



FACULTY OF SOCIAL SCIENCES

DEPARTMENT OF ECONOMICS

**LINK BETWEEN HOUSEHOLD BACKGROUND,
EDUCATION AND INDIVIDUAL EARNINGS IN BOTSWANA**

BY

KAGISO NORLEEN MATEBESI

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DEDICATION

I dedicate this work to my parents: Calvin and Kelly Matebesi, who have always supported my educational aspirations. Thank you very much for your moral support.

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Errors, omissions as well as shortcomings remain the sole responsibility of the author and should not be attributed to any of the above acknowledged persons.

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LIST OF ACRONYMS

BCWIS	Botswana Core Welfare Indicators Survey
BFTU	Botswana Federation of Trade Unions
BURS	Botswana Unified Revenue Service
CSO	Central Statistics Office
HIES	Household Income Expenditure Survey
IMF	International Monetary Fund
MDGs	Millennium Development Goals
MOESD	Ministry of Education and Skills Development
NLSCY	National Longitudinal Survey of Children and Youth
OLS	Ordinary Least Square
SES	Socio Economic Status
SDGs	Sustainable Development Goals
SSA	Sub Saharan African
UNICEF	United Nations Children's Fund

ABSTRACT

The paper estimates the impact of household variables: parental education, household income, household size and location on education and earnings outcomes of an individual. The paper concludes with comments on the implications for policy and future research.

The study uses cross-sectional data for 2009/10 Botswana Core Welfare Indicators Survey (BCWIS) from Statistics Botswana. The methodology adopted to estimate the link between household background and education attainment follows the Ordered Probit method and for estimation of earnings outcomes it follows the method proposed by Mincer called Mincerian Earnings Function. Estimation is run on STATA 13 software package, taking the problem of heteroscedasticity and multicollinearity into account.

The results of the paper show that children's education is strongly related to household structure; parental education, household income, location and size of household. Findings from the Mincer earnings function show that household background factors raise individual earnings outcomes. We conclude that household variables not only influences educational attainment but also provides children with substantial wage returns in adult life.

CHAPTER ONE

INTRODUCTION

1.1 Background Information

Historically, household background variables such as parental education and household income have been viewed as predictors of a child's academic achievement. According to Joan (2009), socio-economic status and parental level of education are part of the variables that influence a child's schooling outcomes. Economists have long been interested in the impact of household background on the subsequent labour market success of individuals. As such this interest has attributed to a strong correlation between the educational attainment of parents and children, ultimately contributing to the transmission of socioeconomic status and inequality across generations. Over the years, the attention to the factors that contribute to a child's schooling have been heightened by the increasing role of education as a determinant of economic wellbeing (Danzinger and Waldfogel, 2000).

It is generally assumed that formal schooling is one of the significant contributors to skills of an individual and human capital, and also that income distribution is highly related to the amount of education people have. Thus the outcome of schooling on the distribution of skills and income will be more evident in future when those currently in school join the labour market. Therefore, it is apparent that household's background measured using parental education and household's income can either benefit or injure chances of children receiving an education and excelling in the same regard (Rosetti, 2000). Thus, the study uses parental education and household's income as measures of household background. Education is a vital determinant of earnings which is why it has become a progressive important focus of the government of Botswana.

Quality education is important in improving skills, something policy makers have recognised as a key aspect of schooling as well as adult earnings outcomes. Quality here encompasses; learning that is supported by the family and community, environments that are healthy and provide resources and facilities conducive for learning as well as content that comprises knowledge, skills and attitudes that are positive for participation in the society. Williams (2000) reports that children whose parents had primary school education or less were more than three times as likely to score low on tests or grades than children whose parents had at least secondary schooling; research shows that most parents with low education are poor and as such the environment in which they raise children may not necessarily support child ability.

This shows how vital parents' level of education is on a child's ability to learn in school. On the other hand, it is common for parents to consider location and condition of learning environments when assessing school quality as this can influence school participation. For instance, when students have to travel significant distances for clean and drinking water they may not always return to class (Miske and Dowd, 1998).

The theory of human capital envisages that highly educated workers have higher labour market earnings than less educated workers, indicating that earning outcomes of adults is linked to education differences. The central idea of this theory is that, capacity is developed through formal and informal education at school and at home also through training, experience and mobility in the labour market.

Education has broad benefits and the reality is that it equips individuals with skills that enhance productivity and earnings in the workplace. For instance, the higher earnings of university graduates relative to secondary school graduates are the monetary returns as a result of a university education. Studies have attributed higher earnings of individuals to higher education. McMahon (1998) reported that the lifetime earnings of University of Illinois-Urbana Champaign (UIUC) graduates were considerably higher than earnings of high school graduates nationwide. Education is indeed an extremely important determinant of earnings and once job opportunities are available to those educated, highly educated individuals are sure to fare better than those with low or no education at all. Having low education is related closely to low income which essentially perpetuates poverty among the poor.

Botswana has made tremendous progress over the years in increasing access to its education system; however the progress made is not enough as a significant number of children and adults in Botswana do not obtain full basic education. Botswana adopted a free primary school but not compulsory approach. This is a policy of persuasion which encourages parents to have some obligations towards sending their children to school on their own free will; the government also has had an obligation towards education, as it has improved access by building more schools to cater for as many remote and rural children as possible. The Remote Area Development Program provides food, toiletry and clothing to these children to improve school retention for students in rural settlements. However in spite of this initiative, many children from these poor families perform poorly in national examinations and some leave school before they complete their basic education programme (Republic of Botswana, 2011).

Involving parents in the school system is perhaps as old as the history of the education system, thus the history of education shows that school and family relationship is a key component of a successful and effective schooling. Students' academic achievement and educational attainment have been studied within different frameworks. Many focus on parental education or home background like household income, language at home and activities of the family. There is evidence that parents' education affects the performance or achievement of students in school. According to Grissmer (2003) parents' level of education is the most important factor affecting students' academic achievement. This is supported by Musgrave (2000) who said that a child that comes from an educated home would likely follow the steps of his or her family by actively working on their studies.

To provide insight on the role of household background in Botswana, the study investigates the impact household background has on educational attainment and adult earnings outcomes in the Botswana labour market. These issues have not been sufficiently studied for the case of Botswana; hence it is imperative to examine these issues since despite the country experiencing huge growth in the education sector, income inequality is still high (World Bank, 2015). The labour market is an important indicator of household income and welfare, inequality is important in determining this as it goes hand in hand with poverty. Different people have different levels of consumption and income which can be observed at personal and functional levels. Families with high income or consumption are likely to have educated children, whom eventually join the labour market and thus experience consumption at personal level. Hence to study household background and earnings in this study there is need to also explore income inequality in Botswana. This study therefore analyses the link between household background, education and individual earnings in Botswana.

1.2 Statement of the Problem

All children are entitled to good quality education; children missing an education are at risk of succumbing to poverty and unemployment. In Botswana the key challenge is ensuring inclusiveness and quality of basic education. In recent years education quality at all levels has been declining as measured by the number of students obtaining C or better grades (BEC, 2014). This may contribute to low quality of the labour force and make the output from these education levels less employable. It also makes it difficult for some of the children to access tertiary education and ultimately become less employable. In terms of inclusiveness, all children aged six years have the right to be in school and attain an education. Not only this but to have regular school attendance as well as achieving continuity in their schooling during basic education phases. Another aspect of this is to ensure good transitional rates from primary to junior and senior school which has been on the rise. There are however those from poorer household backgrounds who are unable to complete the full cycle due to poor performance and hidden costs despite education being free in terms of government policy.

Families and communities have a significant role to play in achieving continuity in the process of child schooling. Education plays an important role in building individual skills together with human capital. The theory of human capital posits that formal education is highly instrumental and necessary to improve the productive capacity of a population. However education is not the only contributing factor, parents and home background undoubtedly contributes. It is also very much known that personal income in the community is strongly related to the level of education attained; the higher the personal income the higher the level of education attained.

Economists have developed a range of models to explain variations in growth rates among economies, specifically highlighting the importance of human capital. Moreover empirical evidence exists concerning the influence household background has on education and wage earnings. For instance a study by Sanda and Garba (2007) for Nigeria finds that household demographic characteristics affect educational attainment and school attendance of children such that female children are more disadvantaged. Wambugu (2013) for his study in Kenya finds that children from well-educated parents tend to have more education and this has a positive effect on workers education and earnings, the effects were larger for the father's education compared to the mother's education. For Botswana, Siphambe and Okurut (2011) find that child schooling is positively influenced by educational level of household head and household income. To add on to their study, this study extends by looking at how adult

earnings outcomes are subsequently impacted by education and household background in the long run.

In addition more studies in this area have been based on returns to education as well as the experience of developed countries. Very few attempts have been made to estimate the relationship that link household background and education to adult earning outcomes in developing countries, Botswana included. Knowledge on how household background affects education and income of the labour force is very minimal. Hence this study adds to current research findings to gain answers in the context of Botswana.

The purpose of this research is to find out the link between household background, education and individual earnings in Botswana. The value addition of the study is in testing the empirical models in the context of Botswana using more recent data from Botswana labour's market.

1.3 Objective of the Study

The overall objective is to examine the impact of household background on educational level and subsequently earnings/ income in adult life. The following objectives act as a guide;

The specific objectives are:

- i. To analyse how household background influences individual's ability to attain higher level of education.
- ii. To examine the effect that education attained as a result of household background has on earnings or income attained by the worker.

1.4 Hypothesis

The hypothesis is stated as follows

- i. Null Hypothesis Ho: Household background variables do not influence educational level of offspring
Alternate Hypothesis H1: Household background variables influence educational level of offspring

- ii. Null Hypothesis Ho: Household variables do not leads to higher earnings of offspring
Alternate Hypothesis H1: Household variables lead to higher earnings of offspring

1.5 Significance of the Study

Poverty has been identified to be a major deprivation of well-being; it is also linked to low levels of educational attainment as well as low income which only prolongs the cycle of poverty among the already poor population. According to the 2009/10 Botswana Core Welfare Indicator Survey, majority of persons living below the poverty datum line are those living in rural areas with female headed households affected more than male headed households (Statistics Botswana, 2013) . Given the Botswana's vision 2016 of getting an educated and well informed nation, all children should be in school without engagement in labour market activities more so that there is a free education policy and welfare grants for poor households. UNICEF (2015) reports that in Botswana, 7% of primary aged children are not in primary school and that 3% of children never experienced school; while a national update done in 2014 reported 11 % of school age children to be out of school. This is in spite of the Out of School Programme developed by the Ministry of Education together with UNICEF, whose mandate was to halt the cycle of inter-generational poverty by making sure that children and youth unable to be in school are given another chance at basic education.

Evidence however shows that there continues to be fundamental gaps in access and quality. A cross-sectional study on street involved youth in Botswana done for UNICEF by Chakera *et al*, (2015) shows that some of the challenges faced by children include child labour, parents neglecting children, teenage pregnancy as well as poor families disadvantaged from public services among others. Seventy- eight respondents were interviewed of whom 69.3% were profiled as street involved, mostly boys aged 19 and younger. They found that 62.3% were on the street to beg and seek employment and that of these youth who dropped out of school, 93.5% were interested in returning to school.

Hidden costs linked to education which includes money for uniform, a high opportunity cost of child labour for the poor and feeding fees are among some reasons for school drop-out. These costs are responsible for bringing inequality despite education being free, as impoverished households are unlikely to meet these hidden costs. This gives a rise to the question of how free is free education. These hidden costs may cover nothing of the educational service but are however still necessary for school attendance. Distance is also another major factor. The government of Botswana has however come up with initiatives geared at minimising these hidden costs for the poor. For instance, the Government of Botswana through different programmes buys uniform and toiletry for these students as well as ensuring that they are transported to and from school; they liaise with teachers to monitor

these children. Despite these initiatives students continue to drop out of school and this is more pronounced in rural areas. This may also be attributed to culture and upbringing as their lifestyle requires them to attend to farming activities.

Poorer families living in the remote areas or at the lands are likely to live very far away from school. With children especially with poor family background unable to attend school, it is very likely that poverty will become a generational transition. Household background is important in terms of education financing as children from poorer household background are observed to have lower educational outcomes than other youth. Poorer families may be financially constrained which ultimately prevents them from investing in the human capital of their offspring, thus policies addressing this could be vital in reducing income inequity and schooling inequality.

The study examines whether household background variables such as parental education and household income are associated with educational attainment and hence comparable wage earnings outcome of an individual. It adds on to Siphambe and Okurut's 2011 study by finding the impact of education attained on the level of earnings using the latest data from Statistics Botswana, Botswana Core Welfare Indicators Survey (BCWIS) 2009/10. Lastly policy recommendations on the role of parents and family background in educational attainment of children are made.

1.6 Organisation of the Study

Following this introduction is chapter two; which contains the review of the Botswana's education sector and system, income distribution and income inequality. Chapter three outlines the literature review, both theoretical and empirical literature. The methods of analysis adopted in this study are provided in chapter four. The chapter covers data collection techniques, theoretical and empirical models, description of variables and analytical framework. Chapter five explains statistical tests necessary to determine whether the variables fit the analysis, it also explains the empirical results and interpretations. The final chapter provides conclusions and recommendations on interlink of the home or family front, education system and earnings in Botswana. This chapter also highlights the limitations of the study and areas of further research.

CHAPTER TWO

OVERVIEW OF BOTSWANA'S ECONOMY AND EDUCATION

2.1 Introduction

This chapter provides an overview of the socio/economic background, education system and sector as well as income distribution and inequality in Botswana. It covers three sections. The first section is a brief presentation of the economy of Botswana and the education sector. The second section explains how the education system is set in Botswana. The final section discusses Botswana's income distribution and income inequality

2.2 The Socio/Economic Overview

Botswana has been classified among the world's fastest growing and most sustained economies over the past 40 years, with an impressive record of prudent macroeconomic policies and good governance. This has seen the country move from being one of the poorest in the world to the upper-middle income range (Republic of Botswana, 2011)¹. Botswana has over the years experienced rapid growth and sustained economic growth and has implemented policy measures to spread the benefits of growth to other sectors other than mining. The country however continues to face challenges of high and persistent levels of unemployment and poverty, estimated at 20.0% and 19.3% respectively (Statistics Botswana, 2015).

The 2009/10 Botswana Core Welfare Indicator Survey shows that a majority of the unemployed at 21.4% are women while men had an unemployment rate of 14.6%. Also population living below a dollar a day was more pronounced in rural areas than urban areas. The youth of Botswana particularly graduates are largely unemployed, partly because of lower on-the-job- experience and to some extent skills mismatch. Other issues could be due to their late entry into the labour market compared to the older cohort (CSO, 2012). The impact of poverty on the economy can be alleviated through education, however a larger portion of children from poor families are less likely to finish primary education and hence less likely to proceed to secondary education in pursuit of employment to sustain the household or alternatively they drop out to engage in subsistence farming. It is further reported that previous analysis on poverty showed a distinct rural gender differences, with a higher prevalence in rural female based households with children and widows (UNICEF, 2011).

¹ This classification is based on level of income and therefore does not include the other indices of development.

To respond to the demands of a growing economy, the Government of Botswana considered access to basic education as a fundamental human right. In 1997 the Government of Botswana finalised the Long Term Vision for Botswana entitled towards prosperity for all (Vision 2016). As a fundamental goal of Vision 2016, basic education was made a key tenet. In addition, in 2000 the United Nations drew a map on development coming up with what is known as Millennium Development Goals targeted at combating poverty (MDGs, 2010). The vision is coming to an end this year and efforts are on-going to develop a new vision, Vision 2036. MDGs also ended in 2015 and are being replaced by a new framework that is geared towards Global Sustainable Development Goals (SDG), bringing to the core the issue of development without compromising sustainability for the future generation. In Botswana the education sector has consistently received a larger share of budget over the years. In 2011 it received the highest share at 31.1 % declining in 2012 and 2013 respectively at 27.3% and 22.98% although it was still the largest sectorial share. Furthermore, it received the largest share of P512, 49 million which is 28% in 2015 of the total budget which increased from the 27.8% it had received previously in 2014, and for 2016 it is still the largest ministerial share at 28.8% (Republic of Botswana, 2015). Considering the other spending for education particularly for primary education that falls under the Ministry of Local Government and Rural Development, the proportion is quite bigger than the percentage reflected in these figures.

This demonstrates the government's commitment to increase education funding with a view to support human capital development. As a result Botswana achieved most of the education related MDGs and Vision 2016 goals such as increase in access to education at all levels. However while these have improved, there are still challenges in terms of increasing unemployment of graduates and declining education quality which has a negative impact in terms of education's ability to move children from poorer household backgrounds out of poverty.

2.3 Formal Education and Education System in Botswana

Formal education in Botswana is categorised into four levels, pre- primary education, primary education, secondary education and post-secondary education. Increasing access to schooling has been a major priority of the government, with measures adopted to improve access to education like abolition of school fees from primary to tertiary institutions (BFTU, 2007). Basic education is the first stage of twelve years education programme, which includes 3 years of pre-primary education plus primary education covering standard 1 to 7. Secondary education consists of three years of junior schooling followed by two years of senior

schooling. Then there is higher education also known as tertiary education, which is offered in a variety of institutions in the country. However the University of Botswana is the oldest and most significant among the pool of tertiary institutions as it offers a broad range of academic programmes even at graduate level. As a way of meeting economic and development objectives of the country, the government designed vocational education and training programmes. Vocational education is facilitated at upper secondary and tertiary educational levels.

Table 2.3.1 Education Structure in Botswana

BASIC EDUCATION				LABOUR MARKET	
Pre-Primary Education	Primary Education	Secondary Education		Vocational Education & Training	Tertiary Education
Private Kindergartens	Public Primary Schools	Community Junior Secondary Schools	Senior Secondary Schools	Brigades	Public & Private Universities
Pre-Primary classes provided by NGOs	Private English Medium Primary Schools	Private English Medium Secondary schools		Technical Colleges	Colleges of Education

Source: Republic of Botswana (2015)

Table 2.3.1 shows the structure of the education system as set from Pre-Primary Education to Tertiary Education.

Basic Education: consists of a total of 12 years which include, 7 years of primary school, 3 years of junior secondary school and 2 years of senior secondary school. The official school starting age is 6 years, however it is only by the age of 7 that almost all children are in school. Pre-primary education is limited mostly to private schools with limited enrolment. Progression from primary to junior secondary is automatic, students sit for three examinations under basic education i.e. examination at primary level, junior secondary and senior secondary level respectively.

Tertiary Education: In Botswana tertiary education is provided by both public and private institutions, these are universities and colleges. Tertiary education provides secondary graduates with the opportunity to be enrolled and trained in various programmes so as to be globally competitive human capital. Botswana has a number of such institutions, which offer courses leading to certificates, diplomas and degree. Education here is mostly sponsored by

Government of Botswana through the Department of Tertiary Education Financing of the MOESD.

Vocational Education and Training: education here is offered at levels from certificate to diploma, at government owned technical colleges and brigades. Private institutions with accreditation also offer vocational training to broaden the skill base source.

2.4 Income Distribution and Inequality

Earlier research suggests that in Botswana like other Sub-Saharan countries, education is the most important determinant of income or wages. The reality to achieving sustainable development and improving human capital lies with raising quality of education. Botswana has been criticized for growing income disparities between working persons. With an income inequality measured by a Gini Index in excess of 0.61, the country is one of the most unequal in the world in comparison to other high middle income countries like Brazil, Chile and Indonesia.

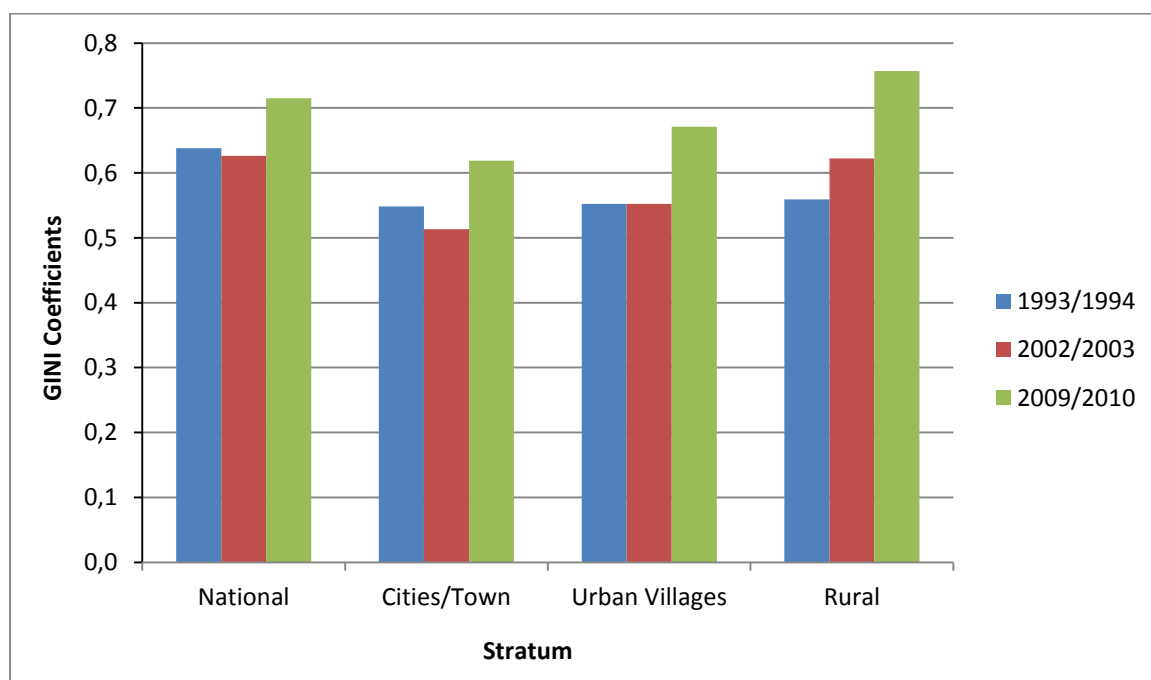
In a developing country such as Botswana, women tend to assume roles that are linked to their domestic role for example, nursing, teaching etc. These jobs normally don't pay much relative to male dominated jobs. Siphambe and Thokweng-Bakwena (2001) investigated gender wage gap using 1995/96 data and found that for women in education and skill intensive occupations the outcomes were more favourable than for those that are at the bottom of the occupations. Research also shows that inequality is more prevalent in the group with the highest level of education being secondary and above. This could be because this particular group contains a larger number of individuals who have trained further for their education, and possess certificates, diplomas and degrees. These levels of education create great income disparities within the group. According to Okatch (2011) having secondary school qualification increases one's income such that it widens the gap in the population; however primary education is an equaliser on effect of income in relation to household heads with no formal education. On the other hand, higher education contributes to earning inequalities because of mismatching of education sector and skills required in the labour market (Pereira and Martins, 2004).

Estimates of the growth incidence curve, based on data from the 2009/10 BCWIS compared with data from the 2002/03 Household Income and Expenditure Survey (HIES), which depicts the growth rate of real consumption per capita for each percentile of the distribution,

suggests that households in the middle of the distribution (between percentiles 15 and 75) experienced more rapid growth than those in the lowest 15 percent or in the highest 25 percent (IMF, 2012). This shows challenges welfare programs have had in reaching the poor in Botswana and as such most children in rural and poor families drop out of school to join the labour market to help support their families. Also labour income in the form of wages or earnings for self-employed contributes to main source of income for most households.

The 2009/10 BCWIS results indicated that income inequality as measured by differences in disposable income at the national level, increased from 0.573 in 2002/03 to 0.645 in 2009/10. The increase in household disposable incomes inequality was more pronounced in rural areas, where the Gini coefficient increased from 0.515 to 0.621, recording an increase of 0.106 Gini points.

Figure 2.4.1 Household Disposable Income Inequality- 1993/94-2009/10



Source: BCWI Survey 2009/10

The figure above is a graphical representation of movement in household disposable income inequality for periods 1993/94, 2002/03 and 2009/10. It shows an overall general increase in income inequality across strata.

2.5 Conclusion

This chapter has shown that over the years, Botswana has experienced great economic growth. However challenges still lurk for the country in terms of high levels of poverty and unemployment. Education has been identified as an important determinant of individual earnings in Botswana. Moreover the country's grapple with income inequality has been documented, showing that the country is unequal when compared to other middle income countries. Not only this but, that at household level, disposable income inequality has considerably been on the rise for the years 1993/94-2009/10 as per the surveys carried out by Statistics Botswana.

CHAPTER THREE

LITERATURE REVIEW

3.1 Introduction

This chapter reviews both the theoretical and empirical literature on household background and children's educational attainment and link to earnings. The theoretical literature explains the theories linking these relationships whereas the empirical literature covers the studies that have been done on similar topics by different countries.

3.2 Review of Theoretical Literature

The theoretical approach underlying most empirical studies of schooling attainment is the human capital model developed by Schultz (1960, 1961), Becker (1964) and Mincer (1974). According to this theory, education increases productivity of workers through useful skills and knowledge, thus raising workers' future income by increasing their lifetime earnings (Becker, 1994). Household background is a key aspect of this study since evidence suggests that less privileged children are disadvantaged when it comes to education level attainment as well as how much income they will earn.

The second link between parental background and children's education is suggested by Blanden and Gregg (2004). They argue that the underlying theory is that of utility maximization over spending on investment in education, consumption and other investments where the three alternatives are substitutes. While there may be other direct investments that parents can make in their children's development like money for fees and maintenance in higher education this is irrelevant at early ages. The third connection between parental background and children's education is made by Behrman and Rosenzweig (2002). They suggest that a child's educational attainment depends linearly on the educational attainment of each of the parents as well as some endowments in the form of earnings of parents, which has income and bargaining effect on child education.

The theoretical aspects that analyse the choice between time devoted to schooling and work sees investment into education as a risky marketable asset. The conflict theory suggests that the purpose of education is maintaining social inequality and preserving the power of those that dominate in society (Williams, 1978, 1979). Their argument is that school can only do little to reduce inequality without implementing major changes in society, for instance creating high paying jobs and equalising differences in the tax base communities. They go on to suggest that schools are linked to the types of opportunities individuals have as inequality

of resources in societies is the source of conflict. These theorists were able to show that increases in the expected net rates of human capital depreciates and the expected net return to employment is positively associated with an optimal level of education.

The relationship between size of the family and education is put forward by Maralani (2004). He introduced three factors regarding the impact of sibling size on their educational attainment. Firstly, the effects of sibling size on educational attainment are relative to the society's level of development and access to schooling. Secondly, contrary to the dilution hypothesis which says families with large number of children dilute their own economic and cultural resources more sparsely than families with fewer children do; elder siblings are able to provide more time and resources for schooling in large families and this they do by sharing household responsibilities.

Anh et al. (1998) also proposed that the impacts of family size on educational outcomes differ according to culture, political make-up and socioeconomic set-up of the country. Similarly, Sathar and Lloyd (1994) were of the same assumption of varying relations between number of children and educational attainment.

Yu and Su (2005) reported that the justification of the resource dilution hypothesis is mostly related to the time when the family is short of resources and educational opportunity for educating their children. They argue that in a time when the variations of family size is large, then family resources are restricted and the educational opportunities will not be equal and widespread; parameters of sibling structures like sibling size, gender composition and birth order would have relevance to individual attaining education.

In terms of gender composition, Dancer and Rammohan (2004) explained that educational outcomes of children are affected by gender composition of the siblings at household level. Female children who grow up with brothers are less likely to be given the same resources for their education by their family. In addition to this, the resource dilution theory assumes that siblings are rivals, who are in competition for better access to household resources. Thus ultimately gender and other characteristics of children become an important factor in decision making on household allocation of resources. Burney and Irfan (1991), suggest that demographic effects are gender/sex specific but also the income of the family because the economic returns for male and female are different owing to variations in cultural norms. Since there is gender disparity in economic returns, parents' investment levels differ according to gender i.e. for male and female children, more so in developing countries.

The relationship between parents' occupation and education is substantiated by the resource theory. It says that, conjugal powers or rights of a partner in household decision making depend on the value of resources they bring into marriage (Rodman, 1972). This theory suggests that a mother's contribution towards household income is more influential in family decision making; furthermore it supposes that mothers with income or with earnings are in better position to send their children for schooling. On the other hand King and Bellew (1990) found that mothers with no job were better positioned to train their children. Likewise, Smits and Hosgor (2006) observed that mothers working in farm activities had the lowest participation rate of their daughters at secondary level than mothers who were unemployed or not involved in farm activities. This is because parents who worked at farms preferred their daughters to also engage in farm activities even after passing their primary level of schooling.

Parental educational attainment also comes up as a strong predictor of children's educational levels. Socialisation patterns as well as educational motivations are linked to parents' educational statuses. Intergenerational effects models show that educational attainment of female population had positive effect on the educational attainment of the next generation (Mare and Maralani, 2006). Although fathers 'education is important, mothers have a greater impact on values children later find important (Ermisch, 1997). This basically indicates that a mother's feelings on education will be transferred and portrayed to their children. Moreover, parents use their educational attainments to teach their children, thus directly increasing human capital.

First there is an income effect, as higher education increases the capacity to earn income in the market and more income is spent on everything that parents value i.e. education of their children. There is also a time allocation effect which hinges on the impact of a parent's education on the cost of human capital investment in their child. Cost variations with a parent's education depends on how much it gives rise to the earnings capacity of parents, also the time a parent spends on child education activities is an important factor to educational attainment. On the other hand there may be a bargaining effect, for instance if mothers place value on their children's education more than the fathers do and as such higher education increases the mother's bargaining power thus her higher education relative to the father's would increase children's education through this mechanism . According to Gurjan et al. (2005) time spent with children is valued more by better educated parents.

De Graaf (1986) concluded that in educational attainment decision making, children choose the levels of education with which they are most familiar and inclined. Similarly, Beblo and Lauer (2004) are of the opinion that social background of the household influences

educational attainment of children. They explained that children internalise particular patterns of behaviour, preferences which ultimately affects their cognitive and socio-psychological development.

The connection between parental income and child outcomes is put forward by Leibowitz (1974). He suggests that family resources theory, also known as child investment theory, postulates that child outcomes are valued by families and are shaped by the household through jointly committing their resources and time. Furthermore the family process model theories that lower income and economic hardship precisely, affects family functioning. Lower income families contain adults with characteristics that may leave children prone to low educational achievement. Examples include poorer innate ability, lower emphasis on educational achievement in parenting and even reduced ability to translate parenting time into educational development. These models are not necessarily competing theories; the channel through which income can influence child outcomes described in each model may exist simultaneously. Both models have empirically been shown to play a role in the correlation between income and various child outcomes with use of American data (Guo and Harris, 2000).

Another mechanism emphasised in the child development literature is that financial constraints or problems increase family conflict and parental stress and as a result reducing the parents' ability to fully engage in effective parenting that improves educational outcomes of their children. The underlying theory of utility investments which demonstrates causal relationship between income and educational attainment has strong emphasis on financial investments in a child's human capital (Becker and Tomes, 1986).

During childhood a large portion of how income influences attainment is likely to come through as the co-production of education together with consumption or other investments. For instance provision of a good home environment through books and toys is vital for attainment. Burgess et al. (2004) demonstrates these to be important for a cohort in Avon. According to Rouse and Barrow (2006), less privileged students attain less education than high income children for several reasons. Firstly it could be of psychological costs as disadvantaged parents tend to have lower educational expectations for their children, and this can cause children to have less confidence in their abilities. Secondly the opportunity cost of getting a job than continuing with their education maybe greater for lower income families. This is because such families are struggling to make ends meet and so finding a job is more lucrative than staying in school as it helps sustain the family. But this incentive may not be true for developing countries such as Botswana with high unemployment rates especially for

the youth. The alternative is for such school drop outs to be engaged in low paying jobs such as the informal sector and subsistence agriculture which tends to depress their future income further and thus increase the income inequality between generations.

This research focuses entirely on the effect household background has on child education outcomes and eventual earnings, using data from Botswana's labour market.

3.2.1 Summary of Theoretical Literature

Resource dilution theory presents a more prominent sociological explanation of the effects of siblings' structure on educational attainment. Researchers however acknowledge that negative educational impact of large family size could be offset by external forces such as successful economy of a country and/or high parental socioeconomic statuses or a combination of both. Parental resources play a vital role in education of their children. Literature shows parental education to be a powerful determinant of child education attainment and here researcher reveal that intergenerational models show that the more the female population is educated the stronger the effect on educational attainment of the next generation, alluding to the strong influence mothers' education has on their children attaining an education. In the context of developing countries, the conflict perspective lead to the ideology that individuals from low income attain fewer years of schooling than those with better wealth status. The human capital theory on the other hand compares costs of education with its future benefits; a higher return in human capital is expected to increase optimum educational level of individuals while decreasing the higher cost of schooling.

3.3 Review of Empirical Literature

3.3.1 Developed Countries

A majority of the literature on parental education postulates a positive direct influence on a child's achievement. For instance Alexander, Entwisle and Bedinger (1994) found out that parents of moderate to high income and educational background held expectations that were closer to those of low income families to actual performance of their children. Low income families rather had high expectations that did not correlate with children's actual school performance. Literature here suggests that parental education had a direct positive influence on expectations parents formed, hence low income families ended up holding high expectations for their children as their educational background positively influenced these beliefs they made. Davis-Kean (2005) suggested that parents' abilities to form expectations on their children's performance are crucial in the structure of the home and educational environment such that they can be successful in post schooling endeavours.

Lillard and Willis (1994) and later on Glick and Sahn (2000) used ordered probit to model the highest education level completed by a worker. They both argue that schooling attainment outcomes are discrete and ordered. These two models help investigate how parental background is correlated with different measures of a worker's education, to which the findings are a positive correlation for all the different measures of education of a worker. Strauss and Thomas (1995) found out that parental education is positively related to greater child education. However the effect of this finding may vary depending on the gender of the child as well as the locality of the household.

De Graaf (1986) used final completed grade as a dependent variable using OLS for analysis, and introduced an indirect approach to measure the effects of parents' education on their children's educational attainment using data from the Netherlands. Background characteristics being education of mother and father and occupational score of father were used to predict the socio-economic status (SES) of parents. The SES of parents was used as an independent variable in statistical modelling for estimating effects of education attainment levels of their children. He observed a highly significant SES on educational attainment of children in the families. The bivariate level of analysis also showed a positive relationship of fathers' and mothers' education with educational levels of their children.

Techman (1987) used USA data from 1972 to 1979, high school completion being the dependent variable and logistic model for analysis. The study reported a positive effect of both mother's and father's education on educational attainment of their children. The

coefficients of his statistical model depicted same-sex preference among American parents also that the father's education appeared more significant for sons and mother's education for daughter's schooling, which makes sense because psychologically boys are inclined to model their fathers and girls their mothers. He inferred that parents with higher education have more value for education, ability and motivation to provide material, physical and other educational resources for the development of educational skills of their children.

Beblo and Lauer (2004) using the ordered probit model for students in Poland found a significant effect of parents' education on schooling of their children. They furthermore explained that children from low educated parents face the worst educational attainment prospects. This is because these children are not afforded the motivation and resources they need to excel in school and as a result they mostly don't do well in their education or end up dropping from school. Lauer (2003) presented similar ideas. The researcher discussed the importance of biological and inherent characteristics of parents in influencing their children's achievements. He found that scholastic abilities of one generation are passed to next; furthermore the highly educated parents place more value on education of their children and are more likely to encourage their children for higher educational levels.

For their study in Canada, Bruce and Anderson (2004) found parental education to be the most important factor in attaining higher levels of schooling or education. Their data was 2001 longitudinal data which they analysed using the ordered probit model. For a female child, the probability of her university level of education rose 13% when both parents had education higher than high school. Their results make sense because technically, educated parents have gone through the education system and have full understanding of the benefits and thus are more disposed to encourage their children to aspire for higher learning.

Aakuik et al. (2005) used Norwegian data from 1968-1972 to analyse effects of parental education on their children's education, using OLS and final completed grade as dependent variable. The finding was that a father or mother with a college increased the probability of the child attaining a college degree by more than 20 percent. Their study emphasised that parents' education is a key determinant of children's educational levels especially when it comes to college or university degree. They saw college education of parents as an indicator of motivating cognitive and non-cognitive environment for children in the family.

However to some researchers the effects of parental education on educational outcomes of children have declined over time (Mare, 1980). Ermisch and Francesconi (2001) completed two papers built on the ordered probit model, which addressed link between childhood

parental employment, parental education and subsequent education of children in Britain. They found out that time and money made available to a child affected a child's educational attainment. Children whose mothers work more during their children's early stages of life have less educational attainment compared to children whose mothers spend more time at home. Nevertheless it is not clear whether this means that time is more important than making money and other resources. It is worth noting that working parents sacrifice most of their time with their children during developmental years. The more parents proceed to join the labour market, the more the hours spent with children decreases.

Carneiro and Heckman (2003) using USA Data, suggest that current parental income does not explain child educational choices but that family fixed effects such as parental education levels that contribute to permanent income, have a much more positive impact. This is consistent with Chevalier and Lanot (2002) who used the UK National Child Development Study data; however both these studies are in contradiction with other studies which support the view that financial constraints significantly impact educational attainment. Using UK data, Blanden and Gregg (2004) found out that the correlation between family income and children's educational attainment had risen between 1970 birth cohort data and the later British Household Panel Survey data containing children reaching 16 in the 1990's. They estimated the causal effect of family income in ordered probit models of educational attainment based on siblings differences, implying that estimates in the causal effect of parental education was treated as a fixed effect in sibling differences for their study. To analyse educational attainment and earnings there is a necessity of eventual educational attainment of the worker to be investigated as well. Neal and Johnson (1996) report that in the wage market those with lower abilities will earn less than those with higher ability.

Beblo and Lauer (2004) focused on material resources of family for their possible impact on education attainment level of children during transition process from centralised to market economy in Poland. Financial factors were particularly of interest to the researchers, as the population of Poland was experiencing inequality across families in terms of socio-economic status and income of head of household. Indicators of wealth status were labour income, sources of income, employment status of parents, and their study showed a weak effect of these indicators of material wealth of household on final grade of their children. They explained that parents' education matters more than their financial resources and that additionally parents' income reflects ability that is correlated with ability of their children. According to them, low education levels among farming families are not so much for

financial reasons but more of location i.e. living in rural areas which is accompanied by unfavourable social factors in children relative to educational prospects.

For Ermisch and Francesconi (2001), parents in the bottom family income had lowest education for their children. These researchers detected this negative effect to be stronger for females of larger families. The study interpreted the effect of income in the light of generational dynamic and ambivalent relationship between education and income. They explained that parental differences in education translate into differences of earnings. Thus, the education of one generation is strongly conditioned by the income or education of the parents of previous generation.

King and Bellew (1990) categorised father's occupation in lieu of his income and for them fathers with white collar jobs had significantly higher educational attainment levels for their children. They indicated though that current measures of parental income are not likely to reflect true cross-sectional differences to those at the time of child schooling. Jaeger and Holm (2003) operationalized the social class position of the father as the socio-economic position of the home. The father's social class proved to be very important for attainment especially at intermediate tertiary level for individuals in Denmark.

In Canada Robert *et al.* (2001) used data from two cycles of NLSCY to estimate the effects of income on children's cognitive and behavioural outcomes from ages 0 to 13. To investigate whether there is a causal effect on income, they examined the causal effects of income on mediatory measures of the home environment that would be expected to improve child outcomes including parent-child interactions and child activities. To this they found that the home environment improves as income increases, providing a reasonable and believable pathway through which income may influence child outcomes.

In terms of family size or sibling size a study done in Poland by Bleblo and Lauer (2004), found that effects of family size had negative effect on the final educational level of individuals at the age of 21 in Poland and for ages 25 to 55 years in Hungary as found by Erick and De Graff (1995) and for females ages 35 to 65 years in Taiwan as found by Yu and Su (2005).

Shavit and Pierce (1991) preferred to measure the effects of sibling size at all levels. They introduced sibling size as sets of dummy variables from 1 to 11, with 12 or more children as reference category in their ordinary least square model for completed years of schooling. The effect of sibling size was not the same for all ethnic groups within their findings for Israel. Large sibling size emerged a detrimental factor for the educational attainment levels among

Jews and not Muslims. Respondents from small sibling size significantly attained more education compared to members of families with large size. They further added that extended family provides a pool of adults who help with supervision and school work of their children. However quite contrary to the nuclear families, extended family system provides the psychological and financial support to needy parents to help them cope with the burden of raising many children; thus neutralising the resource dilution effect on child education. This phenomenon however is not universal and depends greatly on the socio-cultural makeup of the group.

Parish and Willis (1993) reported a different dimension for the impact of large sibling size on educational outcomes of children. They are of the notion that high fertility in families shelters girls to stay at home for household chores while there are in critical years of learning, thus shortening their schooling years. Their results from their OLS estimation supported that for females being born into a large family with many children was a disadvantage for their education. This is mostly because they were expected to be homemakers while males were supported and encouraged to attend school.

3.3.2 Developing Countries

In his study in Brazil Rumberger (1983) examined the influence of parental wealth and other families' background characteristics on earnings, using structural and reduced form estimates. However in the study, he separated estimates according to race (whites and black males). This was done to compare results of whites with that of blacks; conversely their focus on male children and thus exclusion of female children might have created some bias in their study. They found out that parental wealth had a positive effect on years of schooling which was higher for white males than black males.

For their study in Pakistan Burney and Irfen (1991) who used probit and logit models found that daughters of educated parents were more likely to enrol in a higher level of schooling. Parents' level of education reflects taste and capacity to educate their children, working as intergenerational transmission factor. Their conclusion was that the fathers' education affects the education of their children indirectly whereas mothers' has a direct role in socialization and developing of skills of their children. Still in Pakistan Sawada and Lokshin (2001), found that father and mother's education was positively related to educational attainment levels of their children. They indicate that although subjective factors count, educated parents have superior home teaching environment and are better suited to perceive the benefits of education.

Holmes (1999) reported that parents' education increases the schooling of their children. The effect of mother's education was stronger than the father's education for girls in the household. The researcher interpreted the finding in terms of less mobility for women than men in rural Turkey. She explained that uneducated parents live in localities with low education facilities and have a negative attitude towards education especially towards females acquiring an education. This is concrete as perceptions of people in rural areas are more cultural and hence the prejudice against women getting an education, something that is historical. In Cambodia Keng (2004) using the logit model, found result that supported the hypothesis that educated parents have a more enlightened attitude toward the education of their children. These parents can fully appreciate education as they have been through the system themselves and thus would want to transfer it to their children.

However to some researchers, the effects of parental education on educational outcomes of children have declined over time (Mare, 1980). Dancer and Rammohan (2006) used the educational levels of head of household's spouse as a proxy for mother's education. The variable had small effect for being currently enrolled at age group 6-15 years for rural girls.

The researcher fixed this insignificance to the possibility of low levels and weak decision making powers of women in rural Egypt. In a male dominated society, the father's education as a priori is likely to have a stronger effect on educational decisions about children in the household. For instance, in traditional societies the role of the male head of household is to enrol females in higher level of education and to work outside the home. Thus in the context of developing countries some studies prefer to examine the effects of only the father's or head of the household's education.

Father's formal or non-formal education proved to be an important determinant for schooling completion of girls in Ethiopia (Rose and Samarrai, 2001). Using a probit model for completed schooling, the education of the head of household favoured their daughter's schooling significantly in Punjab Pakistan (Khan and Ali, 2005). This again can be attributed to cultural dynamics in the household where the father makes most decisions if not all and so if he is educated, chances are his decision making will influence education of their children compared to the mother who may have no bargaining power due to lack of educational background. However contrary to these previously mentioned findings, Pal (2004) who analysed data collected in India using the probit model found an insignificant effect of father's education on enrolment of their children especially daughters in rural India. The effect of parents' education was positive for sons' education; the findings may be attributed to gender bias towards sibling schooling, as the researcher stated that "unequal treatment of women in access to schooling is not only unfair for its own sake but it is also socially undesirable."

Empirical evidence in Sub-Saharan African (SSA) countries show that parental background can play an important role in education attainment. Previous studies for education in developing countries find that children of more educated parents are more likely to enrol in school. Educated parents appreciate education and have personal evidence of the benefits of children attaining an education; also they may provide a healthier environment for their children. According to Wambugu (2002), it is not clear in many SSA countries whether omission of family background results is biased in standard estimates of returns to education.

Wambugu (2002) used data collected in Kenya to estimate OLS and ordered probit models to measure the correlation between family background and workers education. He found out those workers born of well-educated parents tended to attain more education and that earnings increased with parental education level. However in his study like most studies in Africa, he especially focused on returns to education and not the impact on the outcome of children later on as adults. He used estimated returns to education treating education as

endogenous. One critique of estimates to education returns is that they may be based on omitted measures on family background. Knight and Sabot (1990) who used information on parental background of manufacturing workers in Kenya, estimated binary probit models of schooling alignment. They found that workers with educated parents have more likelihood of completing primary school and secondary school; this is because educated parents are well versed with the benefits of education.

Tansel (1997) used per adult household expenditures as a proxy for household's income for modelling the educational attainment levels of females in Ghana and Cote d'Ivoire. The researcher found that household expenditure was a better representation of assets, value and land as well as unearned income of the household. The study found an insignificant contribution of income in the final educational grade. Hidin (2005) also found an insignificant effect of household's income on completing the primary secondary levels of Filipino girls.

In their effort to examine the effect of income on the educational outcomes of children, Khan and Ali (2005) preferred to use the per capita income of households in their probit model. Their findings show an insignificant effect of family's per capita income on enrolment of daughters while it was significant for sons. They observed a high level of discrimination in rural Punjab and thus interpreted their findings in terms of gender perceptions saying:

“It may be concluded that enhancing adult education, employment and income can be an important policy intervention for improving child schooling, but not for eliminating gender discrimination altogether in child schooling (pg 11).”

Burney and Irfan (1991) indicated that relationships between income and education outcomes can hardly be treated as true relationships because the household income was not adjusted for the contribution of working children of the same age group. Parents with lowest income categories were found to be most disadvantageous for school participation of their children compared to other groups with better income. These parents are disadvantaged in terms of providing resources and environment that enhances learning and school participation for their children and as a result they fair low in comparison with those with better income backgrounds.

Literature reported a number of studies using household expenditure as a proxy to total income of households. Tansel (2002) in his study preferred to use per adult household expenditure as a proxy for total income. She argued that it is better to measure total household expenditure than total income, as total income may be subject to temporary

fluctuations. According to their findings, there was a strong positive effect of per adult household expenditure on educational attainment of children at all levels i.e. from primary to university level of education. She concluded that an increase in permanent income of household increases significantly the probability of higher schooling of children. To avoid distortions of permanent income variable by school choices that household make jointly, Maitra (2003) also used per adult household expenditures as a proxy for permanent income of household. His ordered probit model showed a positive effect of per adult household expenditure on the educational attainment of children.

Family size emerged as negative predictor for females' school attendance rate for a study done in India by Jayachandran (2002). She observed that female children are needed more for household chores and caring for younger siblings as the size of family increases. Maitra (2003) examined the effects of number of children at sibling size 1, 2 and 3 of age group 0-5, 6-17 and 18-24 years separately, and found that an increase in the number of siblings of any age reduced the probability of attaining post-secondary schooling for individuals. Using 1996 data from Bangladesh and ordered probit model for analysis, the regression coefficients of dummies for sibling composition were always negative for girls reflecting a strong sibling rivalry for girls within the household. Ahmed (2005) found an insignificant regression coefficient for educational attainment of girls in family size which emerged in the statistical model (OLS). He is however of the opinion that scarcity of resources destroys the educational attainment of females with heightened intensity and that older girls are kept home to help with household chores.

Literature reports that long distances of schools from households are major hindrances in education attainment especially of rural children in developing countries. Loxley (1983) found that the distance of educational institutions obstruct the higher learning level schooling of females due to weak transportation system in rural areas, cost of traveling, opportunity cost and also cultural boundaries on mobility of adolescent girls. For instance in traditional societies like Pakistan, the issue of school distance becomes more serious for girls who are of puberty age due to their religious values and the risk of sexual harassment the girls are subjected to.

Colclough et al. (2000) looked at gender inequalities in the context of poverty and cultural practices. The researchers estimated the school distances by drawing a map of local village and location of children's home. They found an average of 2 km and 1 km of the nearest school for Ethiopia and Guinea respectively. Discussions with the rural natives revealed that parents were reluctant to send their children especially daughters to schools which were far

from home. They considered girls to be weaker than boys to walk long distances and also reported kidnapping incidences of girls on their way to school. The same result for cultural related India show that accessibility was found to be significantly related to school attendance and that Jayachandran (2002) concluded that parents with homes near to school are more inclined towards sending their children specifically the girls to school.

Contrary to the above, some studies found no effect of school distance to schooling in the context of developing countries (Burney and Irfan, 1991; Liu, 2004). Burney and Irfan (1991) examined the national level data for Pakistan and found an insignificant effect of “school in village” at all levels i.e. primary to high for rural girls. They are of the notion that enrolment cannot be exclusively attributed to school availability and any attempts to link low enrolment to availability of school, ignoring the educational system and other differentials would be an unjust misjudgement to the situation. They measured school distance in terms of “school in village” or “no school in village” and concluded that an out of village school is not a clear measurement in terms of economic or cultural barrier for its access to school. For instance, treating schools that are of distance $\frac{1}{2}$ km to 20km from the village with the same value of independent variable “out of village school” in the model would be an impractical approach.

3.3.3 Botswana

For their study on child schooling and child labour using the Labour Force Survey (LFS) 2005/06 data from Central statistics office and multinomial logit model for analysis, Okurut and Yinusa (2009) found out that a rise in child labour had a negative effect on child schooling outcomes; also a child's age and employment status of the household head negatively and significantly influenced the probability of children working while schooling. Their study was more based on the relationship between child schooling and child labour and did not look at adult outcomes.

Siphambe and Okurut (2011), examined whether child schooling is related to family background and location using data from Household Income Expenditure (HIES) 2002/2003 and Labour Force Survey (LFS) 2005/2006 and probit model. They found out that education level of household head and household income positively and significantly influence child schooling. The current study uses data from the Botswana Core Welfare Indicators 2009/10 Survey. It also contributes to literature in that it looks at how household background and education influences outcomes of child earnings as adults in the labour market of Botswana which was not done in their study. This study contributes to literature by investigating how education influences adult earnings outcomes in the context of the Botswana labour market. Our contribution is also in terms of using the latest data to test empirically the key determinants of education and earnings.

3.3.4 Summary of the Empirical Literature

Empirical evidence of household variables such as parental education and household income has increased over the years. There is concrete evidence to suggest educational attainment of children differs across families and socio-economic status. Researchers have experimented with different methods in identifying the influence of household factors on educational attainment of children; from Ordinary Least Square (OLS) to the Ordered Probit Model. Some studies used longitudinal data; however most studies preferred cross-sectional data as longitudinal proved to have an endogeneity problem. Although impact of family background differed across studies, most studies found parental education to be the most important predictor of education attainment outcomes. Results differed in terms of geographical location i.e. developed and developing and also urban and rural, where studies in rural areas most children were disadvantaged in attaining higher educational level compared to urban.

3.4 Distinction of this study

In this thesis the focus is not just on educational attainment of children or child outcomes as per the household background. This study attempts to extend this by also looking at impact on adult earnings outcomes, this is an addition the thesis is making specifically to already existing literature for Botswana. The study adopts similar variables as previous literature for analysis. Parental education, location, household size and household income are used for the ordered Probit model.

The general Mincer earnings function which includes schooling and potential experience, has been modified to include other variables, precisely household variables: parental education, household income, household size and location.

Siphambe and Okurut in their 2011 study used head of household education as a proxy for family background. This study makes use of parents' education which is a distinction from their study, using parental education as opposed to household head gives a clear reflection of the impact education of parents has on their offspring. For example, a child or individual living with an aunt or uncle who is regarded as their head of household differs from a child living with own parents. Privileges extended to biological children vary with those given to non-biological; hence it is imperative to use parental background to get the true reflection in our findings.

This study makes use of two models to achieve the objectives of the study. Most studies have used the ordered probit model and logit models. In this research we also examine earnings, thus a Mincer earnings model is adopted. This is a different methodology to the study for Botswana by Siphambe and Okurut (2011).

Cross-sectional data is used as it is advantageous when using the Mincer function because it has proven useful in estimation as it moderates the effect of other explanatory variables; it assumes we are following an individual over time.

CHAPTER FOUR

METHODOLOGY

4.1 Introduction

This chapter covers the method of analysis that was employed to find the impact household background has on education and consequently on income or earnings. The study makes use of two models. The ordered probit model is used to investigate the relationship between household background and education. The human capital model by Mincer (1974) is used to investigate the relationship between education and earnings. It includes the following sections: theoretical framework, empirical framework adopted in the study, data collection technique, description of variables and expected results respectively.

4.2 Data Collection Technique

The study uses secondary cross-sectional data. The data comes from Statistics Botswana in Botswana. The sample is selected from the 2009/10 Botswana Core Welfare Indicators Survey (BCWIS) which was conducted from April 2009 to March 2010. The survey improves on Household Income and Expenditure Surveys (HIES), as it expands to include other measures of human wellbeing. Data from the Botswana Core Welfare Indicators Survey is the most suitable for this study because it is the latest survey from Statistics Botswana and it offers more data on households as it covers welfare resources that help with understanding household well-being; the target population was all members of households within scope. The study uses Stata 13.0 software to analyse the data in finding the link between household background, education and income.

4.3 Description of Data Sample

The survey covered all members of the household and visitors who stayed overnight at sampled households and for a minimum of 14 days. The interviewers recorded household consumption and expenditure information to determine the welfare measures based on income and consumption levels; households interviewed provided information on household characteristics such as education, consumption, income and others.

THE ORDERED PROBIT MODEL

4.4 Theoretical Framework

The past decades have seen developments being made in qualitative response model or use of discrete models. In economics of education, literature uses probit and multinomial logit models (Miller and Teha, 2005). The ordered probit model involves a qualitative dependent variable where categories have a natural ordering or ranking that reflects the magnitude of some underlying continuous variable or index (Becker and Kennedy, 1992). This method of estimation is appropriate for modelling with a categorical dependent variable as it will not lead to an information loss (Duncan *et al.*, 2001). Becker and Kennedy (1992) go on to explain that in ignoring the existence of the underlying measure and inherent ordering, the multinomial probit and logit models mis-specify the data generating process thus creating the possibility of inference of the response variables to be totally erroneous. A large body of literature recognise that linear regression is inappropriate when the dependent variable is categorical. The appropriate theoretical model in such is the ordered probit model (Greene, 2000).

The ordered logit model also known as the cumulative logit model, estimates the effects of independent variables on the log of odds of lower rather than higher scores on the dependent variable. If the outcome variable is ordered and satisfies the assumption of proportional odds, then switching the ordinal logistics regression will make the model more frugal. However collapsing the number of categories to two and then doing a logistic regression will result in loss of information. Gujarati and Porter (2009) point out that often the response variable can have more than two outcomes and very often these outcomes are ordinal in nature. The techniques of multinomial logit or probit can be employed to study such ordinal models.

For multinomial data that is ordered, models commonly used are multinomial and conditional logit, multinomial probit as well. For ordered data standard multinomial models are ordered logit and probit or count models are used if ordered discrete data are actually a count (Cameron, 2006). Torra et al (2006) pointed out that ignoring the ordinal nature of variables and treating them as nominal i.e. deploying the multinomial logistic causes the loss of efficiency. Furthermore, ignoring the fact that categories are ordered means losing some of the inherent information available, which may lead to estimating more parameters than needed and thus causing a high risk of obtaining insignificant results even if parameters are unbiased.

4.5 Empirical Framework

The relationship between household background and education is estimated using an ordered probit model of educational attainment using data from the Botswana Core Welfare Indicator Survey by Statistics Botswana. It follows the model by Beblo and Lauer (2004) used in their Polish study. Modifications are made in the vector of characteristics to include explanatory variables that suit this study.

The econometric model is thus set as below:

$$E_i^* = \beta x_i + \varepsilon_i \quad (1)$$

The educational level E chosen among the J possible educational alternatives E_j which can be ranked according to their levels, with $j \in \{1 \dots J\}$ and $j=1$ corresponding to lowest and $j=J$ to the highest educational level. The observable educational choice depends on the desired level of schooling and on the opportunities available. Discrete level E_i which is defined to take a value E_{ij} , with $j \in \{1 \dots J\}$, if E_i^* falls within a certain range $[\mu_{j-1}, \mu_j]$:

$$\begin{aligned} E_i &= E_{iJ} \quad \text{if } \mu_J \geq E_i^* > \mu_{J-1} \\ &E_{i(J-1)} \quad \text{if } \mu_{J-1} \geq E_i^* > \mu_{J-2} \\ &E_{i2} \quad \text{if } \mu_2 \geq E_i^* > \mu_1 \\ &E_{i1} \quad \text{if } \mu_1 \geq E_i^* > \mu_0 \end{aligned}$$

Where $\mu_J = +\infty$ and $\mu_0 = -\infty$

Thus, the probability that an individual i opts for educational level J given his/her individual and household characteristics x_i is:

$$\begin{aligned} \text{Prob} (E_i = E_{ij} / x) &= \text{Prob} (\mu_j \geq E_i^* > \mu_{j-1}) \\ &= \text{Prob} (\mu_j \geq \beta x_i + \varepsilon_i > \mu_{j-1}) \\ &= \text{Prob} (\mu_j - \beta x_i \geq \varepsilon_i > \mu_{j-1} - \beta x_i) \end{aligned} \quad (2)$$

The dependent variable is the highest education level attained in ordered levels defined as E_1 being the lowest level of educational attainment and is defined as primary education or less, E_2 corresponds to basic vocational education, E_3 to upper secondary education and the highest attainable education level E_4 is defined as higher education. For explanatory variables in the vector of characteristics x_i , we use individual variables: parental education, household

income, household size and location. The level of education is ordered thus μ here represents the order or range of educational level that individual i can attain whereas J is a particular level of education attainable.

MINCERIAN HUMAN CAPITAL MODEL

The relationship between education and earnings is given by the Mincer model. Most empirical work on labour effects of education derives from this classical model by Jacob Mincer (1958, 1974) and Becker (1964). This model is used to estimate the coefficient between years of schooling and labour outcomes such as wages or earnings using data on individuals.

Polachek (2007) explained that Mincer (1958, 1974) was first to derive an empirical formulation of earnings over lifecycle, thus the Mincer earnings function is appropriate in estimating the impact of education on earnings.

Thus the theoretical model followed by Mincer is $Y(t) = wK(t) - s(t)K(t)$, $s(t)$ being the time spent in period t of investing in human capital. The Mincer earnings function which is modified to include household variables is used to address objective (ii) and it is stated as below:

$$\ln(Y_i) = \beta_0 + \beta_s S_i + \beta_1 E_i + \beta_2 E_i^2 + X_i \gamma + \varepsilon_i \quad (3)$$

Where Y_i denotes earnings or wages of individual i , S_i years of schooling, E_i is years of experience and ε_i is the error term. The equation states that the natural logarithm of annual earnings or of the hourly wage depends linearly on years of schooling and experience. Other non-human capital variables such as location, gender, parental education are included in the vector X . The log-linear functional formulation is commonly used in the human capital literature, economic theory suggest that earnings should be in logarithmic form when estimating returns to education on earnings. Hence this functional form is appropriate for modelling and interpretation of parameters estimated.

4.6 Application of the Mincer Earnings Function

According to Polachek (2007) there are three empirical implications that the Mincer earnings function yields.

Firstly, it argues that earnings are associated with human capital investments meaning the more the capital investments made the higher the earnings. He also mentions that coefficients in schooling variable reflect the rate of return to schooling. Thus earnings should be related to the quality of schooling i.e. the higher the quality of schooling the higher the earnings, which implies that those attending quality schools should earn more.

Secondly, earnings functions are concave, the young experience their earnings rising more quickly and narrowing mid-career.

The model lastly has implications on distribution of earnings. The distribution of earnings should exceed that of human wealth and experience profiles of the log variance of earnings should be U-shaped.

4.7 Definition of Variables and Expected Results

Education: is the dependent variable ordered from the lowest to the highest level, i.e. E_1 being the lowest level of educational attainment and is defined as primary education or less, E_2 corresponds to basic vocational education, E_3 to upper secondary education, and the highest attainable education level E_4 is defined as higher education.

- **Parental Education:** This encompasses the highest level of education the parent has which is ordered. Children with educated parents are more likely to attain higher education. Children growing in families where education level of parents is high may have better educational prospects because they inherit to some level learning abilities and other endowments of their parents. The parent used in our study is a parent who identified as the head of the family. This is a departure from Siphambe and Okurut (2011) study that used head of household education as a proxy for family background, where the head of household was anyone from aunts to uncles. Hence our study adds value here as it looks at the direct relationship of child and parent.
- **Household Income:** the more the income of the household head, the higher the likelihood of the children attaining higher education. This is because children's educational outcomes on intra-family transfers, imperfect capital market and low wages of parents will result in limited investment in their children's education (Rosenzweig and Wolpin, 1993).
- **Household Size/Structure:** This is the number of people in a household. The greater the size of the family, the less likely for some members to attain higher education. The dilution hypothesis states that with the number of children increasing in a household, the per capita of schooling resources for each child will decrease. The higher the number of children in the household the more likely they will be involved in child labour and not schooling.
- **Location:** children from urban areas are more likely to attain higher education than those from rural areas. UNICEF (2005) indicates that drop-outs are higher in rural areas, implying that being located in rural areas has a negative effect on educational attainment.

Mincer Earnings Model

- **Education:** Mincer concluded that educated workers had the highest earnings. Therefore the education coefficient is expected to be positive; the more human capital investment one makes the higher their earnings.
- **Experience:** Using potential experience as the measure, expectation is to find an inverted U shaped relationship between experience and wage premium. It is so because a worker's wage is supposed to consistently rise over the lifecycle at a decreasing rate, resulting in a concave earnings profile. Thus the expectation is to find a positive coefficient for experience and a negative coefficient for experience squared. Experience is approximated as Age-Number of Years of schooling-6 (6 being the age students are expected to start school)².

² E_i years of experience which essentially is post school investments made and according to Mincer (1958, 1974) is given by $A - S - 6$ (6 is the expected starting age of school)

Table 4.7.1 Summary of Variables and the Expected Signs

Variable	Definition of variable of measurement	Expected sign
<u>Ordered Probit Model</u>		
	Dependent Variable	
Education	Individuals' education level ordered From none, primary, secondary and tertiary ³	
	Explanatory Variables	
Log income	Household income	+
Household Size	Total persons in household	-
Location	Separate dummies for 3 residential locations, cities, urban villages and rural. Rural used as the base/reference category	+
Parental Education	Separate dummies for parent's education, non-formal, primary, secondary and tertiary. Non-formal is used as reference category	+
<u>Mincer Earnings Function</u>		
	Dependent Variable	
Earnings	Individual earnings	
	Explanatory Variables	
Years of School	Time spent schooling in years	+
Experience	General working experience in years	+/-
Experience-Squared	Slope of earnings	+/-
Gender	A dummy variable for gender (1= male,0= female)	+
Parental Education	Separate dummies for parent's education, non-formal, primary, secondary and tertiary. Non-formal is used as reference category.	+
Household Size	Total persons in household	-
Location	Separate dummies for 3 residential locations, Cities, urban villages and rural. Rural used as the reference category	+

³ For the purpose of analysis we combined university, college, brigades and vocational education into tertiary education.

4.8 Econometric Issues Regarding Estimation of the Mincerian Function

A number of econometric issues may arise in estimating the earnings function, as concluded by Polachek (2007).

a. Functional Form Specification

Models can be mis-specified in their linearity, as it can be argued that experience affects a person's earnings non-linearly. To model this we will include the square of experience in the model to which we expect a negative coefficient. Given that individuals are randomly sampled; heteroskedasticity could be problematic. However Stata 13 software which is used for estimation corrects for this heteroskedasticity. Stata includes options for estimating robust standard errors and these are usually more trustworthy where heteroskedasticity is present.

Heckman and Polachek (1973) applied the Box-Cox and Box-Tidwell models to allow the data to reveal the appropriate functional form. The Mincer log-linear specification was the best fit for the data although not perfect. Jaeger and Page (1996) used data on actual diplomas obtained by students to confirm specifically these effects.

b. Omitted and Mis-measured Variables

When Mincer originally fit his earnings function in 1958, he used an abbreviated schooling model of the form:

$$\ln Y(t) = a_0 + a_1 S \quad (4)$$

which omits the experience and experience square terms. Omitted variables lead to biased results if the omitted variable is correlated with the dependent variable as the remaining independent variables. Thus years of schooling and experience or on-the-job training, location, gender, family background variables are included in the earnings function as their omission can bias the estimates.

Polachek (1978, 1980) showed that aggregated economic conditions affect rates of return to schooling which was found to be true when estimating rates of return to schooling across black and white people; mis-measuring such variables can bias rates of return estimates.

Most earnings functions today include a lot of supplementary variables together with schooling and potential experience used by Mincer. These include gender, health

status, children, marital status and many other variables. They act as control variables either shifting the earnings function upward or downward based of course on the sign.

4.9 Analytical Framework

The econometric modelling approach was used to achieve the research objectives, Stata 13 package was used to run the regressions. Thus the study adopts the Ordered Probit model and the Mincerian Earnings function.

CHAPTER FIVE

DATA ESTIMATION AND ANALYSIS

5.1 Introduction

This chapter provides the empirical findings and analysis of the impact of household background variables on education and earnings. The first section gives the descriptive statistics in the form of tables, mean and standard deviation of the variables. This is followed by the results of the estimation of the ordered probit model through which the marginal effects will be presented. Finally, the results on the estimation of the Mincerian earnings function will also be presented.

5.2 Descriptive Statistics

A sample of 1, 911 individuals from BCWIS 2009/2010 data was selected as a representation of individuals who are economically active. In this study we defined the child or individuals from households that are earning an income, as composed of persons aged between 19 and 30 years. These are individuals for whom the impact of household background variables is examined on education and earnings. We use this age group because it is suitable for our objectives as the defined child that falls within the age bracket above is expected to have attained education as well as participate in the labour market. Also these individuals by definition in Botswana are young people. This demographic is made up of young people and for our analysis we want to examine young people hence the use of this age group.

The labour market consisted of anyone who has been working for the past 7 days and is paid seasonally or non-seasonally and earns any of the following incomes;

- Gross wage/salary form permanent employment (in cash)
- Wages from temporary work
- Other earned income

At household level 25 594 observations were made, of which 7235 (28.62%) were fathers or parents, 2098 (8.20%) were spouses or mothers and 7838 (30.62%) were children and the remaining 8423 (32.56%) were other reported members of the family.

Some incomes were excluded because there were irrelevant in achieving the main objectives of this thesis. These were incomes such as; back pay, bonuses, overtime, car allowances, home loan mortgages as well as cost of utilities provided and paid for by the employer.

Table 5.2.1 Cross Tabulation of Parental Education Level

EDUCATION LEVEL	FREQUENCY	PERCENTAGE
None	99	1.37
Non-Formal	25	0.35
Primary	1,640	22.67
Secondary	3,230	44.64
Tertiary	2,241	30.97
TOTAL	7,235	100.00

Source: Authors' calculations based on BCWIS 2009/10

Individuals from the survey regarded as parents for our analysis were 7 235 in totality as shown by the table above. Very few (0.35%) of the parents reported having non-formal education as their highest level of education, and only 1.37% had no education as their highest level of education. Most parents (44.64%) reported having secondary education as their highest level of education. Whilst 22.67% reported having primary education and 30.97% said they had tertiary as their highest level of education.

Table 5.2.2 Individual Education and Location Composition

Location	None	Primary	Secondary	Tertiary	Total
Cities	0 (0)	9 (4.81)	226 (15.52)	118 (44.70)	353
Urban Villages	2 (66.67)	54 (28.80)	665 (45.67)	100 (37.88)	821
Rural	1 (33.33)	124 (66.31)	565 (38.80)	46 (17.42)	736
Total	3 100.00	187 100.00	1,456 100.00	246 100.00	1,910

Source: Authors' calculations based on BCWIS 2009/10

Table 5.2.2 shows the composition of individuals and their education by their residential area; cities⁴, urban villages⁵ and rural⁶ areas. Only three people reported having no education because of the low number, only primary, secondary and tertiary will be presented. From the above computation, there were 1,910 individuals in total who reported their levels of

⁴ Urban or gazetted towns/cities have their own administrative structure, while rural and urban villages are administered by district council.

⁵ An urban village is a settlement with a population of more than 5000, 75% of which draw their sustenance from non-agricultural activities.

⁶ Rural area is a settlement with all population and housing being outside or urban territory i.e. areas outside of cities and towns, with a low population density that draws sustenance from agricultural activities.

education. Individuals with primary education as their highest level of education are from rural areas as shown in the table above. The implication is that majority (66 %) of individuals with low education are from rural areas. Urban villages had reported to have most individuals with secondary education background at 46%.

From these individuals, majority (45%) of who had tertiary as their highest level of education, were from cities and the lowest (17%) of individuals with tertiary education was from rural areas. This basically tells us that majority of individuals from this data survey who had a higher level of education were from cities and only a few were from rural areas.

Table 5.2.3 Income and Education Distribution

Income	None	Primary	Secondary	Tertiary	Total
Low Income	0 (0)	129 (4.81)	660 (45.42)	57 (21.67)	846
Medium Income	2 (66.67)	56 (28.80)	618 (42.53)	101 (38.40)	777
High income	1 (33.33)	2 (66.31)	175 (12.04)	105 (39.92)	282
Total	3 100.00	187 100.00	1,453 100.00	263 100.00	1,910

Source: Authors' calculations based on BCWIS 2009/10

Table 5.2.3 shows income earnings across the different levels of education attained by the individual. The income categories are defined relative to the tax bands or tax brackets as given by Botswana Unified Revenue Service (BURS). Remuneration from 0 to 6000 Pula is categorised as low income, 6001 to 12000 Pula as middle income and over 12 000 Pula as high income.

These are the incomes of the individuals who are economically active and we have defined them to be between 19 and 30 years of age cross tabulated against their highest level of education attained. Of 846 people with low income, majority (660 people) reported having secondary education as their highest level of education and 777 that reported having medium income, majority (618) reported having secondary education as their highest income while 175 people from a total of 282 that reported having high income said they had secondary education as their highest level of education.

5.3 Empirical Results

5.3.1 Ordered Probit Model Regression

An ordered probit model was estimated using stata 13 as previously mentioned. The results are presented below:

Table 5.3.1.1 Ordered Probit Regression

<i>Education Level</i>	<i>Coefficients</i>	<i>Standard Error</i>	<i>z-statistic</i>	<i>P> z </i>
log_income	.2301306	.0236016	9.75	0.000
household_size	-.0475903	.0088843	-5.36	0.000
cities	.7361879	.0933504	7.89	0.000
urban_villages	.4088581	.0696419	5.87	0.000
primary_educ	.0651311	.1085768	0.60	0.549
secondary_educ	.1185804	.1168298	1.01	0.310
tertiary_educ	.519381	.1357865	3.82	0.000
/cut1	-1.270913	.2679706		
/cut2	.4991803	.2103734		
/cut3	.322768	.2255115		
Iteration 0: log likelihood = -1329.6679			Number of observations = 1844	
Iteration 1: log likelihood = -1160.808			LR chi2(7) = 344.12	
Iteration 2: log likelihood = -1157.6147			Prob > chi2 = 0.0000	
Iteration 3: log likelihood = -1157.6085			Pseudo R2 = 0.1294	
Iteration 4: log likelihood = -1157.6085				
Log likelihood = -1157.6085				

The results obtained depict how household variables impact an individual's educational outcomes.

Table 5.3.1.1 shows that the value of log likelihood at convergence is -1157.6085. In this model the number of observations is 1844 and there are seven predictors hence there are seven degrees of freedom as shown by the LR chi2 (7). The prob>chi2=0.0000 indicates that coefficients of the independent variables are jointly statistically different from zero. The intercepts are significantly different from each other; therefore 3 categories of the dependent variable should not be combined into 1.

All variables that explain the link between household background and education attainment of an individual are statistically significant at 1% level of significance except for primary and secondary education of the parent, which are statistically insignificant.

In general, coefficients in table 5.3.1.1 indicate that an individual's highest education qualification increases (from none to primary to secondary to tertiary) with an increase in the

parent's income, household residency in cities and urban villages and a decrease in household size.

However, coefficients contain no information relating to the marginal influence of each household characteristic on the individual's education qualification. Therefore computation of marginal effects separate from general ordered probit results is necessary to establish the magnitude, direction and significance of changes in the household characteristics on the probability of an individual attaining a specific education level.

The dependent variable is categorical i.e. it has four categories, the expectation is to see three cut-points estimated that is; cut 1, cut 2 and cut 3.

Cut 1 is the estimated cut-point on the latent variable used to differentiate no education level from primary, secondary and tertiary education when values of the independent variables are evaluated at zero.

Cut 2 is the estimated cut-point on the latent variable used to differentiate no education level and primary education from secondary and tertiary education when values of the independent variables are evaluated at zero.

Cut 3 is the estimated cut-point on the latent variable used to differentiate no education level primary and secondary education from tertiary education when values of the independent variables are evaluated at zero.

The intercept is not identified independent of the cut points thus there is no intercept. Stata software sets the constant in ordered probit model to 0 and estimates the cut points for separating the different levels of education.

5.3.2 Ordered Probit Model Marginal Effects

Table 5.3.2.1 Marginal Effects Coefficients

Education level	None	Primary	Secondary	Tertiary
Income	-0.001*** (-1.72)	-0.03* (-9.01)	-0.01* (-3.37)	0.04* (9.39)
household size	0.0001*** (1.65)	0.006* (5.23)	0.002* (2.99)	-0.009* (-5.31)
Cities	-0.001*** (-1.65)	-0.07* (-9.33)	-0.1* (-4.61)	0.2* (6.46)
urban villages	-0.001*** (-1.68)	-0.05* (-5.89)	-0.02* (-3.33)	0.08* (5.61)
Tertiary	-0.001*** (-1.61)	-0.05* (-5.04)	-0.07* (-2.34)	0.1* (3.17)

*Note: Significance at 1%, 5% and 10% level is indicated by *, **, *** respectively. The numbers in parentheses are values of z-statistics.*

- One unit increase in household income is associated with an individual being 0.1% less likely to attain no education, 3% less likely to attain primary education as their highest level of education, 1% less likely to attain secondary education as their highest level of education and 4% more likely to attain tertiary education as their highest level compared to the base category of non-formal education.
- A 1% increase in household size is associated with a 0.0001 probability of individuals more likely attaining no education, 0.006 more likely attaining secondary as their highest level of education, 0.002 more likely having secondary as their highest level of education and 0.009 less likely having tertiary as their highest level of education.
- A 1% increase in having cities as a place of residency compared to rural dwelling is associated with 0.001 probability of individuals less likely to attain no education, 0.07 less likely to have primary as their highest level of education, 0.1 less likely to have secondary as their highest level and 0.2 more likely to have tertiary as their highest level of education compared to the base category rural areas.
- A 1% increase in having urban villages as a place of residency compared to rural dwelling is associated with a 0.001 probability of individuals less likely having no education at all, 0.05 less likely having primary as their highest level of education, 0.02 less likely having secondary as their highest level of education and 0.08 more likely having tertiary as their highest level of education compared to the reference category rural areas.
- A 1% increase in parents having tertiary level of education compared to non-formal education is associated with a 0.001 probability of their children less likely having no education, 0.05 less likely having primary as their highest level of education, 0.07 less

likely having secondary as their highest and 0.1 more likely to have tertiary as their highest level of education.

5.3.3 Conclusion and Summary of Ordered Probit Results

The results indicate that household background characteristics have an important impact on educational outcomes of individuals.

Parental Education

Parent's education is positively associated with their children's education outcomes. Therefore the conclusion made here is that, if parents are given more education or acquire more education, this is more likely to lead to more education for their children. The results of the study show that parental education is an important determinant of their children's educational attainment. Beblo and Lauer, 2004; Wambugu, 2002 and Eng, 2012; also found education of the parent to be strongly related to the child's education outcomes which is consistent with our results.

Household Income

Household income is another component that influences educational outcomes of children; it matters greatly in early years of life and will certainly persist throughout childhood. Household income's effect on child attaining education plateaus as income increases, also time spent in high income households is more strongly associated with higher educational outcomes compared to low income households. Evidence from the results clearly indicates that there is a causal relationship between income of household with the highest level of education of their children. Our findings are consistent with (Mayer 2002 and Chevalier and Lanot, 2002), who found out that household income is positively associated virtually with every aspect of a child's well-being even as adults.

Household Size

The empirical findings of the study show that household size is an important factor to a child attaining higher level of education. The smaller the household the more likely it is that the children from that household will attain a higher education whereas larger households may not be the case, as the large the number the more disadvantageous it is for all children to participate in schooling. This is consistent with literature especially in developing countries, (Hashmi, 2009; Burney and Irfan, 1991 and Aakuik, Salvanes and Vaage, 2005) found sibling size to be a significant predictor of educational attainment among siblings in a household. The more the siblings the less likely the individual will attain higher education.

Location

The findings show that residential status is a good predictor of educational attainment. Children from cities and urban villages are shown to be more likely to attain higher educational and earning outcomes compared to those in rural areas. Living in cities and urban villages implies living amongst developed communities that have more chances of having educated members compared to rural areas. Hence our results reflect this as they show that those in better developed localities i.e. cities and urban villages are more likely to attain higher education than those in less developed localities i.e. rural. The implication is that people in rural areas have minor educational priorities for their children whereas those in cities and urban villages have bigger priorities for their children as well as a motivation to continue the educational path. Hashmi (2009) and Ahmed (2005) who estimated the determinants of family background of female education in a Muslim family also found location to be an important determinant of educational attainment. They found location to explain major hindrances of educational attainment of rural females.

Table 5.3.3.4 Mincer Earnings Function Regression

<i>Explanatory Variables</i>	<i>Coefficients</i>	<i>Standard Error</i>	<i>t-statistic</i>	<i>P>t</i>
years of school	0.1447	0.0182	7.93	0.000
years of experience	0.0221	0.0223	0.99	0.322
experience squared	-0.0023	0.0009	-2.40	0.017
male dummy	0.0348	0.1084	0.32	0.748
household size	-0.0873	0.0163	-5.36	0.000
primary education	-0.5058	0.1897	-2.67	0.008
secondary education	-0.2458	0.2110	-1.17	0.244
tertiary education	0.5045	0.2540	1.99	0.048
cities	0.7288	0.1720	4.24	0.000
urban villages	0.2513	0.1202	2.09	0.037
Constant	5.6363	0.2975	18.94	0.000
Number of observations	464			
F(10, 453)	23.78			
Prob > F	0.0000			
R-squared	0.3443			
Adjusted R-squared	0.3298			

We tested for Multicollinearity and Heteroskedasticity as econometric problems that are more common with cross-sectional data.

With multicollinearity, explanatory variables are assumed to be non-stochastic and as result estimates will be very unreliable. To detect if there is multicollinearity we use the variance inflation factor (VIF). High level of VIF signifies multicollinearity thus as a rule of thumb if vif is closer to one then the greater the evidence that there is no multicollinearity and the closer it is to ten or more than ten then there is high multicollinearity (Gujarati and Porter, 2009).

Table 5.3.3.5 Multicollinearity Detection Using Variance Inflation Factor

Variable	VIF	1/VIF
experience-squared	3.85	0.259973
years of experience	3.84	0.260343
primary education	3.15	0.317688
secondary education	2.72	0.367760
tertiary education	1.99	0.502324
cities	1.37	0.728468
urban villages	1.32	0.758626
years of school	1.14	0.877821
household size	1.12	0.889595
male	1.07	0.931122
Mean VIF	2.16	

Table 5.3.3.5 shows us variance inflation factor among the variables is closer to one and less than 4 which is the rule of thumb, thus we can conclude that there is no multicollinearity as reflected above.

Another problem that is common with cross-sectional data is that of heteroscedasticity also known as robust standard errors. We used the Breusch-Pagan / Cook-Weisberg test for heteroskedasticity. The results of the test are given below,

$$\text{chi2}(1) = 2.32$$

$$\text{Prob} > \text{chi2} = 0.1281$$

Thus, Ho: Presence of Heteroscedasticity
 H1: Absence of Heteroscedasticity

The rule of thumb is that if chi-square exceeds the critical value then we reject the null hypothesis, implying there is no problem of heteroscedasticity.

The objective in this part is to examine the impact household background has on earnings or income of the individual.

The results presented in table 5.3.3.4 are not subject to any type of selection. The inclusion of household background variables in our estimation ensures that there are no omissions made in our selectivity. Moreover the data used for analysis is from a survey conducted on households and therefore results are based on data that did not just cover working persons ensuring no omission of unobserved wages for those not working. Hence our results are not subject to a potential problem of sample selection bias; the implication of this is that there is no need to perform any Heckman techniques to our results.

The results of the model estimation indicate that the parameter estimates are jointly statistically different from zero with probability of the F-statistic being significant at 1% level. The adjusted R-Square which measures goodness of fit of the model is 0.3298, which is consistent with cross-sectional data. It is also fairly consistent compared to other similar cross-sectional studies conducted in Botswana, who also found the measurement of goodness of fit to be around 35% (Sekwati, Narayana and Raboloko, 2003; Okurut, Narayana and Molefe, 2012; Siphambe, 1999).

According to the results years of schooling has a positive and statistically significant effect on individual earnings (at 1% significance level). This result is consistent with other studies (Wambugu, 2002 and Eng, 2012) observed that highly educated individuals earn more whereas those with low education will earn less. The more the years of education the more the productivity and hence this will increase earnings in the labour market. The results also show experience squared has a negative and highly significant effect on earnings (at 1% significance level) which is consistent with empirical literature. The justification is that e^2 is the second derivative of e , the slope of earnings profile and it is diminishing reflecting a concavity of earnings; that is as earnings rise rapidly for young people then eventually it will reduce mid-career.

The study also found the estimated coefficient of household size to be negative and statistically significant at 1% significance level. A one percent increase in household size reduces earnings by 0.08%. This is consistent with other studies (Rosenzweig and Wolpin, 2000; Hill and Stanfford, 1977) who presented a discussion along the same lines. The justification of this phenomenon is the financial burden of a larger family imposes on the family head to invest financially in education of their children's subsequently affecting their children's life earnings outcomes.

Primary education of the parent has a negative but significant impact on individual earnings. A percentage increase in primary level education of the parent reduces individual earnings or their children's earnings by 0.5%. While the highest level of education of the parent, tertiary education has a positive and significant effect on earnings at 1% level of significance. The results correspond to the findings by Lam and Schoeni, 1993; Wambugu, 2002 and Kingdon, 1998. The common belief is that highly educated parents have an intergenerational influence on their children and thus individuals with higher education and income usually come from households where parents are highly educated.

The study also found the estimated coefficients of location (where cities and urban villages we used as dummies and rural was the base category) to be positive and statistically significant at 1% level of significance. A one percent increase in living in cities or/and urban areas increases earnings of an individual by 0.72% and 0.25% respectively. Individuals from cities and urban villages have higher earnings in comparison to those in rural areas. This is consistent with literature especially in developing countries (Levin and Plug, 1999; Callan and Walker, 1999). Regional dummies capture regional differences in education development and earnings as well as other region specific factors.

The gender dummy in our model was found to be statistically insignificant in explaining individual earnings in Botswana as well as experience and secondary education dummy for parent's education level.

5.3.6 Conclusion and Summary of Mincer Earnings Function Results

Years of School

The results show a positive relationship between years of schooling and earnings, increase in education level of an individual increases their earnings. This is substantiated by the belief that achievement of higher learning or education is a well-established path to better earnings as per the results.

Experience-Squared

The coefficient of (e) is the slope of an age earnings profile; it is simply the first derivative $d\ln Y/dt$ and e^2 which is the second derivative indicates the rate at which the slope of earnings profile is diminishing. The results thus reflect a concavity to earnings; Polachek (2007) identified earnings function to be concave i.e. as earnings rise more rapidly for the young then earnings will taper off mid-career. Mincer showed that a worker's wages consistently rise over the lifecycle at a decreasing rate thus yielding a concave earnings profile for most individuals.

Parental Education

Parent's education is significantly associated with their children's education and earning outcomes. Therefore the conclusion made here is that, if parents are given more education or acquire more education, this is more likely to lead to higher income or earnings in the household. As a result, this is more likely to be deposited onto their children as a motivation for them to acquire higher education that subsequently leads to higher earnings in the labour market. The higher the educational level the more the lifetime earnings of that individual. The results of the study show that parental education is an important determinant of their children's educational attainment and earnings; not only does education of the parents increase children's educational attainment levels but it also grants them substantial wage returns in adult life.

Household Size

Findings of the study indicate that household size is an important factor to a child attaining higher level of education and subsequently earning higher wages. Larger households are associated with low education among siblings and hence lower wages, generally larger families have one to two breadwinners. The implication is that household size is a good predictor of not only education but wage outcomes. Individuals raised in larger families have significantly lower returns to education. This may be attributed to lower benefits per year of education received by the individual raised with more siblings and less education as shown

by the results ultimately leads to lower earnings. This could be picking up that poor families tend to have larger families.

Location

Residential status is a good predictor of child earnings outcomes; individuals from cities generally earn more wages than those in rural areas. Cities and urban villages comprise mostly of formal employment whilst rural areas are composed mostly of the informal sector and agricultural activities like farming that do not necessarily generate higher and consistent income. Children from cities and urban villages are shown to be more likely to attain higher educational and earning outcomes compared to those in rural areas. Developed areas offer beneficial opportunities not only in education but in wage earnings as well compared to less developed areas as shown by our results.

The following are overall conclusions from the results of both models;

1. The findings of the study support the hypothesis that household variables influences educational level and earnings of offspring. Household background variables are more likely to raise the educational attainment and subsequently earnings outcomes of individuals.
2. Education of the parent emerged as a powerful predictor of educational levels of offspring.
3. The income status or situation of the household has a strong influence on educational attainment of children up to higher level of education. The better the income of a household the better the chances of their children attaining higher education.
4. Location and the size of the household also impacted on how far a child could go with their level of education as well as their earnings in the labour market. Most children who had tertiary education and higher earnings came from smaller households and not large household and were also from cities and not rural areas.

Theoretical Interpretation

The results of the study are in accordance with the intergenerational effects models or patterns of socialisation. The findings show that highly educated parents are more likely to have highly educated children, which is consistent with intergenerational effects. It states that educated parents have a greater impact on values that children later find important (Ermisch, 1997). In essence, educated parents deposit or transmit the value and importance of attaining an education onto their children. They use their educational achievements to teach their children the long term significance of having higher education level.

Also the resource theory or child investment theory, which states that families who place value on their children's education will utilise the resources they have as well as time to enhance and shape their children's education. The findings of the study are affirmed by this theory as they reveal that as household income increases so does the education of the child.

For household size, the findings indicate that there is a gap between children who come from small families and large families. The resource dilution theory supports this as it advocates that siblings serve as competitors in the household; that is a large household hurts the individual's educational attainment (Yu and Su, 2005). The results of the study show evidence that those individuals from large households are less likely to attain a higher level of education compared to those from smaller households. The dilution theory supports these findings since it states that an increase in number of siblings hinders the outcomes of every child.

The human capital theory also argues that education awards an individual with productivity and thus enhancing human capital. Moreover the increased productivity as a result increases earnings in the labour market. That is, the more human capital investments one makes the higher his or her earnings (Polachek, 2007). Simply put, earnings increase with years of schooling suggesting that a lack of educational background or qualifications basically reduces employee hourly earnings.

CHAPTER SIX

CONCLUSION AND RECOMMENDATIONS

6.1 Introduction

This chapter presents conclusions made in this study based on the findings obtained as well as the recommendations that can be made on the role of family on education and earnings outcomes of children. The limitations of the study and areas of further research are also presented.

6.2 Conclusion

This study has examined the impact of household background factors such as parental education, household income and household size on educational attainment and earnings outcomes of individuals in Botswana. The omission of household variables in previous studies has rendered them an important subject of investigation to education and earnings. The study has adopted the Ordered Probit Model and Mincerian Earnings function.

Preliminary results from the descriptive statistics showed that very few parents at 1.37% reported having no education while a lot had secondary education at 45%. Thus most parents from our data had secondary education as their highest level of education. The study also observed that most individuals defined to be the child who had tertiary education as their highest level of education were from cities at 45% and only 17% were from rural areas. The descriptive statistics also found out that higher earning individuals had tertiary education level at 40% and low income earners had secondary education.

According to the ordered probit regression results through their interpretation on the marginal effects; household income, household size, location and parental education were found to be significant hence they could explain the change in the educational levels of the individual through the marginal effects. The results of this papers show parental education and household income were highly significant, this meaning that education of the parent and their income is highly associated with the education of the child.

This then implies household background variables have an important impact on education and earnings outcomes of individuals. Educational investment decisions are influenced greatly by the education of the parents, location, and size of the household and household income. In addition educational attainment is a variable that may not be independent of the earnings determination process.

The Mincer earnings function results showed; years of schooling, experience-squared, household size, parental education and location to be significant in explaining the earnings outcomes of individuals. It was found that earnings increase with years of schooling and experience squared reflects a concave shape. The implication here is that earnings rise more quickly for those that are young and then it tapers off mid-career.

6.3 Policy Implications and Recommendations

The targets of sustainable development, political stability, optimum use of resources and social justice cannot be achieved without raising educational levels of individuals. Household background is important in predicting education as well as earnings; education has positive wage returns that rise with the quantity of education.

The empirical results of the study indicate that household background plays a significant role in education and earnings outcomes of individuals in Botswana. Based on these findings the following are recommended:

- Analysis showed that individuals, who belonged to household with low income, had low educational attainment. Therefore household with better facilities at home are more likely to continue their schooling to higher levels. Economic planning that includes development of rural areas and provision of special quotas for rural adults in jobs is expected to raise financial status of parents enabling them to meet some educational expenses for their children. It is clear that household income makes a contribution to a child's education and well-being. This implies that income gains are prospective in making a difference in the lives of children. Policy makers therefore will need to weigh the potential gain to child education and well-being from policies that improve income of low-income families against the cost of such policies.
- The government of Botswana should design policies to induce environment of occupational transition and mobility for rural population more especially strategies to achieve education for all and keep children in rural and remote areas in school. Children who are physically and emotionally well endowed, whose physical needs are met, who live in safe and stable environments and who have adults they can look up to and trust are likely to succeed.
- Remote Area Development Programme which helps children who stay in remote villages and settlements to access education has not been effective in its mandate of educating school dropouts. To curb this gap, awareness should be transferred to parents; their involvement in education of their children is likely to meet the shortcomings of any designed programme or initiative that enhances education in Botswana. Public policy towards greater access to education and quality education for children of less educated and /or privileged parents is very imperative. The Ministry of Education should design special campaigns building on the weaknesses of the Remote Area Development Programme to curb the acceleration of school dropouts

after passing primary level education. These strategies should control school dropouts at the age of attaining puberty.

- To achieve community awareness and involvement of parents, community awareness programmes or outreach should be mobilised. Schools should start programmes that educate parents on active involvement in their children's education and schooling, especially in areas where families are disadvantaged economically. This way parents, specifically those with no or low education can fully appreciate the value of involvement in ensuring their children participate in schooling which in turn will motivate children to stay in school and aspire to do well. Community activities that bring teachers, parents and children together on a consistent basis could help support a teacher – parent rapport that could help improve the quality of schooling of children.
- Active mentoring is also important in mobilising school participation; students can be mentored to aspire for more in life and more importantly to stay in school. Career guidance should be extensively launched in rural areas where information dissemination is poor.
- NGOs should focus on returns to education mentorship programmes to help students build confidence in terms of their grades, higher learning or tertiary education aspirations as well as job market aspirations. Community members who are successful in the corporate realm as a result of educational attainment, especially those with similar background as children with less advantageous household background factors should actively mentor in schools to demonstrate that higher education and earnings in the labour market are all attainable. Role models that can be case studies to students should heighten accountability within students.
- Government-Private partnership programmes or campaigns in schools to increase awareness of the long term benefits of education on families of low social status can assist in raising school participation of rural children. Government together with private organisations should structure short and long term policies to elevate the status of education and increase rural communities' involvement in political, economic and other activities of life. These strategies diffuse an innovative attitude towards education in rural communities.
- Curriculum needs to be amended to create equity among students who have different backgrounds e.g. location or residential difference. The education policy that is currently in use, One Size Fits All that is from 1994 making it 21 years old, an out-dated policy that currently does not speak to the needs of today's student; this policy needs to be improved or revised. The one size fits all curriculum, cannot benefit all

children as such it has to be tailor made with students' background in agenda like parents or family, location and socio economic status to better meet the needs of different students. For instance the needs of children in cities cannot possibly be the same as of those in rural or remote settlements; thus teachers in cities cannot teach using the same policy or curriculum as teachers in rural areas it violates the needs of these students based on background and in the long run equity is minimised as everybody is not getting what they need to improve the quality of their situation. This can be attributed to why there are more school dropouts in rural areas than urban areas.

- Information and technology should be mobilised in rural areas as very often there is not enough information and technology to enhance education and knowledge.

6.4 Limitations of the Study and Recommendation for Further Research

- Time was a major limitation to this study, allocation given was not sufficient to allow an in depth analysis of the study. Moreover, the data available did not allow for an in depth analysis of the study. We could not use primary data which offers tailored information hence we had to settle for secondary data. The secondary data was collected for other purposes by Statistics Botswana and thus we had to tweak and scale out a lot of information to satisfy the objectives of the study, this process proved to be time consuming.
- The data used for estimation is cross-sectional data conducted almost six years prior to this study, which makes the data somewhat out dated. Our main interest was to use current data; unfortunately we were unable to do so as the data employed for this study was the latest of its kind that was suitable for our study.
- The study could not measure the effect of household background across gender i.e. between girls and boys. For future research, considering the impact on gender roles may improve the study. With more data it would be appropriate to study whether relationships estimated in the study vary across gender and time periods.
- Also measurement of cognitive ability such as verbal and logical skills of children of the same age group could be explored for future research. This could be an investigated factor in the modelling of educational attainment and eventual earnings. Child parent relationship in the household is another measurement effect that could enhance research on the subject matter.
- Other studies reported a positive effect of better nutrition and good health of the children on their educational attainment (Warner, 2006; Stith et al, 2003). This could be an area or topic for future research in Botswana. Another recommendation for future research would be gender and region specific analysis. Researchers with more data could study education attainment and earnings of girls or females in rural Botswana alternatively boys or male educational attainment and earnings in rural Botswana. A comparative analysis of the two would also be desirable given availability of data.
- Our study used any parent (whether it was mother or father) who identified as a head; future studies could measure the education of a parent across gender. Either use the father or mother's education.

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APPENDIX

```
Iteration 0: log likelihood = -1329.6679
Iteration 1: log likelihood = -1160.808
Iteration 2: log likelihood = -1157.6147
Iteration 3: log likelihood = -1157.6085
Iteration 4: log likelihood = -1157.6085
```

```
Ordered probit regression                               Number of obs   =       1844
                                                         LR chi2(7)      =       344.12
                                                         Prob > chi2     =       0.0000
Log likelihood = -1157.6085                             Pseudo R2      =       0.1294
```

educa_level	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
log_income	.2301306	.0236016	9.75	0.000	.1838723	.2763888
household_size	-.0475903	.0088843	-5.36	0.000	-.0650031	-.0301774
cities	.7361879	.0933504	7.89	0.000	.5532245	.9191514
urban_villages	.4088581	.0696419	5.87	0.000	.2723625	.5453537
primary_educ	.0651311	.1085768	0.60	0.549	-.1476754	.2779376
secondary_educ	.1185804	.1168298	1.01	0.310	-.1104018	.3475626
Tertiary_educ	.519381	.1357865	3.82	0.000	.2532444	.7855176
/cut1	-1.270913	.2679706			-1.796125	-.7456999
/cut2	.4991803	.2103734			.086856	.9115047
/cut3	3.22768	.2255115			2.785686	3.669675

```
. mfx compute, predict(outcome(1))
```

Marginal effects after oprobit

```
y = Pr(educa_level==1) (predict, outcome(1))
= .00059226
```

variable	dy/dx	Std. Err.	z	P> z	[95% C.I.]		X
log_in~e	-.0004783	.00028	-1.72	0.086	-.001024	.000068	8.06847
househ~e	.0000989	.00006	1.65	0.098	-.000018	.000216	6.85683
cities*	-.0008871	.00053	-1.67	0.095	-.00193	.000156	.185466
urban_~s*	-.0008271	.00049	-1.68	0.093	-.001793	.000138	.430043
primar~c*	-.0001363	.00024	-0.56	0.573	-.00061	.000337	.52603
second~c*	-.0002262	.00024	-0.93	0.354	-.000704	.000252	.263015
Tertia~c*	-.00063	.00039	-1.61	0.108	-.001398	.000138	.122017

(*) dy/dx is for discrete change of dummy variable from 0 to 1

```

Iteration 0: log likelihood = -1329.6679
Iteration 1: log likelihood = -1160.808
Iteration 2: log likelihood = -1157.6147
Iteration 3: log likelihood = -1157.6085
Iteration 4: log likelihood = -1157.6085

```

```

Ordered probit regression                               Number of obs   =       1844
                                                       LR chi2(7)      =       344.12
                                                       Prob > chi2     =       0.0000
Log likelihood = -1157.6085                          Pseudo R2      =       0.1294

```

educa_level	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
log_income	.2301306	.0236016	9.75	0.000	.1838723	.2763888
household_size	-.0475903	.0088843	-5.36	0.000	-.0650031	-.0301774
cities	.7361879	.0933504	7.89	0.000	.5532245	.9191514
urban_villages	.4088581	.0696419	5.87	0.000	.2723625	.5453537
primary_educ	.0651311	.1085768	0.60	0.549	-.1476754	.2779376
secondary_educ	.1185804	.1168298	1.01	0.310	-.1104018	.3475626
Tertiary_educ	.519381	.1357865	3.82	0.000	.2532444	.7855176
/cut1	-1.270913	.2679706			-1.796125	-.7456999
/cut2	.4991803	.2103734			.086856	.9115047
/cut3	3.22768	.2255115			2.785686	3.669675

```
. mfx compute, predict(outcome(2))
```

Marginal effects after oprobit

```

y = Pr(educa_level==2) (predict, outcome(2))
= .06985195

```

variable	dy/dx	Std. Err.	z	P> z	[95% C.I.]		X
log_in~e	-.0305715	.00339	-9.01	0.000	-.03722	-.023923	8.06847
househ~e	.0063221	.00121	5.23	0.000	.003955	.00869	6.85683
cities*	-.0707691	.00758	-9.33	0.000	-.085628	-.05591	.185466
urban_~s*	-.0524977	.00891	-5.89	0.000	-.069971	-.035025	.430043
primar~c*	-.0086751	.0145	-0.60	0.550	-.037101	.019751	.52603
second~c*	-.0151297	.01432	-1.06	0.291	-.043187	.012927	.263015
Tertia~c*	-.0518737	.0103	-5.04	0.000	-.07206	-.031687	.122017

(*) dy/dx is for discrete change of dummy variable from 0 to 1

```

Iteration 0: log likelihood = -1329.6679
Iteration 1: log likelihood = -1160.808
Iteration 2: log likelihood = -1157.6147
Iteration 3: log likelihood = -1157.6085
Iteration 4: log likelihood = -1157.6085

```

Ordered probit regression

```

Number of obs = 1844
LR chi2(7) = 344.12
Prob > chi2 = 0.0000
Pseudo R2 = 0.1294

```

Log likelihood = -1157.6085

educa_level	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
log_income	.2301306	.0236016	9.75	0.000	.1838723	.2763888
household_size	-.0475903	.0088843	-5.36	0.000	-.0650031	-.0301774
cities	.7361879	.0933504	7.89	0.000	.5532245	.9191514
urban_villages	.4088581	.0696419	5.87	0.000	.2723625	.5453537
primary_educ	.0651311	.1085768	0.60	0.549	-.1476754	.2779376
secondary_educ	.1185804	.1168298	1.01	0.310	-.1104018	.3475626
Tertiary_educ	.519381	.1357865	3.82	0.000	.2532444	.7855176
/cut1	-1.270913	.2679706			-1.796125	-.7456999
/cut2	.4991803	.2103734			.086856	.9115047
/cut3	3.22768	.2255115			2.785686	3.669675

```
. mfx compute, predict(outcome(3))
```

Marginal effects after oprobit

```

y = Pr(educa_level==3) (predict, outcome(3))
= .82499948

```

variable	dy/dx	Std. Err.	z	P> z	[95% C.I.]		X
log_in~e	-.010668	.00316	-3.37	0.001	-.016871	-.004465	8.06847
househ~e	.0022061	.00074	2.99	0.003	.000759	.003653	6.85683
cities*	-.1022619	.02219	-4.61	0.000	-.145747	-.058776	.185466
urban_~s*	-.0237389	.00712	-3.33	0.001	-.037692	-.009786	.430043
primar~c*	-.0029715	.00495	-0.60	0.548	-.012677	.006733	.52603
second~c*	-.0069104	.00834	-0.83	0.407	-.023248	.009428	.263015
Tertia~c*	-.0658306	.02808	-2.34	0.019	-.120866	-.010795	.122017

(*) dy/dx is for discrete change of dummy variable from 0 to 1

```

Iteration 0:  log likelihood = -1329.6679
Iteration 1:  log likelihood = -1160.808
Iteration 2:  log likelihood = -1157.6147
Iteration 3:  log likelihood = -1157.6085
Iteration 4:  log likelihood = -1157.6085

```

```

Ordered probit regression                               Number of obs   =       1844
                                                       LR chi2(7)      =       344.12
                                                       Prob > chi2     =       0.0000
Log likelihood = -1157.6085                          Pseudo R2      =       0.1294

```

educa_level	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
log_income	.2301306	.0236016	9.75	0.000	.1838723	.2763888
household_size	-.0475903	.0088843	-5.36	0.000	-.0650031	-.0301774
cities	.7361879	.0933504	7.89	0.000	.5532245	.9191514
urban_villages	.4088581	.0696419	5.87	0.000	.2723625	.5453537
primary_educ	.0651311	.1085768	0.60	0.549	-.1476754	.2779376
secondary_educ	.1185804	.1168298	1.01	0.310	-.1104018	.3475626
Tertiary_educ	.519381	.1357865	3.82	0.000	.2532444	.7855176
/cut1	-1.270913	.2679706			-1.796125	-.7456999
/cut2	.4991803	.2103734			.086856	.9115047
/cut3	3.22768	.2255115			2.785686	3.669675

```
. mfx compute, predict(outcome(4))
```

Marginal effects after oprobit

```

y = Pr(educa_level==4) (predict, outcome(4))
= .10455631

```

variable	dy/dx	Std. Err.	z	P> z	[95% C.I.]		X
log_in~e	.0417178	.00444	9.39	0.000	.033007	.050429	8.06847
househ~e	-.0086271	.00163	-5.31	0.000	-.011814	-.00544	6.85683
cities*	.1739181	.02691	6.46	0.000	.121177	.226659	.185466
urban_~s*	.0770638	.01374	5.61	0.000	.050125	.104002	.430043
primar~c*	.011783	.01961	0.60	0.548	-.026653	.050218	.52603
second~c*	.0222662	.02271	0.98	0.327	-.022241	.066773	.263015
Tertia~c*	.1183343	.03736	3.17	0.002	.045112	.191557	.122017

(*) dy/dx is for discrete change of dummy variable from 0 to 1