workers had worked for about 83 months. This translates to about 7 years of work experience.

The soft skills, which are openness to experience, extraversion, emotional stability, conscientiousness and agreeableness, were measured on a Likert-type scale of 1 to 4, with 4 being more desirable. Using the raw score, conscientiousness had the highest mean score of 3.212 (SD = 0.579) with extraversion having the least mean score of 2.517 (SD = 0.612). The raw mean scores of conscientiousness suggests that many have the tendency to be effective, efficient, and careful instead of being messy and sluggish at work. The cognitive ability, which is captured by literacy proficiency in the study had a mean score of about 140 (SD = 91.463). This mean level of literacy proficiency just falls in below level 1 proficiency bracket, the least of all five levels of proficiency. The highest literacy score is about 3.54 which is categorize under literacy level 4. This supports the results of Lehrer (2009) who finds that, even among secondary school students, a large number were unable to read and understand written text. Of those working, just about 41 percent of them read some materials at work. This could also contribute toward the low levels of literacy in the sample. The average years of schooling as seen in Table 29 is about 9 years (SD = 3.705). This is higher than the mean years of schooling reported by the GSS (2014) which is about 7 years. It shows that the average individual has completed just about Junior High School. About 72 percent of all individuals sampled has ever attended preschool.

Females accounts for about 55 percent of the total sample; while the mean age is about 32 years (SD = 11.857). This shows that the sample is largely youthful in nature and are in their prime. About 80 percent of the individuals had at least one parent in the household while they were growing up. Interestingly, about 90 percent of the sample had at least one parent having a form of education.

Table 29: Descriptive statistics of the variables

Variables	Mean	SD	Min	Max	Count
Hourly earnings	3.38	9.35	0	196.73	1765
Log of hourly earnings	0.36	1.24	-6.03	5.28	1750
Employment Status	0.72	0.45	0	1	2687
Wage worker	0.38	0.49	0	1	1940
Informal employment	0.82	0.39	0	1	1936
Skill	0.17	0.38	0	1	2101
Openness to experience	3.08	0.59	1	4	1903
Extraversion	2.52	0.61	1	4	1914
Emotional Stability	2.72	0.57	1	4	1889
Conscientiousness	3.21	0.58	1	4	1907
Agreeableness	3.04	0.64	1	4	1897
Literacy proficiency	139.70	91.46	0	354.02	2693
Years of schooling	9.07	3.71	0	19	2693
Sex (Female)	0.55	0.50	0	1	2693
Age	32.33	11.86	15	64	2693
Age squared	1185.91	886.09	225	4096	2693
Father and mother in the house	0.80	0.40	0	1	2693
Tenure (in months)	82.53	91.64	0	480	1936
Attended preschool	0.71	0.45	0	1	2656
Parental Education	0.90	0.09	0	1	2693
Read at work	0.41	0.49	0	1	2102
N	2693				

Source: Nunoo (2020)

An examination of the correlations between the measures of soft skills and literacy proficiency were found to be mostly significant but low in magnitude. As shown in Table 30, the correlation between openness to experience and all the other measures of soft skills are positive and significant with the exception of emotional stability, which is negative and not significant.

Table 30 also has conscientiousness (0.346) and agreeableness (0.348) as among the ones with a higher correlation. The highest correlation is actually observed between agreeableness and conscientiousness (0.356). The relationships between literacy proficiency and openness to experience, agreeableness and conscientiousness are relatively high with 0.254, 0.221 and 0.210 respectively.

Table 30: Partial correlations between measures of skills, Ghana

	(1)	(2)	(3)	(4)	(5)	(6)
(1) Openness to experience	1					
(2) Extraversion	0.13[a]	1				
(3) Emotional Stability	-0.0012	0.11	1			
(4) Conscientiousness	0.35[a]	0.05[a]	-0.05[a]	1		
(5) Agreeableness	0.35 [a]	0.13[a]	-0.03	0.36[a]	1	
(6) Literacy proficiency	0.25[a]	0.06[a]	-0.09[a]	0.21[a]	0.22[a]	1

[c] $p < 0.1$, [b] $p < 0.05$, [a] $p < 0.01$

Source: Nunoo (2020)

Distribution of Soft Skills Across Gender in Ghana

Figure 5 shows pictorial relationship between the various soft skills and gender in Ghana using kernel density. There are relational differences in the distribution between males' and females' soft skills. However, at various levels of soft skills, as can be seen in Figure 5, males reach their peak before female, meaning that females perform well on all counts of soft skills used in the study. This appears to show that females tend to out-perform their male colleagues in exhibiting these soft skills. It can also be observed that both males and females are less likely to possess openness to experience, agreeableness and conscientiousness reflecting the relatively negative skewed nature, but they are more likely to be emotionally stable. The observed differences are statistically significant at the 95 percent level for all the soft skills except agreeableness where there is no significance between males and females when the T-test is used. This finding confirms the results of other studies that observe females to consistently score higher than men on conscientiousness, openness to experience, and agreeableness, and associated measures such as tender-mindedness (Feingold, 1994; Costa *et al*., 2001; Goodwin & Gotlib, 2004; and Schmitt *et al*., 2008). The perceived differences could be due to the accepted gender roles in many Ghanaian societies where women are expected to agree to decisions imposed on them by their male counterparts and are to be industrious and orderly in behavior and actions.

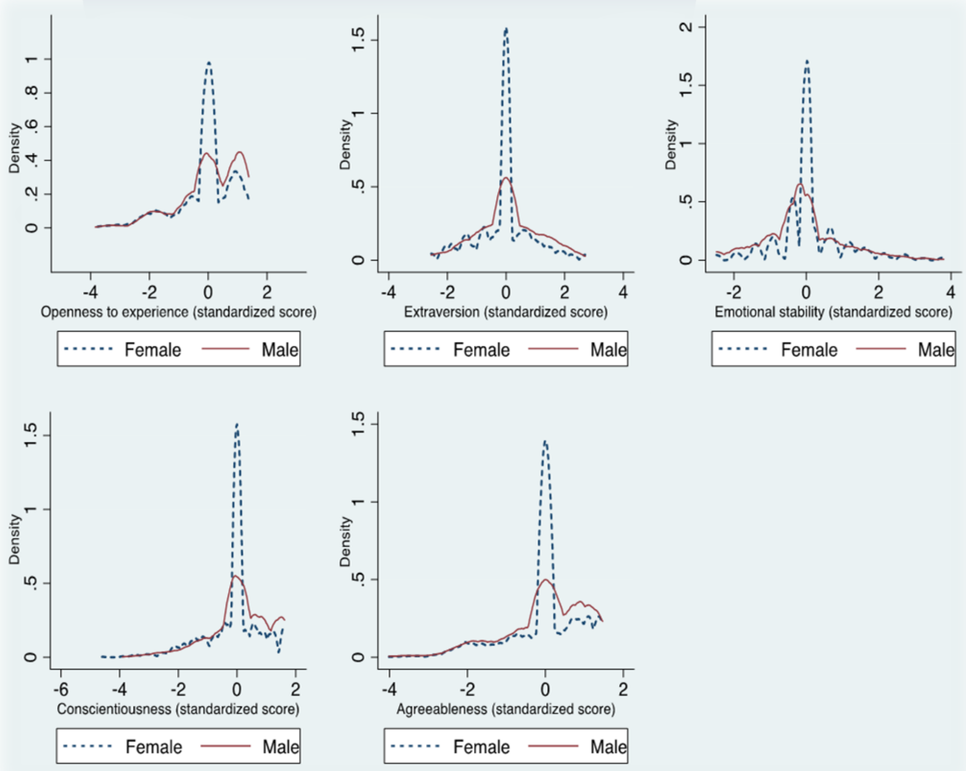

Figure 5: Distribution of soft skills across gender, Ghana

Source: Nunoo (2020)

Note: The graphs represent tabulations of the standardized scores of soft skills across gender. Differences in the distribution of all the soft skills are significant at the 95 percent level based on T-tests.

Distribution of Soft Skills across Highest Educational Level Completed

Figure 6 also shows graphical representation of soft skills and highest educational level completed in Ghana. From Figure 6, it can vividly be seen that soft skills are magnified with higher education. The least scores are observed among those with primary and no schooling. This makes intuitive sense because those who have had advanced level of education are mostly exposed to a number of formal and informal ways of doing things, and as such, may possess these personality traits (soft skills) as illustrated in Figure 6. To add, there are significant differences in the distribution of the various soft skills by educational levels completed when a one-way analysis of variance (ANOVA) was conducted at 95 percent level. The current study supports the finding of Almlund *et al.* (2011) which found that the big five personality traits are positively associated with years of schooling in the United States, Germany and Netherlands with conscientiousness and emotional stability having the strongest association.

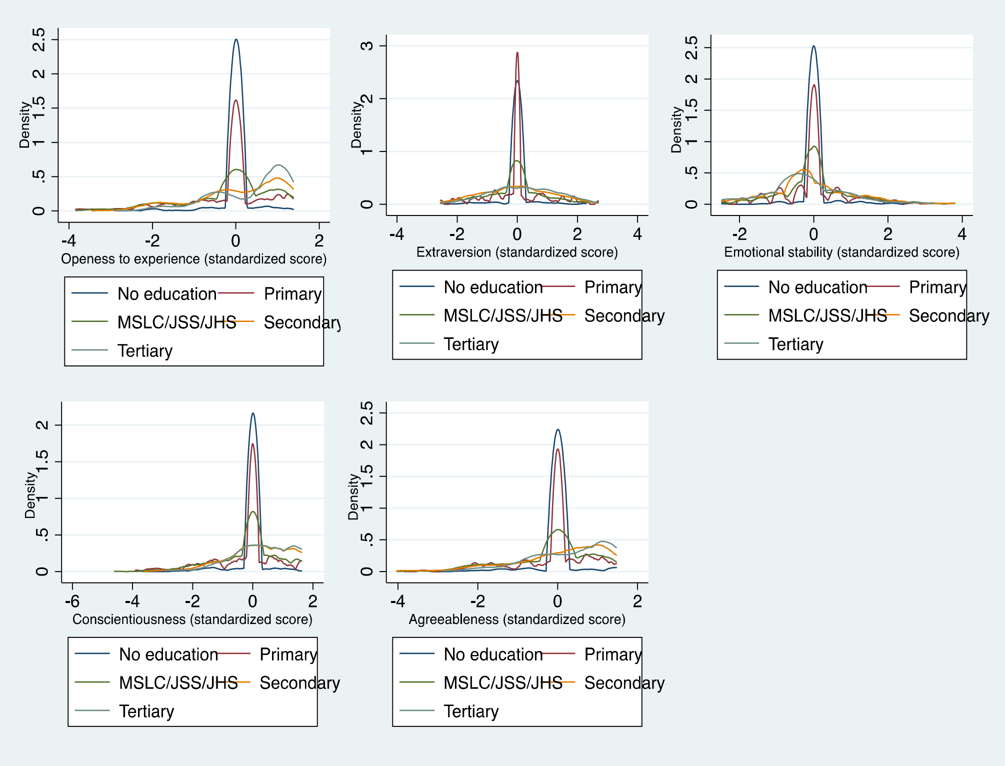

Figure 6: Distribution of soft skills across highest educational level completed, Ghana

Source: Nunoo (2020).

Note: The graphs represent tabulations of the standardized scores of soft skills across gender. Differences in the distribution of all the soft skills are significant at the 95 percent level based on ANOVA.

Results of Structural Equations

Model Fit

One general model was estimated for all the labour market outcomes used in this study (log of hourly earnings, employment status, skills level and being a wage worker). The model had no dynamic or reciprocal paths making it recursive. The model, as presented, was seen to fit the data to an acceptable threshold. This is presented in Tables 31-33. Because the models were fitted with robust standard error, only the standardized root mean squared residual

(SRMR) and coefficient of determination (CD) were provided as goodness-of-fit measures. According to Pituch and Stevens (2016) and Hu and Bentler (1999), SRMR values up to 0.05 are considered indicative of a close-fitting model. Values between 0.05 up to 0.80 suggest adequate/acceptable fit while CD is equivalent to the overall model R^2 and should be close to 1 to be close-fitted.

From the full model in Table 31, SRMR is 0.063 while CD is 0.436 suggesting adequate fit with about 44 percent of the variation in hourly earnings explained by the factors included in the model. For the female and male models, similar results are observed for the goodness-fit measures. SRMR is 0.066 for the male model; while 0.063 is observed for the female model with CD being about 49 and 34 percent respectively. The generalized structural equation models for the binary dependent variables did not give similar goodness-of-fit measure.

SEM Results for Hourly Earnings

The SEM results on the effect of soft skills on hourly earnings are reported in Tables 31-33. The estimates are standardized maximum likelihood regression weights (Desjardins, 2003). Three different models are analysed in this section using direct, indirect and total effects of the soft skills and literacy proficiency on log hourly earnings in Ghana. The direct effect of a variable of interest on an endogenous variable is the coefficient of interest in the equation for endogenous variable. It is conditional on all other variables in the equation and the effect ignores any simultaneous effects. The total effect of a variable, on the other hand, is the change in an endogenous variable due to a unit change in the variable of interest after accounting for all the simultaneity in the system.

The indirect effect becomes the difference between the total effect and direct effect.

In assessing the effect of the soft skills on log hourly earnings, literacy proficiency, gender, age, age of starting school, parental education, years of schooling, tenure, whether individual attended preschool, reads at work and had father and mother at home by age 15, are included in the analysis as control variables. This is because previous research suggests that they are significant determinants of log hourly earnings. From Table 31, it can be observed that openness to experience is the only soft skill out of the big five personality traits which is positive and significant ($p<0.05$) in explaining log hourly earnings among adults in Ghana. It also has the highest coefficient. Following Desjardins (2003), a one-standard deviation higher in openness to experience is associated with about 46 percentage points increase in log hourly earnings, when all the other control variables are accounted for. With the exception of conscientiousness, which although not significant, was positive, extraversion, emotional stability and agreeableness were negative and not significant.

As reported in Table 32, when a separate model is run for females, none of the soft skills were significant in influencing log of hourly earnings. The highest effect of a soft skill on log of hourly earnings was seen in the model for males as can be observed in Table 33. Openness to experience is positive and significant ($p<0.05$). It suggests that a one-standard deviation higher openness to experience is associated with about 64 percentage point rise in log hourly earnings for men. This disparity in gender wage gap can also be inferred from the sex variable in Table 31 which is significant and negative. The results show that compared with males, females earn about 38 percentage point less than males. In Ghana, given that intelligence, being innovative, creative and ingenuous are all facets of openness to experience, employers may be using the pay difference to attract individuals who have these personality traits to work for them.

Table 31: Full structural equation results of associations between hourly earnings on latent soft skills in Ghana

Log of Hourly Earnings	*Direct Effects*	*Robust SE*	*Indirect Effects*	*Robust SE*	*Total Effects*	*Robust SE*
Structural						
Openness to experience	0.46^{c}	0.23	-	-	0.46^{c}	0.23
Extraversion	-0.23	0.25	-	-	-0.23	0.25
Emotional Stability	-0.16	0.13	-	-	-0.16	0.13
Conscientiousness	0.26	0.17	-	-	0.26	0.17
Agreeableness	-0.07	0.16	-	-	-0.07	0.16
Literacy proficiency	0.0008^{c}	0.0004	-	-	0.0008^{c}	0.0004
Sex (Female)	-0.38^{a}	0.06	-	-	-0.38^{a}	0.06
Age	0.05^{b}	0.02	-	-	0.05^{b}	0.02
Age squared	-0.0006^{c}	0.0002	-	-	-0.0006^{c}	0.0002
Age of starting school	0.02	0.02	-	-	0.012	0.02
Parental Education	0.28	0.29	-	-	0.28	0.29
Years of schooling	0.07^{a}	0.009	0.01^{a}	0.005	0.08^{a}	0.009
Tenure	0.001^{b}	0.0004			0.001^{b}	0.0004
Attended preschool	-	-	-0.005	0.007	-0.005	0.007
Father and mother in the house	-	-	0.003	0.003	0.003	0.003
Read at work	-	-	0.02	0.01	0.02	0.01
Openness to experience						
Years of schooling	0.005^{a}	0.0007	-	-	0.005^{a}	0.0007
Attended preschool	0.001	0.007	-	-	0.001	0.007

Table 31 Continued

Extraversion						
Years of schooling	0.002[c]	0.0007	-	-	0.002[c]	0.000671
Attended preschool	-0.003	0.006	-	-	-0.003	0.006
Emotional Stability						
Years of schooling	-0.006[a]	0.001	-	-	-0.006[a]	0.001
Attended preschool	0.04[b]	0.010	-	-	0.035[b]	0.01
Conscientiousness						
Years of schooling	0.009[a]	0.0001	-	-	0.009[a]	0.00010
Attended preschool	-0.02[c]	0.009	-	-	-0.02[c]	0.009
Agreeableness						
Years of schooling	0.006[a]	0.0001	-	-	0.006[a]	0.00010
Attended preschool	-0.0010	0.009	-	-	-0.0010	0.009
Literacy proficiency						
Years of schooling	11.85[a]	0.52	-	-	11.85[a]	0.52
Father and mother in the house	4.98	2.61	-	-	4.98	2.61
Read at work	29.53[a]	4.51	-	-	29.53[a]	4.51
N					1723	
SRMR					0.06	
CD					0.44	

[c] $p < 0.1$, [b] $p < 0.05$, [a] $p < 0.001$ SRMR: Standardized root mean squared residual; CD: Coefficient of determination
Source: Nunoo (2020)

Openness to experience has been found to have positive and significant effect on earnings in many studies as in the current study. Heineck (2011), in his work on personality and earnings in the United Kingdom, found that openness to experience was positive and significant in explaining earnings. Also, Mueller and Plug (2006) and O'Connell and Sheikh (2011) found openness to experience to increase earnings after controlling for the effect of cognitive skills. Again, Nandi and Nicoletti (2014) found openness to experience to be the most germane personality trait in explaining wages in UK because it accounts for about 9 percent of the pay difference. Similar result was found by Braakmann (2009), but when his results were decomposed for the gender dimension, he found males openness to experience to have a significant and positive effect on wages and employment.

On the contrary, using the German Socio-Economic Panel (SOEP), Denissen *et al*. (2018) showed that the openness to experience has the tendency to lower earnings in Germany. Such a negative effect was also observed by Heineck and Anger (2010). In a recent study by Collischon (2020), he revealed that openness to experience had no effect on earnings in Germany, UK and Australia.

Table 32 shows that literacy proficiency has a positive and significant direct effect on log hourly earnings, though very marginal when the soft skills are accounted for in the model. This confirms the works of Mueller and Plug (2006) and O'Connell and Sheikh (2011). Cattan (2012), in assessing gender wage gap using data from the US also found significant effect of literacy on earnings. Similar effect was found with the female model (see Table 32) but literacy proficiency was negative and not significant in explaining log of hourly earnings for the male model.

The literature has on many occasions revealed the important role education plays in determining earnings (Heckman *et al*., 2006; Oreopoulos & Salvanes, 2011; McMahon, 2009; Oreopoulos & Petronijevic, 2013). Years of schooling from Tables 32-33 show both a positive and significant effect on log earnings directly, and on all the soft skills indirectly, except emotional stability where the effect was negative and significant in both the full and male model but insignificant in the female model. Attending preschool is also observed to explain emotional stability, conscientiousness and literacy proficiency. This shows that education is important in determining the soft skills of adults, and this supports the view that these skills can be learnt and nurtured through schools (Heckman *et al.*, 2006a).

The results support the theories of the Heckman equation and human capital model. While preschool attendance is not significant in the direct structural model, as the Heckman equation shows, it is important in influencing the soft skills and ultimately conscientiousness which is significant in the log hourly earnings of workers. This goes to show that an investment in early childhood brings life success in later years. Like in the human capital model, investment in education especially early childhood education, results in gains in workers' wages.

Table 32: Female structural equation results of associations between hourly earnings on latent soft skills

Log of Hourly Earnings	*Direct Effects*	*Robust SE*	*Indirect Effects*	*Robust SE*	*Total Effects*	*Robust SE*
Structural						
Openness to experience	0.24	0.34	-	-	0.24	0.34
Extraversion	-0.07	0.36	-	-	-0.07	0.36
Emotional Stability	-0.06	0.20			-0.06	0.20
Conscientiousness	0.37	0.26	-	-	0.37	0.26
Agreeableness	-0.09	0.27	-	-	-0.09	0.27
Literacy proficiency	0.001[b]	0.0006			0.001[b]	0.0006
Age	0.03	0.03	-	-	0.03	0.03

Table 32 Continued

Age squared	-0.0003	0.0003			-0.0003	0.0003
Age of starting school	0.01	0.03	-	-	0.01	0.03
Parental Education	-0.04	0.77	-	-	-0.04	0.77
Years of schooling	0.06[a]	0.01	0.01[a]	0.00517	0.07[a]	0.01
Tenure	0.001[b]	0.0005			0.001[a]	0.0005
Attended preschool	-	-	-0.008	0.00836	-0.008	0.008
Father and mother in the house	-	-	0.003	0.00655	0.003	0.007
Read at work	-	-	0.04[b]	0.0225	0.04[b]	0.02
Openness to experience						
Years of schooling	0.002[c]	0.00098	-	-	0.002[c]	0.00098
Attended preschool	-0.004	0.009	-	-	-0.004	0.009
Extraversion						
Years of schooling	0.0004	0.0009	-	-	0.0004	0.0009
Attended preschool	-0.007	0.007	-	-	-0.007	0.007
Emotional Stability						
Years of schooling	0.0002	0.002	-	-	0.0002	0.003
Attended preschool	0.02[c]	0.01	-	-	0.02[c]	0.01
Conscientiousness						
Years of schooling	0.005[a]	0.001	-	-	0.005[a]	0.001
Attended preschool	-0.02	0.01	-	-	-0.02	0.01

Table 32 continued

Agreeableness						
Years of schooling	0.003[b]	0.001	-	-	0.003[b]	0.001
Attended preschool	-0.004	0.01	-	-	-0.004	0.01
Literacy proficiency						
Years of schooling	9.23[a]	0.71	-	-	9.23[a]	0.71
Father and mother in the house	2.76	5.43	-	-	2.76	5.43
Read at work	36.72[a]	6.89	-	-	36.72[a]	6.89
N					812	
SRMR					0.06	
CD					0.34	

[c] $p < 0.1$, [b] $p < 0.05$, [a] $p < 0.01$

SRMR: Standardized root mean squared residual; CD: Coefficient of determination

Source: Nunoo (2020)

Table 33: Male structural equation results of associations between hourly earnings on latent soft skills

Log of Hourly Earnings	*Direct Effects*	*Robust SE*	*Indirect Effects*	*Robust SE*	*Total Effects*	*Robust SE*
Structural						
Openness to experience	0.64[b]	0.30	-	-	0.64[b]	0.30
Extraversion	-0.54	0.35	-	-	-0.54	0.35
Emotional Stability	-0.10	0.18			-0.10	0.18
Conscientiousness	-0.016	0.20	-	-	-0.02	0.20
Agreeableness	0.09	0.19	-	-	0.09	0.19
Literacy proficiency	-0.00006	0.0006			-0.00006	0.0006
Age	0.07[a]	0.02	-	-	0.07[a]	0.02
Age squared	-0.0008[a]	0.0003			-0.0008[a]	0.0003
Age of starting school	-0.006	0.02	-	-	-0.006	0.02
Parental Education	0.56[b]	0.22	-	-	0.56[b]	0.23
Years of schooling	0.069[a]	0.01	0.005	0.008	0.07[a]	0.01
Tenure	0.0007	0.0006			0.0007	0.0006
Attended preschool	-	-	0.0007	0.01	0.0007	0.01
Father and mother in the house	-	-	-0.0005	0.005	-0.0005	0.005
Read at work	-	-	-0.001	0.01	-0.001	0.01
Openness to experience						
Years of schooling	0.009[a]	0.001	-	-	0.009[a]	0.001
Attended preschool	0.012	0.01	-	-	0.01	0.01

Table 33 continued

Extraversion						
Years of schooling	0.002[b]	0.001	-	-	0.002[b]	0.001
Attended preschool	0.005	0.009	-	-	0.005	0.009
Emotional Stability						
Years of schooling	-0.0099[a]	0.002	-	-	-0.01[a]	0.002
Attended preschool	0.03[b]	0.02	-	-	0.03[b]	0.02
Conscientiousness						
Years of schooling	0.01[a]	0.002	-	-	0.01[a]	0.003
Attended preschool	-0.02	0.01	-	-	-0.02	0.01
Agreeableness						
Years of schooling	0.009[a]	0.002	-	-	0.009[a]	0.002
Attended preschool	-0.01	0.014	-	-	-0.01	0.01
Literacy proficiency						
Years of schooling	14.52[a]	0.74	-	-	14.52[a]	0.74
Father and mother in the house	8.87	3.96	-	-	8.87	3.96
Read at work	17.23[a]	6.12	-	-	17.23[a]	6.12
N					911	
SRMR					0.07	
CD					0.49	

[c] $p < 0.10$, [b] $p < 0.05$, [a] $p < 0.01$,

SRMR: Standardized root mean squared residual; CD: Coefficient of determination

Source: Nunoo (2020)

SEM Results for Employment Status, Wage Worker, Informal Worker and Highly Skilled Worker

In examining the effect of soft skills on employment status for individuals who have been wage workers, been in the informal sector or are highly skilled workers, the GSEM method of estimation was used since the dependent variables are binary. The results are presented in odds ratios with robust standard errors in Table 34 for the main structural model.

From Table 34, the employment status model had only conscientiousness as the soft skill that has an effect on being employed. The odd ratio shows that an individual who is conscientious is about 1.55 times more likely to be employed than to be out of employment. According Almlund *et al*. (2011), conscientiousness, which is measured as the tendency to be organized, responsible, and hardworking, suggests to be the most important soft skill employer looks for in prospective employees. The findings of conscientious individuals being more likely to be employed support the results of Barrick and Mount (1991) and Wichert and Pohlmeier (2010). They found that conscientiousness has a large positive effect on labor participation in the United States and Germany respectively. Acosta *et al*. (2015) also found conscientiousness and decision making to be positively related with being employed and being active or in school in Colombia. Nyhus and Pons (2005) add that conscientiousness as a soft skill is rewarded at the start of one's employment career.

On being either a wage worker or self-employed, extraversion was found to be positively significant; while emotional stability was significant, but negative. Extraverts are 2.349 times more likely to receive wages than to be self-employed. Emotional stability has the tendency to reduce the propensity of being a wage worker by about 0.56 times when gender, age and education are controlled. This suggests that being in a paid work is associated with the facets of being able to communicate, to be outgoing and sociable rather than being unfriendly. According to Acosta, Novak, Rojas, Patel, Vaish, Koruza, Rossetti and Rödel (2017), emotional stable individuals are more likely to be suited for high-pressured situations. Hence, in this study, they are more likely to get employment. This finding is in variance with many other works such as Nyhus and Pons (2005), Braakmann (2009) and Collischon (2020) who all found no significant result for extraversion and emotional stability and being a wage employee.

In examining the effect of the soft skills on the big five personality traits on the sector of employment (informal or formal), a similar model was used. Table 34 shows that extraversion is less likely to influence a worker's decision to work in the informal sector by about 0.37 times. On the other hand, being emotionally stable has a higher propensity for one to be an informal sector worker. It increases the likelihood by about 2.01 times. The current findings contrast the work of Nomura and Adhikari (2017) who found extraversion to be associated with employees of small firms of less than 20 workers' wages in the formal sector in Bangladesh.

Among the five soft skills used in the study, agreeableness is the only personality trait that has the positive probability for a worker to be highly skills. The highly skilled worker here comprises all those with managerial roles and professional positions. Agreeableness is defined as the tendency to act in a cooperative, unselfish manner with trust, and compliance and straight-forwardness are some of its key facets (Almlund *et al*., 2011). Nieß and Zacher (2015), in assessing the effect of the big five personality trait on upward job changes into managerial and professional positions, found that agreeableness could increase or decrease workers response to upward job changes into managerial and professional positions. Kern *et al*. (2013) found that less agreeable smart individuals attained higher occupational status; whereas disagreeable low-intelligent men had a high propensity to be unemployed or to work at a lower-status job. As stated, because agreeable employees are accommodating and self-sacrificing, they naturally get along well with others. This may, therefore, be regarded as well-suited for headship positions in which cooperation and teamwork are required, and thus are more likely to experience promotion especially into managerial and professional positions.

Of interest too, in Table 34 is the effect of cognitive skills and education on these labour market outcomes. Literacy proficiency that captures cognitive skills is observed to be more likely to influence the probability of being a wage worker and being in a managerial or professional rank. On the employment status and the sector of employment captured as either being in the informal sector or formal sector, literacy proficiency was seen to be less likely to have an effect. Education (years of schooling) is seen to be more likely to influence employment status, being a wage worker and being a manager or professional; while the opposite is observed for informal workers. In assessing the effect of personality traits on employment status and other labour market outcomes, Braakmann (2009) confirms that cognitive and education as control variables also positively influence employment status of workers. Chiswick *et al*. (2003) also support the findings that education and literacy proficiency have a positive effect on being a wage worker. The study confirms the Heckman equation in that preschool attendance and years of schooling tend to influence soft skills development which subsequently affect the labour market outcomes.

Table 34: Effect of cognitive skills and education on these labour market outcomes

	Employment status (Odd ratio)	Robust SE	Wage worker (Odd ratio)	Robust SE	Informal Worker (Odd ratio)	Robust SE	Skilled worker (Odd ratio)	Robust SE
Structural								
Openness to experience	1.23	0.47	0.60	0.24	0.80	0.42	0.80	0.47
Extraversion	1.51	0.62	2.35[b]	1.02	0.37[c]	0.20	1.61	0.89
Emotional Stability	0.98	0.21	0.56[b]	0.13	2.01[b]	0.65	0.69	0.21
Conscientiousness	1.546[c]	0.41	1.11	0.33	0.85	0.33	1.16	0.46
Agreeableness	0.62	0.18	0.70	0.22	1.50	0.61	2.18[c]	0.93
Literacy proficiency	1.00[a]	0.0008	1.01[a]	0.0007	0.99[a]	0.001	1.01[a]	0.001
Sex (Female)	0.55[a]	0.06	0.35[a]	0.04	2.20[a]	0.001	0.52[a]	0.08
Age	1.63[a]	0.04	0.91[a]	0.03	0.81[a]	0.03	1.01	0.04
Age_squared	0.99[a]	0.0003	1.00[b]	0.0004	1.00[a]	0.0005	1.00	0.0006
Age of starting school	1.14[a]	0.05	1.05	0.04	1.08	0.06	0.96	0.06
Parental Education	0.62	0.33	1.04	0.55	1.14	0.77	0.83	0.77

Table 34 continued

Years of schooling	1.03[c]	0.02	1.17[a]	0.02	0.75[a]	0.022	1.55[a]	0.05
Openness to experience								
Years of schooling	0.006[a]	0.0006	0.006[a]	0.0006	0.006[a]	0.0006	0.006[a]	0.0006
Attended preschool	0.004	0.006	0.004	0.006	0.004	0.006	0.004	0.006
Extraversion								
Years of schooling	0.002[a]	0.0006	0.002[a]	0.0006	0.002*	0.0006	0.002[a]	0.0006
Attended preschool	0.004	0.005	0.004	0.005	0.004	0.005	0.004	0.005
Emotional Stability								
Years of schooling	-0.006[a]	0.001	-0.006[a]	0.001	-0.006[a]	0.001	-0.006[a]	0.001
Attended preschool	0.03[a]	0.009	0.03[a]	0.009	0.03[a]	0.009	0.03[a]	0.009
Conscientiousness								
Years of schooling	0.01[a]	0.0009	0.01[a]	0.0009	0.01[a]	0.0009	0.01[a]	0.0009
Attended preschool	-0.03[a]	0.008	-0.03[a]	0.008	-0.03[a]	0.008	-0.03[a]	0.008
Agreeableness								
Years of schooling	1.01[a]	0.0009	1.01[a]	0.0009	1.01[a]	0.0009	1.01[a]	0.0009
Attended preschool	0.99	0.008	0.99	0.008	0.99	0.008	0.99	0.008

Table 34 continued

Literacy proficiency								
Father and mother in the house	3.36	2.39	3.36	2.39	3.36	2.39	3.36	2.39
Years of schooling	12.08^a	0.47	12.08^a	0.47	12.08^a	0.47	12.08^a	0.47
Read at work	-26.19^a	4.09	-26.19^a	4.09	-26.19^a	4.09	-26.19^a	4.09
Variance								
In_earnings	1.02^a	0.0007	1.02^a	0.000	1.02^a	0.0007	1.021***	0.0007
Openness to experience	1.02^a	0.0005	1.02^a	0.0005	1.02^a	0.0005	1.02^a	0.0005
Extraversion	1.05^a	0.002	1.05^a	0.002	1.05^a	0.002	1.05^a	0.002
Emotional Stability	1.04^a	0.001	1.04^a	0.001	1.04^a	0.001	1.04^a	0.001
Conscientiousness	1.04^a	0.001	1.04^a	0.001	1.04^a	0.001	1.04^a	0.001
Agreeableness	0.00^a	0.00	0.00^a	0.000	0.00^a	0.00	0.00^a	0.00
N	2693		2689		2689		2689	

^{c} $p < 0.10$, ^{b} $p < 0.05$, ^{a} $p < 0.01$

Source: Nunoo (2020)

Summary

This chapter presented estimated results on the effect of soft skills on labour market outcomes. The main focus of the chapter was to establish whether or not there is a significant relationship between the soft skills measured by the big personality traits and the various labour market outcomes in Ghana. Using SEM, it was tested, whether or which soft skill has a significant effect on the various labour market outcomes and whether the effects were significantly different by gender for the log of hourly earnings in Ghana.

Results revealed that, in line with the hypothesis, openness to experience was the only soft skills that had a significant positive impact on log hourly earnings. Males, rather than females, were found to be more likely to benefit from openness to experience with increased earnings. Extraversion was found to be significant and positive in the probability of worker being in a wage employment, but less likely to determine whether worker is in the informal sector. Emotional stability negatively influenced the likelihood of being a wage worker, but it positively influenced the propensity to be an informal worker. Conscientiousness positively impacted the likelihood of one being employed; while agreeableness positively influences the propensity of a worker being a manager or a professional. The Heckman equation as a theory underpins the findings of the chapter since education is seen to mostly influence soft skills.

CHAPTER SEVEN

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Introduction

The world of work today is fast evolving. In order for the citizenry of a country to be competitive, there is the need for the educational system to impact skills not just the basic ones, but advance and more technical skills together with soft skills. Ghana, like many sub-Saharan African countries, lags behind comparatively in international cognitive skills assessments. The poor performance in both local and international cognitive assessments are general symptoms of the inherent problems in our educational institutions and the lack of infrastructure for continuous and sustained life-long training and retraining programs.

It is in the light of these challenges that this thesis sought to examine the effect of cognitive skill and non-cognitive skills on labour market outcomes in Ghana. Using an international comparable household level data, it investigated how age of starting school after cognitive skills measured with literacy proficiency, and the effect of literacy proficiency and personality traits captured as soft skills affect labour market outcomes.

This chapter presents the summary of the entire thesis by providing the main conclusions of the study and offering policy recommendations based on the conclusions. The chapter is divided into three main sections. The first section provides the summary of the entire research. This is followed by the conclusions derived from the results of the study as presented in the second section. The third section provides policy recommendations, the limitations of the study as well as areas for future research.

Summary

The study covered three empirical chapters. The first empirical chapter presented and discussed results on the effect of age of starting school on cognitive skills proficiency. Two main hypotheses were tested: (1) attending school at the required age of six has a significant positive effect on cognitive skills proficiency, and (2) the effect of age of starting school on cognitive skills proficiency is mediated by gender and education. These hypotheses were formulated and tested to inform policy on what can be done to improve the skills level of the Ghanaian labour force. In addition, the analysis provided insights into what can be done to benefit women in the labour market since they have been marginalised in the world of work. The chapter made use of the standard OLS, 2SLS and ordered logit analysis to estimate and investigate the relationship between age of starting school and cognitive skills proficiency. Moreover, bivariate analysis between the dependent variable and all the independent variables was conducted prior to the multivariate analysis in order to gauge the statistical performance of the regressors.

The second empirical chapter provided results and discussions on the relationship between cognitive skills proficiency and labour market outcomes. Five labour market outcomes were examined in this chapter - log of hourly earnings, being employed, being in the informal sector, being a wage worker and working at a managerial position. The main hypothesis formulated and tested in this chapter was to examine whether or not there is a significant positive relationship between cognitive skills proficiency and the labour market outcomes. To achieve the objective outlined for the chapter, the study employed the OLS, IV technique and the logit analysis to estimate and investigate the relationship between cognitive skills and the five labour market outcomes. Two variants of the cognitive skills proxy were used for the analysis – literacy proficiency scores and literacy proficiency levels. Results from all the techniques and models showed that starting school at the required age of six positively influenced the cognitive skills of adults.

Marginal analysis was undertaken to assess and to evaluate the combine effect of literacy and education by gender on earnings. The standard Mincerian equation was estimated where years of schooling was substituted with literacy proficiency scores or levels alongside other full models to solve any possible problem of omitted variable biases. The possible problem of reverse causality was corrected with the use of IV technique. Explanatory variables in the models included parental involvement in education, dropped out status, regional fixed effects and other demographic and socioeconomic factors as covariates. The findings revealed that a strong positive and significant relationship exists between cognitive skills proficiency and all the labour market outcomes of interest, thus confirming the study's alternative hypothesis of a positive link between cognitive skills proficiency and log of hourly earnings, being employed, being in the informal sector, being a wage worker and working at a managerial position.

Finally, the last empirical chapter delved into the emerging literature of the effects of soft skills on labour market outcomes. Two key hypotheses were tested: (1) Soft skills measured by personality traits have a significant effect on log of hourly earnings, being employed, being in the informal sector, being a wage worker and working at a managerial position, and (2) the effect of soft skills measured by personality traits on log of hourly earnings differ significantly by gender. Since soft skills are considered as latent variables, the analysis in this chapter relied on the structural equation model (SEM) technique for the estimation. Of the big five personality traits used, openness to experience, extraversion, emotional stability and conscientiousness were observed to have different effect on the different labour market outcomes. The chapter confirms the Heckman equation and human capital theory.

Conclusions

Employing different econometric techniques, this thesis investigated the effect of age of starting school on cognitive skills proficiency of adults and examined how cognitive skills and soft skills influence labour market outcomes in urban Ghana. The study used the World Bank's Skills toward Employment and Productivity (STEP) surveys data. In all the empirical chapters, both bivariate and multivariate models were considered, and observed patterns discussed in relation to existing theoretical positions and empirical research.

Inferring from the exposition on the three empirical chapters, it is concluded that all the hypotheses formulated and tested by the study were supported by the empirical estimations with the exception of the part of the second hypothesis that sort to test the moderating effect of education. First, the hypothesis that there is a significant positive relationship between starting school at the required age of six and cognitive skills proficiency was supported. In addition, the hypothesised moderating effect of gender on age of starting school in positively influencing cognitive skills was established, but that of education was rejected. Similarly, the hypothesis that there was a significant positive relationship between cognitive skills proficiency and log of hourly earnings, being employed, being in the informal sector, being a wage worker and working at a managerial position was also supported. Further, the study also tested for the existence of a significant relationship between personality traits and all the labour market outcomes of interest, and it was discovered that four out of the five traits were statistically significant in determining labour market outcomes. Finally, the study supported the hypothesis that the effect of personality traits on hourly earnings differ by gender.

Recommendations

Based on the findings from the study, the following recommendations are made:

1. A nation-wide campaign should be organized by the Ministry of Education through its agency the Ghana Education Service and the Ministry of Gender and Social Protection and its agencies to get the over 400,000 Ghanaian children who are out of school back to school. Again, district assemblies and local authorities should enact and enforce existing by-laws to enforce the school starting age of six and sanction parents who do not comply. District education officers should visit communities to help parents comply with these by-laws.
2. Given that it is what one actually knows and not how long the individual has stayed in school that matters for favourable labour market outcomes, the Ministry of Education through its agencies like the Ghana Education Service and the National Council for Curriculum Revise & Assessment should intensify its drive to improve learning outcomes at all levels of education. Circuit supervisors should be empowered to increase school monitoring.

3. Sponsorship packages should be provided by the Ministry of Education for girls in schools to stay in school, and also the ministry should make it a matter of urgency to help the girls catch up in terms of their performance by providing extra tuition. Women and girls out of school should also be assisted to be cognitively proficient through adult education programs.
4. A quote attributed to Mahatmas Gandhi of India says that “education is of no value, if it is not able to build up sound character”. This statement gives credence for the need of the Ministry of Education through its agencies like the Ghana Education Service to incorporate the teaching and learning of soft skills as part of the curriculum at the basic level of education since it matters for favourable labour market outcome. In addition, employers through their mother umbrella of Employers’ Association of Ghana, should also institute regular training programme of soft skill development.

Contributions to Knowledge

While evidence on the determinants of cognitive skills proficiency exists in Ghana, this study has contributed to the non-existent literature on age of starting school and how it affects cognitive skills proficiency especially among adults. Additionally, no study has investigated the effect of cognitive proficiency levels on labour market outcomes in Ghana. This study provided a new direction by investigating the levels of cognitive skills proficiency on more comprehensive labour market outcomes. The study is also novel in Ghana since it is among the first to contribute to the emerging literature of the effect of soft skills on labour market outcomes.

Limitations of the Study

The World Bank's Skills toward Employment and Productivity (STEP) surveys data is limited to only urban Ghana. Therefore, the interpretation and generalisation based on it should be done with caution. In addition, the STEP data captured only literacy skills, which is used in this study. While this does not affect the outcome of the study, a combination of cognitive skills indicator including numeracy skill could have enhanced the study. Nevertheless, these limitations do not affect the outcome of this study.

Areas for Further Studies

The study could not exhaust the issues that can be examined as far as cognitive skills and labour market outcomes are concerned. Future studies can advance the arguments raised in the study by utilising panel data and including other independent variables not captured by the present study as a result of the absence of information on such variables in the original dataset. Again, the effect of age of starting school can be extended to educational and labour market outcomes.

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APPENDICES

A: Inventory of soft skills in the step household survey

Personality Traits	Definition	Questionnaire item
Openness to experience	Appreciation for art, learning, unusual ideas, and variety of experience	Do you come up with ideas other people haven't thought of before? Are you very interested in learning new things? Do you enjoy beautiful things such as nature, art, and music?
Conscientiousness	Tendency to be organized, responsible, and hardworking	When doing a task, are you very careful? Do you prefer relaxation more than hard work? R Do you work very well and quickly?
Extraversion	Sociability, tendency to seek stimulation in the company of others, talkativeness	Are you talkative? Do you like to keep your opinions to yourself? Do you prefer to keep quiet when you have an opinion? R Are you outgoing and sociable – for example, do you make friends very easily?
Agreeableness	Tendency to act in a cooperative, unselfish manner	Do you forgive other people easily? Are you very polite to other

		people?
		Are you generous to other people with your time or money?
Emotional stability	Predictability and consistency in emotional reactions, with absence of rapid mood changes	Are you relaxed during stressful situations?
		Do you tend to worry? R
		Do you get nervous easily? R

B*: Variance Inflation Factor (VIF) results for OLS models 9 - 12*

	VIF (9)	VIF (10)	VIF (11)	VIF (12)
Age of starting school (Conti)	1.08	1.92		
Age of starting school (Exactly 6=0)				
< 6			1.04	1.05
> 6			1.13	1.13
Educ_yrs	2.19		2.20	
Educ Levels				
Primary		2.28		2.28
JHS		5.11		5.07
Secondary		4.31		4.27
Tertiary		4.11		4.08
Read_Wk (Skill not used=0)				
Low	2.00	2.05	2.01	2.05
Medium	1.97	1.96	1.99	1.96
High	2.39	2.42	2.40	2.35
Dropped out (N0=0)				
Dropped out	1.54	2.05	1.55	2.04
Wealth quintile (Poorest=0)				
Poorer	1.87	1.88	1.86	1.87
Middle	2.00	2.02	2.01	2.01
Richer	2.31	2.35	2.29	2.33
Richest	2.39	2.42	2.38	2.41
Gender *(*Male=0)				
Female	1.12	1.13	1.22	1.12
Shocks_15 (Conti)	1.06	1.06	1.06	1.06
Mother tongue (Akan only=0)				
Akan and other	1.06	1.06	1.06	1.06
Other only	1.09	1.12	1.12	1.10
Labour market status (Employed=0)				
Unemployed	1.04	1.04	1.03	1.04
Inactive	1.27	1.31		1.31

Socioeconomic Status (Low=0)				
Middle	1.69	1.59	1.58	1.69
High	1.73	1.78	1.74	1.73
Parental involvement (Not involved=0)				
Involved	1.09	1.10	1.09	1.10
Chronic illness (Not present=0)				
Present	1.09	1.09	1.09	1.09
Age in years	1.31	1.32	1.31	1.32

C: *Results of OLS estimation for age of starting school and cognitive skills*

	OLS	OLS	OLS	OLS	OLS	OLS	OLS	OLS
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Age started first grade	-11.76[a]		-2.50[b]		-2.33[b]		-2.35[b]	
	(1.19)		(1.04)		(1.00)		(1.00)	
Age started first grade (Exactly 6=0)								
Less than 6		-5.96		-6.24		-5.95		-6.05
		(9.83)		(8.25)		(7.85)		(7.85)
Greater than 6		-30.87[a]		-7.50[b]		-6.10[b]		-6.15[b]
		(3.58)		(3.09)		(2.94)		(2.94)
Education								
Educ in years			13.60[a]	13.65[a]	10.28[a]	10.35[a]	10.48[a]	10.55[a]
			(0.41)	(0.41)	(0.47)	(0.47)	(0.51)	(0.51)
Length of material read (Skill not used=0)								
Low					4.73	4.91	5.37	5.55

					(3.95)	(3.95)	(4.01)	(4.01)
Medium					49.60[a]	49.43[a]	50.24[a]	50.07[a]
					(4.92)	(4.92)	(4.97)	(4.97)
High					61.76[a]	61.87[a]	62.37[a]	62.48[a]
					(4.93)	(4.93)	(4.98)	(4.98)
Dropped out of highest educational level started (N0=0)								
Dropped out							3.68	3.65
							(4.06)	(4.06)
Constant	221.07[a]	154.06[a]	33.57[a]	19.49a	39.07[a]	25.24[a]	36.16[a]	22.22[a]
	(8.45)	(2.48)	(9.12)	(4.54)	(8.78)	(4.47)	(9.35)	(5.59)
R^2	0.04	0.03	0.32	0.32	0.38	0.38	0.38	0.38
Log likelihood	-22010.09	-7624.01	-8005.80	-11725.88	-35021.51	-48746.79	-9786.41	-3200.74
F Stats.	10.35[a]	7.17[a]	12.03[a]	22.35[a]	13.89[a]	39.09[a]	18.34[a]	10.22[a]
_hat	0.91	1.16	0.89	0.89	0.93	0.97	1.98	0.42
	(0.03)	(0.22)	(0.03)	(0.02)	(0.01)	(0.02)	(0.44)	(0.09)
hatsq	0.11	0.08	0.01	0.05	0.03	0.07	0.05	0.20

	(0.51)	(0.05)	(0.03)	(0.80)	(0.53)	(0.17)	(0.11	(0.15)
Mean VIF	2.01	2.01	2.01	1.95	2.14	2.05	1.54	1.60
N	2,631	2,631	2,631	2,631	2,631	2,631	2,631	2,631

Robust standard errors in brackets, [a] $p<0.01$, [b] $p<0.05$, [c] $p<0.1$

Source: Nunoo (2020).

D: *Test of endogeneity for IV 2SLS regression in Table 10*

Tests of endogeneity

Ho: variables are exogenous

Durbin (score) chi2 (1)	= 0.035 (p = 0.43)
Wu-Hausman F (1, 2139)	= 0.027 (p = 0.43)

Under-identification test

Anderson canon. corr. LM statistic: 128.562

Chi-sq (1) P-Val = 0.00

Weak identification test

Cragg-Donald Wald F statistic: 134.967

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

Over-identification test of all instruments

Sargan statistic = 0.00

E: *Test of joint effect of interacting terms for Table 11*

Model 1: Age of starting school and Education level

Primary*Age of starting school = 0

JHS*Age of starting school = 0

Secondary*Age of starting school = 0

Tertiary*Age of starting school = 0

F (4, 2615) = 0.89

Prob > F = 0.4677

Model 1: Age of starting school and Gender

Female*Age of starting school = 0

F (1, 2615) = 5.37

Prob > F = 0.0206

Model 2: Age of starting school (categorical) and Education level

Primary*Less than 6 = 0

JHS* Less than 6 = 0

Secondary* Less than 6 = 0

Tertiary* Less than 6 = 0

Primary*Greater than 6 = 0

JHS*Greater than 6 = 0

Secondary*Greater than 6 = 0

Tertiary*Greater than 6 = 0

F (8, 2609) = 1.37

Prob > F = 0.2049

Model 2: Age of starting school (categorical) and Gender

Female*Less than 6 = 0

Female*Greater than 6 = 0

F (2, 2609) = 6.03

Prob > F = 0.0310

F: *Results from the ordered logit estimation for models 1 - 11*

	OLogit Odds ratio	OLogit Odds ratio	OLogit Odds ratio	OLogit Odds ratio	OLogit Odds ratio	OLogit Odds ratio	OLogit Odds ratio	OLogit Odds ratio	OLogit Odds ratio	OLogit Odds ratio	OLogit
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Age started first grade	0.73^{a}		0.89^{a}	0.86^{a}			0.88^{a}		0.88^{a}		
	(0.02)		(0.03)	(0.03)			(0.03)		(0.03)		
Age started first grade (Exactly 6=0)											
Less than 6		0.86			0.86	0.89		0.85		0.84	0.88
		(0.18)			(0.20)	(0.20)		(0.20)		(0.20)	(0.21)
Greater than 6		0.49^{a}			0.79^{a}	0.75^{a}		0.80^{a}		0.81^{a}	0.77^{a}
		(0.04)			(0.07)	(0.07)		(0.07)		(0.07)	(0.07)
Educ_yrs			1.60^{a}		1.61^{a}		1.49^{a}	1.49^{a}	1.47^{a}	1.47^{a}	
			(0.03)		(0.02)		(0.03)	(0.03)	(0.03)	(0.03)	
Educ_levels											
Primary				13.94^{a}		14.35^{a}					5.78^{a}
				(6.53)		(6.72)					(2.78)

JHS	21.85^a	22.97^a					6.69^a
	(9.98)	(10.48)					(3.19)
Secondary	114.74^a	121.93^a					26.89^a
	(52.77)	(56.03)					(12.96)
Tertiary	528.27^a	558.03^a					97.76^a
	(246.48)	(260.35)					(47.87)
Length of material read overall score							
(Skill not used=0)							
Low			2.49^a	2.49^a	2.39^a	2.39^a	2.57^a
			(0.41)	(0.42)	(0.42)	(0.41)	(0.43)
Medium			5.71^a	5.61^a	5.47^a	5.39^a	5.71^a
			(1.03)	(1.02)	(1.02)	(0.99)	(1.03)
High			7.63^a	7.63^a	7.25^a	7.25^a	8.07^a
			(1.37)	(1.37)	(1.31)	(1.30)	(1.44)

Dropped out of highest educational level started (No=0)											
Dropped out									0.51[a]	0.52[a]	0.46[a]
									(0.08)	(0.08)	(0.78)
cut1	-1.88[a]	0.02	3.91[a]	2.97[a]	4.72[a]	3.88[a]	4.33[a]	5.18[a]	4.13[a]	4.91[a]	3.72[a]
	(0.22)	(0.05)	(0.31)	(0.52)	(0.18)	(0.45)	(0.34)	(0.22)	(0.34)	(0.22)	(0.48)
cut2	-0.97[a]	0.92[a]	5.26[a]	4.32[a]	6.07[a]	5.23	5.76[a]	6.61[a]	5.56[a]	6.35[a]	5.15[a]
	(0.22)	(0.06)	(0.32)	(0.52)	(0.20)	(0.46)	(0.35)	(0.23)	(0.35)	(0.24)	(0.49)
cut3	0.85[a]	2.74[a]	7.65[a]	6.64[a]	8.47[a]	7.55[a]	8.22[a]	9.07[a]	8.01[a]	8.79[a]	7.8[a]
	(0.23)	(0.10)	(0.35)	(0.53)	(0.24)	(0.47)	(0.37)	(0.27)	(0.38)	(0.28)	(0.50)
	2,601	2,601	2,601	2,601	2,601	2.601	2,601	2,601	2,601	2,601	2,601
N											

Robust standard errors in brackets, [a] $p<0.01$, [b] $p<0.05$, [c] $p<0.1$