

DECLARATION

I, Simbarashe Sibanda, hereby declare that the work contained in this research report is my own unaided work. It is being submitted exclusively to the University of the Witwatersrand in partial fulfilment of the requirements for the degree of Master of Education. It has not been submitted for any other degree or examination at any other university.



Simbarashe Sibanda

Signed on this 18

day of JUNE in the year 2020

STATEMENT BY THE SUPERVISOR

I, Professor Brahm Fleisch, as the candidate's Supervisor, agree/do not agree to the submission of this dissertation.

Supervisor's

Date

Signature

DEDICATION AND ACKNOWLEDGEMENTS

I would like to acknowledge and express my gratitude to the following people for their help in the completion of this study:

- My supervisor, Professor Brahm Fleisch, for his encouragement and careful direction during the research.
- My family, particularly my wife Ivy, for their support of my endeavours.

TABLE OF CONTENTS

Copyright Notice.....	Error! Bookmark not defined.
Abstract.....	Error! Bookmark not defined.
Declaration.....	i
Statement by the supervisor	ii
Dedication and acknowledgements.....	iii
Abbreviations.....	vii
CHAPTER 1: INTRODUCTION.....	1
1.1 Human development and the human capital theory	1
1.2 Zimbabwe's investment in human capital.....	1
1.3 Overview of Zimbabwe's education system	2
1.4 Misalignment of the education system and the realities of an informal economy	14
1.5 Impact of vocational education	14
1.6 Historical analysis of rates of return for Zimbabwe.....	16
1.7 Aims and objectives of the study	18
1.8 Research question	20
1.9 Significance and rationale.....	20
CHAPTER TWO: LITERATURE REVIEW	22
2.1 Introduction.....	22
2.2 Theoretical Literature Review	22
2.3 Effect of short training on relationship between educational attainment and incomes.....	26
2.4 Factors influencing the returns of vocational training	29
2.5 Income inequality.....	30
2.6 Effect of education and training on income equality	32
2.7 Conclusion	34
CHAPTER 3: RESEARCH METHODOLOGY	14
3.1 Research approach	14
3.2 Research data	15
3.3 Data Description	16
3.4 Model and estimation techniques.....	17
3.5 Gini Coefficient	20

3.6	Limitations	20
3.7	Ethical considerations	20
3.8	Chapter Summary	21
CHAPTER 4: DATA PRESENTATION AND ANALYSIS		22
4.1	Research approach.....	22
4.2	Descriptive Statistics Section	22
4.3	Restatement of primary study findings	28
4.4	Secondary analysis of results at baseline	29
4.5	Results after treatment.....	33
4.6	Effect of targeted short training income inequality among workers in the rural informal economy	40
4.7	Conclusion.....	43
CHAPTER 5: CONCLUSION AND RECOMMENDATIONS		45
5.1	Introduction	45
5.3	Insights from literature review	45
5.4	Summary of findings.....	47
5.5	Recommendations	50
5.6	Areas of further study.....	51
5.7	Conclusions	51

ABBREVIATIONS

AIDS	Acquired Immune Deficiency Syndrome
B Tech	Bachelor of Technology Degree
CLRM	Classical Linear Regression Model (CLRM)
DID	Difference in Difference
D Tech	Diploma of Technology
HND	Higher National Diploma
ILO	International Labour Organization
ITC	Industrial Training Centres
MHTE	Ministry of Higher and Tertiary Education
M Tech	Master of Technology Degree
NC	National Certificate
ND	National Diploma
PCC	Pearson Correlation Coefficient
PROJOVEN	Youth Labour Training Programme (Honduras)
PSM	Propensity Score Matching
TVET	Technical and Vocational Education and Training
UIS	UNESCO Institute for Statistics
USD	United States dollar

CHAPTER 1

INTRODUCTION

1.1 Human development and the human capital theory

Human development is the expansion of people's freedom to live long, healthy and creative lives, and that as individuals or in groups, they are not only the beneficiaries but also the drivers of human development (Sen, 2001, p.3). Central to this notion is the belief that knowledge expands people's possibilities (Clark, 2011, p.47). These human skills and abilities are enhanced through education and training (Rolleston & Oketch, 2008) Human capital determines a country's level income and its economic growth (Connolly, 2004). If the inequality in education is high in a country then the income inequality is expected to be high in that country. Schultz (1960) postulated that education should be treated as an investment in man (Human Capital Theory) an asset on which an income or 'return' comparable to rent or interest is earned. High-quality education, which improves the cognitive skills of the population, is powerfully related to individual earnings, to the distribution of income, and to economic growth (Hanushek & Woessmann, 2007).

1.2 Zimbabwe's investment in human capital

When Zimbabwe gained its independence from colonial rule in April 1980, the majority of the people did not have the opportunity to access formal education due to a racially biased system. The education system was very restrictive for the black population, with the majority only completing primary education.

Studies on the rates of returns to education have shown that private returns to schooling are generally positive and the gross economy average rate of return to schooling is 10 per cent for every additional year in school (Montenegro & Partings, 2014, pp.2-3). In that regard, Zimbabwe, like many other African governments, in the post-independence period made significant investments to improve access to education and training as well as to improve the quality of the education system (Kanyenze, 2011). Despite this expansion and improvement in the education sector, those who reside in the remote

parts of the country, continued to struggle to access education due to factors such as limited access and high cost of education.

Overview of Zimbabwe's education system

Education system in Zimbabwe comprises of two years of Pre-Primary School (Early Childhood Development), seven years of Primary School, four years of Lower Secondary School, two years of Upper Secondary School and at least three years of Higher Education (Post-Secondary).

Access to education remains a challenge with a Net Enrolment Ratio of 83 per cent for Primary education and 35 per cent for Secondary (UIS, 2013). On average, 350 000 young people complete Primary education while only 40 000 gain access to a post-Secondary qualification (MHTE, 2017, p.7), a function of poor pass rates and limited access at higher levels.

Figure 1.1: Structure of Zimbabwe education system. Source, Zimbabwe (2017) Ministry of Higher and Tertiary Education

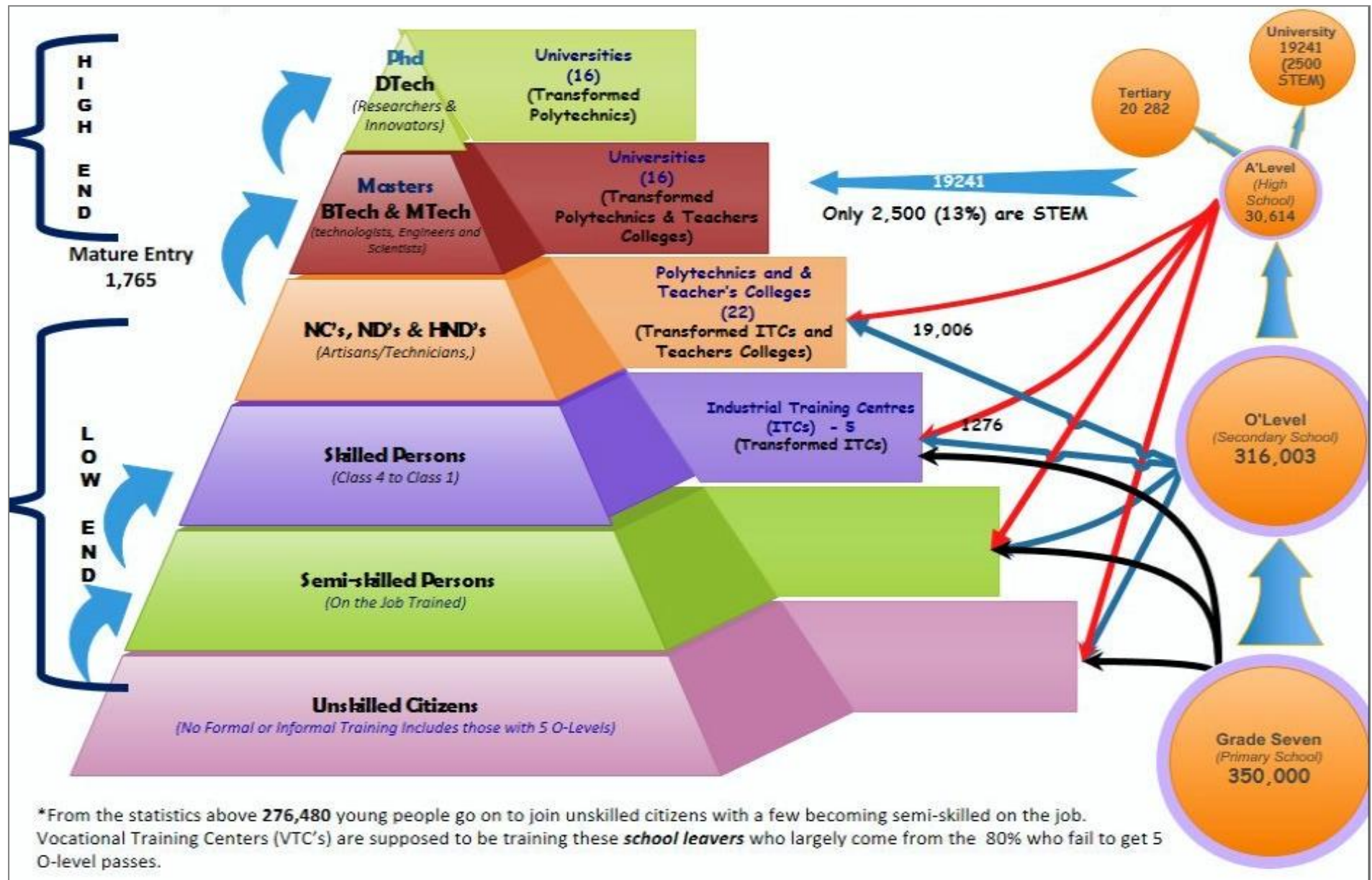
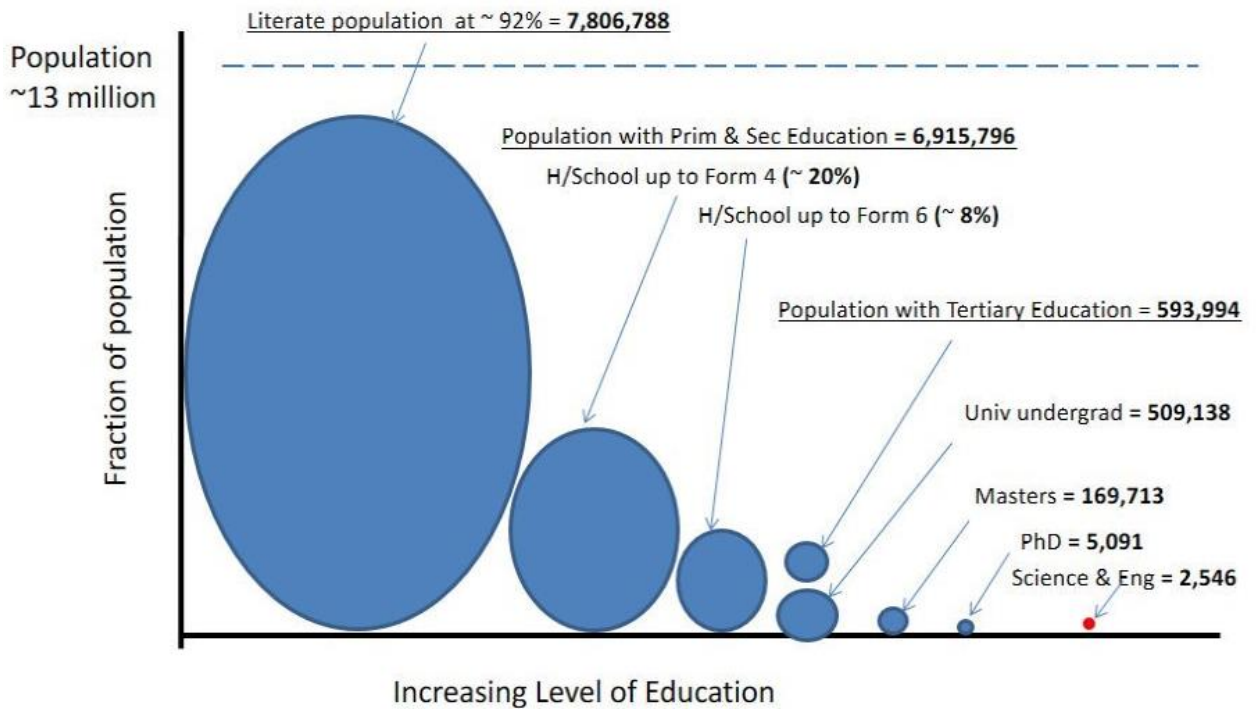


Figure 1.2: Skills base of Zimbabwe



Source: Zimbabwe (2017) Ministry of Higher and Tertiary Education

1.3 Misalignment of the education system and the realities of an informal economy

In the post-2000 era, Zimbabwe faced significant economic and social challenges leading to lower investment in education and training. Resultantly, access to education declined and the quality of the system's outputs became questionable. On the economic side, the country underwent massive deindustrialization and informalization (Confederation of Zimbabwe Industries, 2016). Ninety four per cent of all jobs are now informal (Zimbabwe Statistical Agency, 2014). Recent graduates struggle to secure formal jobs. In addition to informality, the skills produced are misaligned to labour market needs and employers believe graduates lack relevant employability skills. Graduates lack the skills required to enter the formal economy (Mwenje, 2016).

1.4 Impact of vocational education

In the face of economic challenges, there have been growing calls to “vocationalise” the education and training system and align skills development to the key economic sectors. A number of African governments have implemented Technical and Vocational

Education and Training (TVET) reforms since 1990s and this has resulted in the formulation of a number of TVET policies across the continent (Konayuma, 2008, p.2).

Policy makers have been preoccupied with the task of developing TVET systems that are of high quality, relevant and accessible. This policy focus reflects the growing awareness of the role that TVET play in improving national development outcomes. The increasing importance that African governments including the Government of Zimbabwe (GOZ) now attach to TVET is reflected in the various Poverty Reduction Strategy Papers, National Development Plans and Vision Papers that governments have developed over the years (Konayuma, 2008). A Presidential Commission of Inquiry into Education and Training made a number of recommendations in 1999 on how to reform Zimbabwe's education system to meet the needs of a globalized economy. Among the recommendations was a call to increase access to post-basic education by improving pathways. This would be achieved by strengthening technical vocational education and training (Nziramasanga, 1999).

Another dominant voice in this discussion has been the International Labour Organization (ILO), which has been advocating for the decentralization of education and training services and a greater focus on low-cost skills training programmes in order to meet the huge demand across the country. The main tool to advocate these policy options has been through development cooperation programmes.

The ILO, in partnership with the Government of Zimbabwe Workers and Employers implemented the *Skills for Youth Employment and Rural Development programme* (2010 -2015), to address the challenges of youth employment and rural development. The programme reached 10,000 young people (18 to 35 years of age) with the short targeted vocational skills training to position them to gain employment or generate income. This was achieved through the expansion of technical and vocational skills development to rural and urban out-of-school youth. The programme offered demand-driven technical and vocational training (aligned to local economic opportunities) in under-served rural communities and was aimed at upgrading existing informal apprenticeships in urban areas (ILO, 2015).

1.5 Historical analysis of rates of return for Zimbabwe

In their analysis of rates of return to education for Sub-Saharan countries, Psacharopoulos and Woodhall (1985) state that in the 1960's, the social rate of return for primary education for Zimbabwe was 12.4 per cent. The rates for the other levels of education are not provided and there is limited information on how the rate was calculated. Despite several criticism to the methodology, (Bennell, 1995; Jain, 1991) the study identified four key trends in Sub-Saharan Africa:

- a) The returns to primary education (whether private or social) are the highest among all the educational levels;
- b) The private rates of return are in excess of social returns, especially at the university level;
- c) All rates of return are well above the 10 per cent common yardstick of the opportunity cost of capital; and
- d) The returns in developing countries are higher relative to the corresponding returns in advanced countries. The first three 'patterns'.

Zimbabwe experienced major political, socio-economic changes in during the 1970 and the early 1980's. It is likely that the rate of return during this period underwent some changes, but data paucity makes it difficult to confirm this theory.

Rates of return in post-independence Zimbabwe

Bennell and Malaba (1993) assessed the extent to which Psacharopoulos' rate of return to education patterns prevailed in Zimbabwe during the late 1980s. They established that the social rate of return for university education was negative (-4.3 per cent) for female students while very low for male students 1.3 per cent. They questioned the utility of public investments into university education. Although private rates of return were higher they remained the lowest across all levels of education.

The social and private rates of return to education for both lower and upper secondary schooling were much greater than those for primary education. Comparing the rates of return to education for Zimbabwe in the late 1980s with Psacharopoulos' figures for Africa as a whole during the 1960s and 1970s, it can conclude that, on the one hand,

both the private and social rates of return for primary and university education in Zimbabwe are much lower while, on the other hand, the rates of return for secondary (and especially upper secondary) education are considerably higher Bennell and Malaba (1993).

Table 1.1: Comparison of Zimbabwe and Regional RORE

	Primary	Secondary	University
Zimbabwe (1987)	16.6	48.5	5.1
Africa average	41.3	26.6	27.8

Source : Psacharopoulos, 1994

The view that the return to education in sub-Saharan Africa is high has recently been challenged by Bennell (1996). The most recent of the surveys of the evidence by Psacharopoulos (1994) finds that the rate of return on primary, secondary and higher education were 24 per cent, 18 per cent and 11 per cent respectively. Bennell articulates “the conventional rate of return on education patterns almost certainly do not prevail in sub-Saharan Africa under current labour market conditions.” (Bennell, 1996, p.195). This objection is further supported by the survey of the Mincerian returns to education in sub-Saharan Africa in Appleton, Hoddinott, and Mackinnon (1996) who show that there is a general pattern by which the returns to education rose with its level. The average returns to education suggested by their survey are substantially below those presented in Psacharopoulos (1994).

Effects of the structural adjustment period early 1990's

At the start of economic liberalisation in the form of the Economic Structural Adjustment Programme, in 1991, the private and public sectors experienced a decline in real wages, mass retrenchments, informalization and lower levels of wage employment. This was coupled with increases in cost recovery in the education sector, thus reducing the returns to investments in human capital (particularly for university education) and increasing the level of uncertainty, which further depressed all types of investment including human capital (Bennell et al., 1999, p.13).

Appleton, Hoddinott, and Mackinnon (1996) undertook an analysis of rates of return on human capital in sub-Saharan Africa in the 90's. Zimbabwe was part of the analysis and they found the rate of return for primary education to be 2 per cent; secondary education 27 per cent and university education 37 per cent (Bigsten et al., 1998).

Land reform and economic decline post-2000

The economic decline accelerated in the post-2000 era fuelled by the land reform, currency crisis, political turmoil, capital flight, corruption and mismanagement. This trend continued for a decade, there is no data on rates of return to education for this period. However, the education sector was adversely affected, transition rates to higher levels declined, cost recovery efforts resulted in a decline in access, and the profile of university students changed drastically – fewer learners from low-income households. In addition, rates of return are likely to have been adversely affected by the AIDS epidemic, brain drain, informality, land reform, hyperinflation and political uncertainty (Ncube et al., 2003). In the entire formal sector, real wages in 2000 were almost half their 1990 level.

1.6 Aims and objectives of the study

This study is a secondary data analysis. It will make use of data from a 2015 study undertaken by the ILO, an impact assessment (randomised control trial) that compared control and treatment groups to determine the net change in income for groups that received technical vocational skills training. This original study established that providing short, low cost and targeted vocational skills training to a cross section of young people in the rural economy had a significant impact on incomes. Although incomes across the population increased during the period under review, young people in the treatment group (those that benefited from skills training) reported much higher increases. Over a three year period, the average treatment candidate saw a jump in income of US\$819 compared to US\$ 322 for those in the control group. The study controlled for other factors that affect incomes and the increase is attributed to the intervention. The study also reported that in addition to improved incomes, the targeted low cost training led to an unintended positive impact. Young people in the treatment

group reported better health and education outcomes. This was measured through proxies, specifically, household expenditure on health and education.

The original study did not discuss the correlation between educational attainment and incomes for sub-populations. There was also no discussion on the impact of targeted low cost training on income inequality. The data collected in the study makes it possible to undertake a secondary analysis of these issues.

The first objective of the study is to establish if educational attainment (using highest level completed, with seven categories – None; Primary; Ordinary level; Advanced level; certificate; diploma and degree) is related to income across the population (one population regression analysis). The researcher assumes that although the data is for young people working in an informal rural economy, the case remains that higher educational attainment predicts higher income. As most evidence focuses on the public sector, formal workers use data that is in some cases not robust, this analysis will contribute to filling an existing gap. The original study collected the data required to establish this relationship, however, the analysis was not presented in the report. This study will contribute new information using a data set that is more robust and applies more reliable measures of income. In addition, the data was collected from a national representative sample of 2,200 respondents.

The second and main aim of the study is to conduct a next level analysis to check the extent to which the intervention impacted sub-populations within the study population based on the initial relationship between the educational attainment and income. The analysis will also establish if the average effect size is similar for different groups. The analysis will provide insights on the intervention's effect on income inequality and to what extent can relatively inexpensive (short term skills development) interventions reduce the income gap between the highest (95th percentile) and lowest (5th percentile). By so doing, it will attempt to establish how the dispersion patterns are affected by the introduction of a skills training programme. This will contribute to the discussion on how developing countries with highly informal economies can best invest limited resources.

1.7 Research question

Against this background, the main research question is:

What are the effects of educational attainment and training on incomes for young people working in Zimbabwe's rural informal economy?" The study will also address the following sub-questions:

- a) What is the relationship between educational attainment and income for young people working in the rural informal economy?
- b) What was the effect of introducing a short term technical vocational training programme on the relationship between educational attainment and incomes?
- c) How does the introduction of targeted short term training affect income inequality among workers in the informal economy?

1.8 Significance and rationale

It is now widely recognized that the skills development system (policies and practices) in Zimbabwe is failing to increase the capacity of the majority of the working population, including young people in the rural informal economy (ILO, 2016). This means that the investment in education and training is leading to limited social and economic benefits. This calls for a rethinking of policies, institutions and modalities that develop skills. Transitioning towards new models that are effective, scalable and cost effective should be the priority.

There is, however, limited knowledge on the effectiveness of these interventions, as there is limited data on the public and private returns of the broader education system and various vocational education and training programmes. The existing body of knowledge on returns to schooling seem to be focused on high and middle-income economies, with a focus on formal education, hence this study will make a contribution to the discussion on the effects of "short, informal training systems". Most of the literature has a strong bias on the formal economy, particularly the public sector. While this is valuable, African economies have evolved and the informal economy has grown in prominence.

The study sought to contribute to the conversation by exploring the relationship between incomes and educational achievement in the informal economy. A strong positive correlation between education and income will suggest that the rates of return in the informal economy remain strong. This information could serve as the basis for further exploration. The study will also sought to establish how the introduction of short, market oriented vocational training affects the relationship between incomes and education. This could contribute to the conversation with policy makers on how best to invest limited education and training resources for an economy that is highly informal. This could also provide some ideas on how training programmes can affect income inequality.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

In this chapter, the study reviews both theoretical and empirical literature on the correlation between educational levels and income in rural areas of Zimbabwe. Firstly, the study will look at theoretical literature review and then empirical literature review.

2.2 Theoretical Literature Review

Human Capital Theory

The human capital theory states that higher levels of educational attainment will lead to higher incomes. Rolleston and Oketch (2008) note the belief that human skills and abilities enhanced through education may be considered analogous to physical capital in their productive capacities and investment potential. Schultz (1960) postulated that, “education should be treated as an investment in man; it becomes a part of a person receiving it. There is a reason to treat it as stock of human capital; an asset on which an income or ‘return’ comparable to rent or interest is earned”.

Mincer Model

Propounded by Mincer in 1958, the model highlighted that the distribution of incomes follows the distribution of abilities; there is a normal distribution of abilities while incomes have an unequal distribution. This distortion is as a result of other factors that intervene, such as choice and behaviour. Individuals with different amounts of training are to be compensated for the costs of training; the present values of life-earnings must be equalized at the time a choice of occupation is made. As income is steady during the working life, it is possible to estimate the extent of compensatory income differences due to differences in the cost of training (Mincer, 1958). The cost of training depends on duration, the opportunity cost of foregone incomes and the direct cost of educational services. Mincer further acknowledges that more difficulty arises in measuring formal training. Years of schooling completed, as reported by the census do not, unfortunately, include time spent in vocational, trade, and business schools, not to speak of

apprenticeships and various forms of on-the-job training programs. Quantifying informal training is thus even more complex. Mincer further notes that there is a positive relationship between investment in human capital and the growth of productivity.

However, the Mincer Model has its weaknesses in that it fails to take into account the notion of ability endogeneity and omits some variable bias. Relationships between wages and education are also non-linear. The model fails to take into account the potential for different experience premiums for people with different levels of education (Humphreys, 1976). The London School of Economics, also notes that wages can be influenced by compensating differentials (the effects of non-monetary benefits), labour market imperfections (individuals of equal ability are matched to roles with differing productivity) and taste based discrimination (prejudices such as race or gender). In addition, human innate ability varies; school quality, the non-schooling investment options and post school training all affect incomes but have not been factored in the Mincerian Model. Thus, this study is open to the idea that differences in labour market outcomes for the graduates could in part be driven by variations in human innate abilities.

Schooling Investments and Returns to Education

Productivity and growth are viewed, as driven by a focus on quality and the upgrading of skills in line with the requirements of a post-industrial society (Becker, 1964). Wolf (2002) argues that the benefits of education and training are easy to quantify and are significant at an individual level. Benefits are most commonly measured through changes in income and the general finding is that more education and training increases levels of income. However, as noted by Ashton and Green (1996), using income as a measure of private benefit can distort reality as individuals from different social and economic conditions may access different occupational categories and therefore derive relatively different returns in income. Society also invests in the education of an individual and there is a public benefit to this investment largely in the form of economic growth and favourable socio-economic indicators in areas such as health (Psacharopoulos, 2004).

The earliest empirical cost-benefit analyses of education were arguably conducted by Strumilin (1929), Becker (1960) and Schultz's (1961) focusing on calculating the real rate of return estimation. Estimation techniques have also evolved from the 'elaborate type' to the contemporary reliance on the 'earnings function' to estimate rates of return (Psacharopoulos, 1981, p.1).

Various studies on the rates of returns to education outlined by Montenegro and Patrinos have shown that private returns to schooling are generally positive and the cross-economy average rate of return to schooling is 10 per cent a year (2014, p.2-3). Returns to schooling seem to be higher in low or middle-income economies than in high-income economies with tertiary education displaying the highest average private rates of return. In addition, estimated returns to schooling are higher for women than for men. Lastly, returns to schooling have declined very modestly over time despite rising average levels of schooling attainment, suggesting that the world demand for skills has been increasing as the world skill supply has also increased.

Some scholars however critique most of the studies on rates of returns to education (Psacharopoulos & Patrinos, 2004). The criticism largely stems from the use of data that is not comparable largely as a result of varying data sample coverage. Many data sets do not reflect the population, and the methodology employed. In addition, most of the studies compared use different models to estimate returns and the inclusion of many independent variables in the regression models.

Rates of return have also been criticised, as it is argued one cannot approximate the true social productivity of education by working with the earnings of employees by level of educational attainment (Tilak, 1989). The use of earnings as a proxy for productivity is also highly contested, however, these objections are weakened (by the fact) that employers conduct initial and persistent screening and would not maintain wages not backed by productivity. (Psacharopoulos, 1981, p.10). Embedded in the screening argument is the ability factor: those who have more education than others allegedly also have a higher level of ability. Wage differentials are not solely due to learning, a great part of them being due to differential ability (Psacharopoulos, 1981, p.13).

There has also been a debate on whether public sector earnings underestimate or overestimate rates of return. Externalities and spill over benefits of an educated population are often cited as being under-reported, if not completely excluded in some studies (Psacharopoulos & Patrinos, 2004, p.113).

Despite the limitations, it is clear that different types of education have different rates of return. For example, prior to Montenegro and Patrinos (2014), it was always believed that the rate of return is higher for primary education (Psacharopoulos & Patrinos, 2004).

Use of rates of returns to education has some policy implications. The perceived higher rate generated by investing in primary education explains the huge push for universal primary education and the neglect of vocational education in some countries. However, in modern times, rates of return are not viewed as prescriptive but rather as indicators of areas to concentrate on. (Psacharopoulos, 1981, p.14). Data on rates of return have also raised questions on the utility of continued public investment in higher education, where the social return is largely outstripped by the private returns.

Huge income inequalities in the 1990's led to renewed interest in rates of return, changes in production processes led to changes in demand for certain types of labour. The classic pattern of declining returns to education by level of economic development and level of education have however been maintained (Psacharopoulos & Patrinos 2004, p.112; Montenegro & Patrinos, 2014, p.2).

Rates of return for vocational education programmes

Chung (1995) in a review of the literature undertaken from the 1970s to the early 1990s found that twelve studies on returns to vocational education in developing countries reported higher returns to vocational training. Ten studies reported that lower returns to vocational education are not different from other forms of learning, and five studies concluded that there is no basis to compare the returns to vocational education with the returns from other forms of learning. Other studies have stressed that the returns to vocational education depend substantially on the general level of economic development, the availability of private sector jobs, and whether or not people are employed in a field related to their training (Bennell & Segerstrom, 1998).

High levels of academic education have far higher returns than those available either from vocational or lower levels of academic education. However, at lower levels, the vocational return can exceed the academic (Kahyarara & Teal, 2008). The studies cited refer to diverse economic conditions, some from much more developed countries, reducing comparability of data.

There is no evidence on rates of return for vocational education programmes in Zimbabwe. There is a lack of quality control mechanisms to prevent poor investments in vocational education and training, thus resulting in very few safeguards against poor investment. The system is generally designed to allow entrance for the weakest students (Rwezuva, Sibanda & Mutasa, 2012).

2.3 Effect of short training on relationship between educational attainment and incomes

Returns to investment in education based on human capital theory have been estimated systematically since the 1950s (Psacharopoulos and Patrinos, 2018). The reviews shows that the private average global rate of return to one extra year of schooling is about 9 per cent a year and has largely been stable over decades. Private returns to higher education have increased over time, raising issues of financing and equity. Social returns to schooling remain high, above 10 percent at the secondary and higher education levels. Women continue to experience higher average rates of return to schooling, showing that girls' education remains a priority. Returns are higher in low-income countries. Those employed in the private sector of the economy enjoy higher returns than those in the public sector, lending support to the productive value of education.

Skills training is a popular labour market strategy to improve labour market outcomes for young people (Fares & Puerto, 2009). Despite this popularity, evaluation evidence is largely from developed countries. While the number of evaluations from developing countries, particularly Sub-Saharan Africa, has grown over the last couple of years, they remain limited (Kluve et al., 2016). This small but growing body of literature on rate of return to vocation education and training provides mixed results.

Some researchers have found weak or no evidence of skills training affecting income. Ashenfelter and Card (1984) estimated the income effect of training in the United States of America. The study found that the training programme had a negligible effect on income, with some graduates reporting lower incomes post-training. In addition, the participants generally had lower incomes than the control group.

Richardson and van den Berg (2002) noted that the net effect of short-term vocational training on the individual's unemployment duration and income levels are about zero. Evaluating a public sector sponsored vocational training programme in East Germany (Lechner 1999) also reached the same conclusion - there are no positive earnings and employment effects from targeted short-term training.

In middle-income and low income countries, the literature suggests a mixed picture. In Turkey, Hirshleifer et al. (2016) found no statistically significant impact of technical vocational training among unemployed youth. Turčínková and Stávková (2012) explored the relationship between education and training on household income in the Czech Republic. The study concluded that a higher education and training was no guarantee of a lower risk of poverty. The study suggested that more and more attention should be paid to the applicability of education and training programmes. Card et al. (2011) studied youth vocational training in the Dominican Republic. The analysis found little impact on employment outcomes and modest effect on incomes. In Nepal, a targeted short skills training programmes focusing on the tourism sector was cited as not having generated income benefits to young people (Bhattarai et al., 2006).

However, the majority of literature reviewed points to a significant and positive relationship between accessing skills training and improved incomes in middle-income countries. Shady (2006) assessed a training and placement programme in Peru which was found to have significant positive impacts on earnings – increases ranging from 12 per cent to 30 per cent per month.

Attanasio et al. (2017) based on an assessment of Colombia, concur that job-related vocational training is a means to achieve growth in incomes. The six-month programme

with a classroom and on the job training targeted young people from low-income households in urban areas, led to increases in incomes of more than 20 per cent. Attanasio et al. (2017) observed that vocational training programmes could also create a displacement effect, taking opportunities away workers who are not treated but are otherwise close substitutes and could have obtained these jobs if the trainees had not been actively placed. Moreover, in areas with a high level of treatment, the competition for jobs can increase, decreasing everyone's arrival rates.

In Sub-Saharan Africa, the literature appears to have greater consensus suggesting the vocational training programmes generally provide positive returns, with a few exceptions. In Lesotho, Morojele (2009) assessed a youth employment initiative and found that skills training led to unspecified increases in income. In Kenya, Hicks et al (2016) found limited evidence that a skills training program led to an increase in earnings. Blattman et al. (2014) examined a training program in Uganda, and Buscher's (2008) assessment of skills training programmes in Liberia found that the majority of these programmes did not provide positive return on incomes

In Zimbabwe, there is very limited literature on returns to education, the bulk of the work is older and is largely confined to the public sector and formal employment workers largely in the public sector, due to the paucity of data (Verner, 1999). The utility of this is limited in a country with the second biggest informal economy in the world.

Bennell (2018) found that alternative artisan training programmes in Zimbabwe provided significantly higher rates of return compared to other off the job training programmes. However, the author noted that the huge difference in returns could be because of the clustering of graduates in elite firm associated with strong market power. While graduates from the off job training programmes tended to find employment in small and medium enterprises.

In the face of limited data on rates of returns, Zimbabwe has undergone a number of changes in its economy and the education sector; therefore, it is vital to revisit the

discussion on rates of returns to education to establish the new trends. It remains unclear if educational attainment has the same effect on income in the informal economy. There are also a number of training systems that exist to complement the formal system with a focus on technical vocational education and training. There is limited knowledge of how these skills development interventions affect income. It also remains unclear if such training affects the already existing income distribution patterns. Therefore this limited knowledge is hampering education and training policy making and could subsequently contribute to the inefficient allocation of resources on education and training programmes that might not meet the economic realities of present day Zimbabwe.

2.4 Factors influencing the returns of vocational training

Blattman et al. (2014) and Buscher's (2008) found that the majority of short term vocational training programmes did not provide positive return on incomes primarily due to poor targeting and implemented and that they did not prepare youth for the informal market, despite opportunities existing in this area.

Knowledge gaps remain, with limited literature on how quality of training affects outcomes (Haan and Serrière, 2002). In addition it is notable that the literature offers evidence from skills programmes that are varied, some as short as 100 hours and others as long as 6 months. Literature also points to a gender dimension in terms of how targeted skills training can affect income. Blattman et al. (2013) as well as Cho et al. (2013) note that training impacts on income and skills are greater for young men than for young women. Card et al. (2011) postulates that some of the gains in income might be unsustainable in the long term.

Wambugu (2013) in the case of Kenya investigated whether the education wage premium observed among workers is attributable to better family background-proxied by parental education. The study found that workers from more educated background enjoyed higher earnings. The study also found a significant negative coefficient for self-selection, implying that unobserved factors that lead individuals to acquire more education and training reduce earnings relative to the mean earnings of education level attained.

Ngugi and Muthima (2017) carried a study in Kenya to investigate female participation in technical, vocational education and training institutions. The study posited that there is a positive relationship between training and incomes. The study found that gender was a big determinant of the returns to vocational training, leading to disparities. Blattman, Fiala and Martinez (2013) as well as Cho et al. (2013) note that training impacts on income and skills are greater for young men than for young women. Card et al. (2011) postulates that some of the gains in income might be unsustainable in the long term. Ngugi and Muthima (2017) recommended a greater focus on gender-responsive approaches to remove the disparities.

Another factor influencing the returns on investment in vocational education was discussed by Kirui and Kozicka (2018) who observed that in Africa significant attention is on agricultural technical and vocational education. The review established that access to training remained very limited and the quality of the trainings did not match the needs of the market. The situation is compounded by a focus on offering training only on production skills, often neglecting the necessary business skills. The study concludes that an effective reform of agricultural vocational education and training in Africa would require policies and initiatives that tackle the general challenges as well as taking advantage of country-specific opportunities.

2.5 Income inequality

Income inequality refers to the extent to which income is distributed in an uneven manner among a population (Inequality.org, 2019). The wider those earnings are dispersed, the more unequal they are (Yglesias, 2015). Income inequality is socially unfair and can fuel political instability (Alesina and Perotti, 1996) as well as reducing the efficacy of economic growth for reducing poverty (Ravallion, 2001). Inequality also negatively affects key outcomes such as life expectancy, health and educational attainment (Pickett and Wilkinson, 2010). However, Rawls (1971) argues that income inequality has positive role to play as it encourages the application of greater effort, enhances productivity and more importantly, by rewarding the most valuable skills to

compels people to master the most useful skills. Keeley (2015) also postulates that income inequality can serve as an incentive for entrepreneurs to take risks.

Measures of income inequality are based on data on people's household disposable income. The main indicator of income distribution used is the Gini coefficient. Values of the Gini coefficient range between 0 in the case of "perfect equality", each person gets the same income, and 1 in the case of "perfect inequality", all income goes to the share of the population with the highest income (OECD, 2011).

Theories of income inequality

A number of theories have attempted to explain the distribution of income among individuals, Gibrat (1931) and Rutherford (1955). This theory has been criticised as incomplete particularly as it does not explain the economics of the distribution process (Mincer, 1958). A second group of scholars postulates that income distribution is a function of economic and institutional factors such as sex, age and location. This the socioeconomic theory stems from the human capital theory. Mincer (1958); Becker (1967) and Van Slijpe (1972) developed this theory, which has been criticised for concentrating too much on the supply side of the markets. The third theory on income distribution was described by Tinbergen (1975), who considers income distribution a result of the supply and demand for different kinds of labour.

Drivers of inequality

As discussed in earlier sections it remains the case that the human capital theory remains a key factor in the distribution of income among individuals. Keeley (2015) argues that while education systems can be a force for social mobility they can also reproduce and reinforce a society's existing pattern of wealth distribution. Wealthier families can invest more in education and as a result provide better chances of higher incomes, perpetuating income inequality.

Social background also has a clear impact on who goes on to higher education. In all OECD countries, the children of parents who did not attend university are themselves less likely to study at tertiary level. This suggests children from low-income families

follow other pathways such as vocational education and tend to earn less perpetuating inequality. Lastly, Keeley (2015) observes that while, there is consensus that providing skills lowers inequality, the skills must be of a particular quality and be matched to the right jobs.

Keeley (2015) also identifies other factors beyond the human capital theory, such as the growing role of technology, globalization, social and demographic shifts. In addition, the state is less inclined to play a redistributive role.

2.6 Effect of education and training on income equality

Vocational education and training is increasingly gaining prominence in the design of education and training system, however there is a small body of knowledge on how it affects income inequality. When discussing the effects of vocational training on income inequality it is important to note at the start that, vocational training tends to be associated with students from low income backgrounds who pursue training rather than pursue their passion in university degree of choice because of financial reasons (Aizenman et al., 2017).

Hanushek et al. (2017) concluded that vocational education is harmful in the later phases of work careers with the specific skills more likely to be outdated. This led to higher chances of unemployment. Korber and Oesch, (2019) also argue that, while vocational degrees protect against unemployment particularly at the start of the career, they come at the cost of flat earnings curves over the life course. This limited growth in incomes over time contributes higher levels of income inequality. Forster et al. (2016) noted that, while it may be true that people with vocational qualifications face negative effects as the years advance, this phenomena is observable statistically only in countries that do not have dual-track systems, like the US and Canada.

Brunello and Rocco (2015) compared incomes for vocational and academic education in OECD countries across different ISCED level. Their analysis found that at the ISCED 3 and 4 level, vocational training performs about as well as academic education as far as earnings are concerned and a bit better in terms of employment outcomes. However, at

the at the ISCED 5 level, the study found a clear advantage of academic education concerning incomes and other outcomes.

Yang and Qui (2016) studied the effects of innate ability, compulsory education (grades 1–9), and non-compulsory education (grades 10–12 and higher education) on inequality and intergenerational mobility of income, by constructing a four-period overlapping-generation model. The duo found that innate ability and family investment in early education play important roles in explaining income inequality and intergenerational income mobility. Children that benefitted from a greater investment in education tended to have better earnings.

Attanasio et al. (2017) observe that job-related vocational training is a means to achieve growth in incomes at the lower end of the distribution and to reduce inequality. Using OECD data, (Aizenman et al., 2017) identified a quantifiable association between the income shares of the working poor and the availability and take-up of vocational education Across 21 countries, the correlation between a measure of inequality and measures of vocational education is always negative. Estimating a panel model, and using a fixed-effects estimation,

Aizenman et al. (2017) found that both the relative size of the manufacturing sector and the share of vocational education are positively associated with the top 10 per cent income share. In a standard trade model, both terms-of-trade adjustment and technological bias for skilled labour can give rise to increasing inequality. The structure of economy is also key, the study found economies with huge manufacturing sectors led to higher earning for those with vocational education, thereby narrowing the income gap. This the study postulates could explain higher income inequality in USA (lower manufacturing, lower vocational training) compared to Germany (high manufacturing, high vocational training).

Shahabadi et al. (2018) in their study of the impact of education on income inequality in Islamic countries found that the enrolment rate in primary and secondary schools has a significant negative effect on income inequality, and the enrolment rate in university has

a significant positive effect on income inequality. Thus, training in primary and secondary schools might reduce income inequality, and education in universities can increase income inequality because of the higher financial capability of certain classes of people and the expertise they have acquired.

Although data on low-income countries is very limited, Tran et al. (2020) undertook an analysis of Vietnam, a lower middle-income country, focusing on the poorest region and found that, greater access to education and training reduced income inequality. They also found that at the same level of training, inequalities persisted suggesting there are other factors contributing to incomes beyond skills.

Impact of training on income is higher in low-income countries than in high-income countries. In lower income countries, with large cohorts of disadvantaged youth, marginal investments in skills and employment opportunities lead to larger changes in outcomes (Kluven et al., 2016).

The gaps on literature are particularly huge when it comes to “short, informal training systems” in developing countries and the effect of vocational training on those working in the informal economy. However, it is widely accepted that the informal economy perpetuates income inequalities. Meghir, Narita and Robin (2015) observed that informality has implications for wage distribution. Informal firms and workers occupy the lowest part of the productivity distribution, since regulatory costs (such as minimum wages) are too high to make formal employment profitable. In contrast, formal firms are more likely to be found in the higher parts of the productivity and thus pay higher wages. At the same time, informal firms mostly pay more than formal ones of equal productivity, which reflects compensating differentials.

2.7 Conclusion

The chapter discussed in depth the theoretical and empirical literature in order to reveal the relationship between education and income distribution as well as the effect that vocational training has on income inequality. A central part of the review is the human capital theory and the large body of work that concurs that higher educational

attainment tends to be associated with higher incomes. The existing body of knowledge on returns to schooling seem to be focused on high and middle-income economies, with a focus on formal education and the returns for those working in the public sector. The study will attempt to confirm if this is the case in Zimbabwe.

The literature reviewed failed to reach a consensus on the impact of vocational training on income distribution. Evidence from developed countries largely shows a negative relationship between vocational training and incomes. Older literature had also strongly suggested that in developing countries vocational education is always associated with positive rates of return. Literature that is more contemporary paints a more complicated picture with different outcomes – this perhaps a reflection of the different contexts; design and quality of the vocational training programmes. Despite the emergence of new literature of the past 10 years, significant gaps remains particularly on low-income countries and for work outside the public sector especially in the informal economy. This study will contribute to the discussion on the effects of “short, informal training systems”.

The literature reviewed also failed to reach a consensus on the implications of VET on income equality in both developed and developing countries. There is a negative relationship between tertiary education and income equality and there is a positive relationship between primary education. However, in some developed countries such as Germany, vocational training is associated with lower levels of inequality, but in the majority of countries, vocational training graduates tend to face low levels of income growth over the entire work lifecycle thereby accentuating inequality. In developing countries, vocational training tends to be associated with candidates from low-income backgrounds and is often associated with increases in incomes thus reducing income inequality. However, the inconsistency in terms of targeting; delivering high quality training and matching labour market needs challenges in terms of ensuring greater impact on reducing inequality.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 Research approach

Quantitative research is systematic, objective, deductive, and can be generalized to larger populations (Fraenkel & Wallen, 1996). The researcher uses a quantitative, non-experimental approach for this study. A non-experimental design was used in order to determine relationships between variables and events that have already occurred (Babbie, 2007). This approach is particularly useful for analysing extensive data. It, however, presents a number of limitations, chief among them being its limited utility in establishing causal relationships (Babbie, 2007).

The research design employed is a descriptive relational correlation design study. This study's design attempts to explain particular conditions (Gall et al., 2007) and seeks to establish if there is a relationship between educational attainment and income distribution in the informal economy.

Correlational research establishes if there is a relationship between two or more variables. In a correlation study, the variables are not experimentally controlled or treated. The predictor variable in this study is the educational attainment, and the co-variable is income. A positive correlation designates a variable value going up or down and the other variable value doing the same. In a negative correlation relationship, one value of a variable goes up as the other goes down (Gall et al., 2007). This design is however limited in that it does not establish causal relationships. Despite this limitation, knowledge on the linear and curvilinear relationships between variables remains valuable in explaining phenomena and guiding areas of further research.

The study is a secondary analysis as it uses an existing data set. Hakim (1982) defines secondary analysis as 'any further analysis of an existing dataset which presents interpretations, conclusion of knowledge additional to, or different from, those presented in the first report on the enquiry as a whole and its main results'. The researcher chose to undertake a secondary analysis due to its many benefits. Long & Sque (2010) summarise the value of undertaking a secondary analysis as:

“...applied secondary analysis to data when they have wanted to: pursue interests distinct to those of the original analysis (Hinds et al,1997); perform additional analysis of an original dataset or additional analysis of a subset of the original dataset [Heaton 1998; Hinds et al, 1997]; apply a new perspective or a new conceptual focus to the original research issues [Heaton, 1998]; describe the contemporary and historical attributes and behaviour of individuals, societies, groups or organisations (Corti and Thompson,1995)...”

The study looked back in time, retrospective research, attempting to find explanations for current group differences (Belli, 2008). The study uses existing data to establish the relationship between educational attainment and incomes.

3.2 Research data

The data used was collected as part of an International Labour Organization’s impact assessment to determine the net change in young people’s lives because of the treatment (a vocational training programme) in Zimbabwe. The data was collected by a research firm in August to October 2015. A key challenge encountered is that there had been no baseline data and no suitable control group identified at the start of the treatment. Access to second-hand information, such as census, official reports and other surveys to reconstruct the baseline was also not available. In light of these limitations, the data for the quantitative analysis was based on a survey that was applied to collect both baseline and end line data at the same time. The analysis relied on Propensity Score Matching (PSM) applied to the baseline data combined with Difference-in-Difference (DID) using both datasets (end line and baseline, i.e., two-round panel data).

Geographical areas for the study were selected using standard methods of randomization. Using publicly available secondary data, the researchers chose 50 matched pairs of control and treatment wards. In the treatment group, the young people who interacted with ILO programmes served as the sample frame to randomly select the respondents. While individual data from the control group was obtained and a sample frame created, the final list of respondents was established using PSM. The survey was conducted (baseline and end line data) to a random sample of matched individuals. The

principal variable of interest for the impact assessment was, change in income as a result of the treatment. Using the following sample size equation:

$$N = \frac{4\sigma^2(Z_{\alpha} + Z_{\beta})^2}{D^2}$$

Where N represents the sample size, $D, \sigma^2, Z_{\alpha}, Z_{\beta}$ are respectively: the expected impact effect treatment group; the standard deviation of income; the critical value of a confidence interval (two-tail test=1.96); and the critical value of the statistical test (two-tail test =1.28), assuming a normal distribution of the variable of interest. After replacing all the values, a sample size of 1343 was obtained. Finally, accounting for the possibility of future attrition and data losses for various reasons, the researchers assumed a 25 per cent safeguard, which leads to a total (preliminary) sample size equal to 2,433, which was rounded to 2,500. Enumerators were trained and collected data using SurveyToGo.

3.3 Data Description

The study collected key individual information such as location, age, gender, marital status and vulnerability status (e.g. disability); family size, expenditure on health and education; household welfare by looking at the type of family dwelling, fuel used, type of toilets and assets owned. Economic activities were also captured by the study through a question on ownership of economic assets (such as land) main activities and time use. Incomes were then established by asking individuals what they earned, for those in wage employment or profit for those in self-employment in the previous month for the numerous activities they reported to be engaged in. The data was cross verified by asking questions on annual harvest, household consumption and quantities sold. Other business related costs, such as wages were factored in. The minority of respondents were in wage employment and for these, monthly income and number of hours worked were also collected.

Educational attainment was measured by asking the question, “What level of education did you attain?” the respondents could provide an answer in the following categories, none; Primary; Ordinary Level; Advanced Level; Certificate; Diploma; Degree. A

follow-up question was asked to establish if the young person was in the control or treatment group, “did you receive skills training from the ILO?”

3.4 Model and estimation techniques

3.4.1 Ordinary Least Squares

To estimate the rate of return on education the study used Ordinary Least Squares, which enables the use of continuous dependent variable. In addition, in order to empirically determine the statistical significance and impact of educational attainment and incomes for workers in the rural informal economy of Zimbabwe, the study conducted a cross sectional regression of education on income. This was done for the post and pre-intervention periods to allow an impact analysis on the effects of training on income.

The following equation was estimated with gender, marital and education being included as control variables.

$$Income_i = \beta_0 + \beta_1 Edu_i + \beta_2 Ms_i + \beta_3 Gen_i + \mu_i$$

Where:

Inc_i is the income for individual i, *Edu_i* is the categorical educational attainment variable of individual i, *Ms_i* is the marital status individual i, *Gen_i* is the gender and *ε_i* is the error term

To ensure that the data did not violate the basic Classical Linear Regression Model (CLRM) assumptions, diagnostic tests were conducted. Multicollinearity tests were used to assess the randomness of regressors; results were tested using the Correlation Matrix.

The study considered pair wise correlation coefficient from the Correlation Matrix and Pair-wise correlation coefficient scores of 0.8 (absolute) or in excess between two explanatory variables show the existence of multicollinearity in this case the solution was to drop one of the correlated variables. Normality was one of the assumptions of the CLRM, to check for normality the Jacque-Bera (JB) was employed and considerations were made for the Skewness and Kurtosis of the data. The study also

considered the later, where Skewness measure closer to 0 and Kurtosis = 3 represent data that was normally distributed.

To achieve the main objective and establish if a correlation exists between educational attainment and an increase in income the Pearson correlation coefficient (PCC) matrix (correlation matrix) was computed using the statistical package. This tested for collinearity between our independent variable (education) and the dependent variable (income). Considering pair wise correlation coefficient from the Correlation Matrix¹, scores of 0.8 (absolute) or in excess between two explanatory variables show the existence of multicollinearity in which may conclude that the said variables are strongly correlated (Gujarati, 2004).

In the presence of heteroskedasticity the Ordinary Least Square estimates would no longer be Best Linear Unbiased Estimator (BLUE)² hence to test for this, the study considered using the Breusch-Pagan test for heteroskedasticity. The presence of autocorrelation has the same consequences and solution as those of heteroskedasticity, tests for serial correlation include the Durbin–Watson (*d* test) and the Breusch–Godfrey (BG) test. The study also explored the use of the Breusch–Godfrey (BG) test for autocorrelation.

A general Goodness of Fit test for the model was tested using the R-squared, which is a coefficient of determination and the F test. It estimated the percentage of variations in the explained variable that accounted for by the explanatory variables in the model, R-squared ranges from 0 to 1, the higher its value towards one, the better the model, because R-squared tends to increase with the addition of variables, we will be guided by the adjusted R-squared which adjusts for degrees of freedom. Adjusted R-squared is a statistical measure, which indicates the suitability of the model and has no economic interpretation. The researcher applied the F test to test for the overall significance of the model. To examine the significance of individual explanatory variables the P-values test was considered at the 10 per cent level of significance.

¹ A correlation matrix is a table showing correlation coefficients between a set of variables. This allows you to see which pairs have the highest correlation. The most common correlation is the Pearson's correlation coefficient.

² Given the assumptions of the classical linear regression model, the least-squares estimators, in the class of unbiased linear estimators, have minimum variance, that is, they are BLUE.

3.4.2 Logit

Given that, some of the rural people were not receiving income it was important to make the dependent variable a binary to cater for those who earn and those who do not earn an income. Since the components of income are binary in nature there is need for binary choice models namely Linear Probability Model (LPM), Probit and Logit.

Linear Probability Models denote a regression model whose dependant variable is binary in nature. This study avoided using LPM because it would violet several assumptions of linear regression model and it is associated with many challenges, which includes no guarantee of positive probability. However with large samples there low probability that it would be so, nonnormality of error term, greatest limitation of LPM concerns the formulation itself that the conditional expectations are interpreted as the probability of an event happening, in many cases it can lie beyond the limits (0, 1) (Gujarati, 2004). Furthermore, with LPM it is not possible to calculate marginal effects.

Having disregarded LPM there is need for a choice between Logit and Probit. However, the choice between Probit and Logit is a matter of preferences, empirically one can either choose Probit or Logit since the results tend to be very similar because cumulative normal distribution and logistic distribution are close to each other except for the tails (Logit has more weight on the tails). Unlike LPM, Logit and Probit does not have constant marginal effects. The model is represented by a functional form as:

$$\ln\left(\frac{P_i}{1-P_i}\right) = \sum_{k=0}^{k=n} \beta_k X_{ik}$$

Where P_i is the probability of earning an income given a vector of explanatory variables X_i . The ideal and standard procedure of estimating a logit model is Maximum Likelihood Estimation(MLE) technique. P_i

3.4.3 Tobit model

To take account for the fact that those that earn an income are a select sample of those in the treatment group, the study used the Tobit model. The Tobit model was first presented by James Tobin , and it was used to explain the range of dependent variable in

regression model censored at a lower threshold (left-censored) or upper threshold (right-censored), or both. Censored data are different from truncated data because only non-limited values are available in truncated data while limited data information is provided as well in censored data. As for the income, the data can be considered as left-censored at zero. The model specification is done through likelihood ratio test.

3.5 Gini Coefficient

To achieve the second objective, a Gini-coefficient was used to compare income inequality between the lowest 5th percentile and the highest 95th percentile for the treatment and control groups. The analysis sought to establish if there was a difference in the share of incomes between the treatment and control groups.

In order to calculate the Gini indicator, individual income data will be organised from lowest income to highest income. The data was classified into percentiles, and total income for every fifth percentile calculated. This was used to plot a Lorenz curve. The Gini coefficient will be formulated using Buchan (2002) approach:

$$G = \frac{\sum_{i=1}^n (2i - n - 1)x_i}{n \sum_{i=1}^n x_i}$$

Where:

n = 20 following the grouping of young people into fifth percentile groups and x_i being the cumulative income for the group, with position i in the ranking.

3.6 Limitations

The study only focused on educational attainment and did not explore some of the available data relating to skills training provided by institutions. Other studies have used proxies to establish the cost of education in order to calculate rates of return. This study only focused on the distribution complexity.

3.7 Ethical considerations

Hussey and Hussey (2007) suggested that ethics of research include debriefing, informed consent, confidentiality, protection of privacy, protection against harm and

anonymity. However, Morrow, Boddy and Lamb (2014) argue the key ethical considerations for a secondary data analysis, relates to informed consent, confidentiality and anonymity, data protection, use of secondary data beyond the original purpose of the research.

The researcher put in place the following measures to ensure information was obtained and processed in an ethical manner. Regarding informed consent, the primary researchers obtained consent from the subjects. The researcher agrees with Morrow et al (2004) that consent should not be ‘once and-for all’ but in some cases, renewed consent may be necessary. However, in this case, this was not necessary, as the secondary use of the data was not discordant with the original research objectives (Christie, 2011). The research was originally funded by the ILO and written consent and the data set was obtained from the organization.

The original data set also contained information such as names, age, sex and location of respondents. The anonymising of the data, removing these elements that could make it possible to identify a respondent, strengthened the confidentiality of respondents. According to Parry (1997), anonymising data is the removal of key identifying information in a manner that does not compromise the integrity and quality of the data. After use, the data will be stored in accordance with the University of Witwatersrand’s guidelines.

3.8 Chapter Summary

This chapter has presented the research methods to meet the study objectives and research questions. The chapter has restated the techniques employed by the primary study and provided details of the proposed secondary analysis. The study uses model estimation techniques and a gini-coefficient analysis.

CHAPTER 4

DATA PRESENTATION AND ANALYSIS

4.1 Research approach

The aim of the study was to undertake a secondary analysis to establish if educational attainment (using highest level completed, with four categories – Primary; Ordinary Level; Advanced Level; Tertiary) is related to income across the population, one population regression analysis. Using data from a 2015 study, a next level analysis was done to determine the extent to which the intervention impacted subpopulations to establish if the average effect size on incomes is similar for different groups and the extent to which income dispersion patterns are affected by the introduction of a skills training programme.

This chapter presents and analyses the data. The chapter opens with a brief description of the data set, key characteristics of the population, a restatement of the findings from the primary study are provided. The rest of the chapter is organized in terms of three research questions starting with a description of the relationship between educational attainment and income for young people working in the rural informal economy. This is followed by an assessment of the effect of introducing a short term technical vocational training programme on the relationship between educational attainment and incomes. The chapter closes with a discussion on the effect of targeted short training on income inequality among workers in the informal economy.

4.2 Descriptive Statistics Section

4.2.1 Description of the sample of participants

Reach of the treatment (skills training programme)

The short term skills training was rolled out in 20 of the 61 districts in Zimbabwe. The reach of the skills training programme was not equitable in the different districts as some had more young people trained than others. In table 4.1 below it is notable that from the 20 districts, three districts namely Mt Darwin, Mutoko and Nkayi were over

represented together accounting for 39 per cent of the young people that benefitted from this programme. In contrast eight of the participating districts were under represented with each having 3 per cent or lower of the young people that accessed skills training.

Table 4.1: Distribution of young people that benefitted from skills training by district

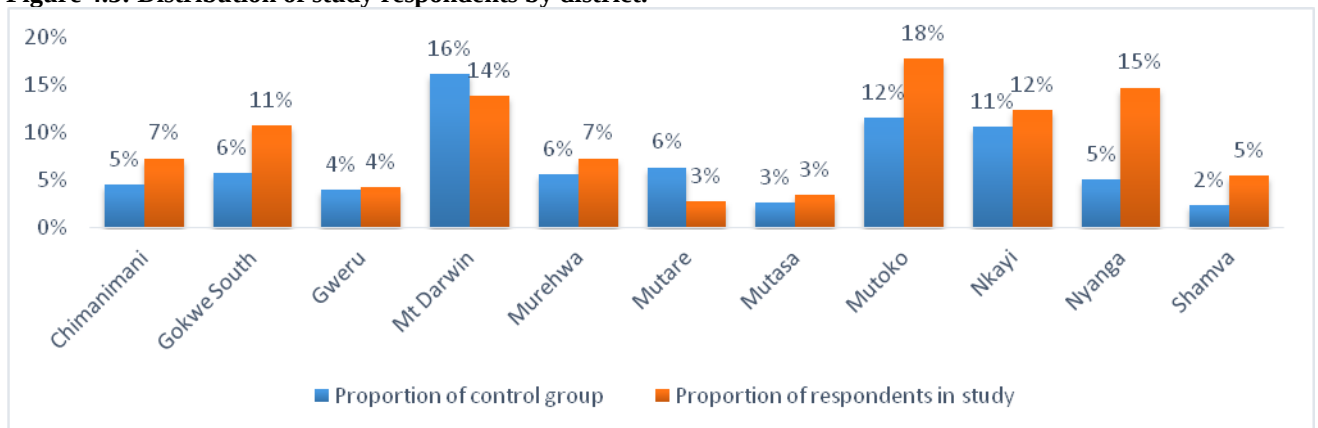
Name of District	Male	Female	Total	Percent
Beitbridge	29	39	68	3%
Bulawayo	10	22	32	1%
Chikomba	36	12	48	2%
Chimanimani	54	46	100	5%
Chipinge	38	54	92	4%
Epworth	10	19	29	1%
Gokwe South	83	44	127	6%
Gwanda	38	38	76	3%
Gweru	36	50	86	4%
Hurungwe	11	24	35	2%
Makoni	55	29	84	4%
Mberengwa	60	40	100	5%
Mt Darwin	188	169	357	16%
Murehwa	78	45	123	6%
Mutare	80	59	139	6%
Mutasa	26	32	58	3%
Mutoko	140	114	254	12%
Nkayi	99	135	234	11%
Nyanga	48	63	111	5%
Shamva	26	25	51	2%
	1145	1059	2204	100%

Source: Author, Calculated from ILO Monthly Reports for 2015

Distribution of respondents across participating districts

Data that was analysed was collected data for two years 2011 (baseline) and 2014 (end line). The data was collected from a sample of four provinces, 11 districts and 161 wards. Figure 4.1 below shows that the distribution of respondents for the study was not even across the 11 participating districts, this a reflection of the different number of young people reached by the skills training. Mutoko, Nkayi and Mt Darwin had 39 per cent of respondents a reflection of these districts having the highest number of young people in the treatment group.

Figure 4.3: Distribution of study respondents by district.

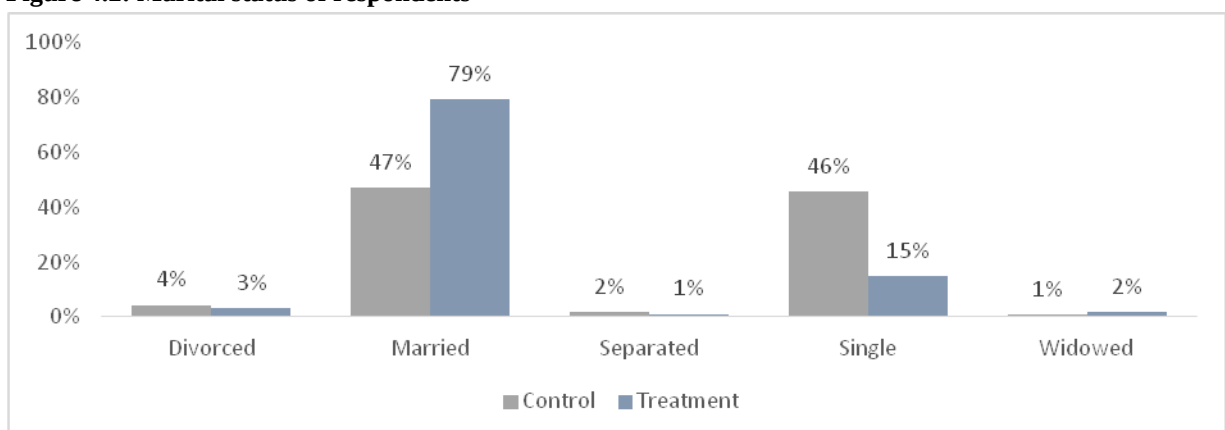


Source: Author, calculated from Lachaud et al, 2018

Marital Status

Figure 4.2 below is significant as it shows that the control group is not an equivalent sample of the treatment group. Close to 80 per cent of the treatment group was married, 15 per cent single and less than 3 per cent of respondents considered themselves to be either divorced, separated or widowed. In contrast, there was an even split between married and single young people in the control group. This means a larger proportion of the treatment group was married compared to the control group.

Figure 4.2: Marital status of respondents



Source: Author, calculated from Lachaud et al, 2018

This is significant considering that a study by ZimStat (2017) shows a relationship between marriage status and incomes, with single headed households being associated with higher levels of poverty. The low levels of married respondents in the control group could negatively affect the comparability of the income data for the two groups.

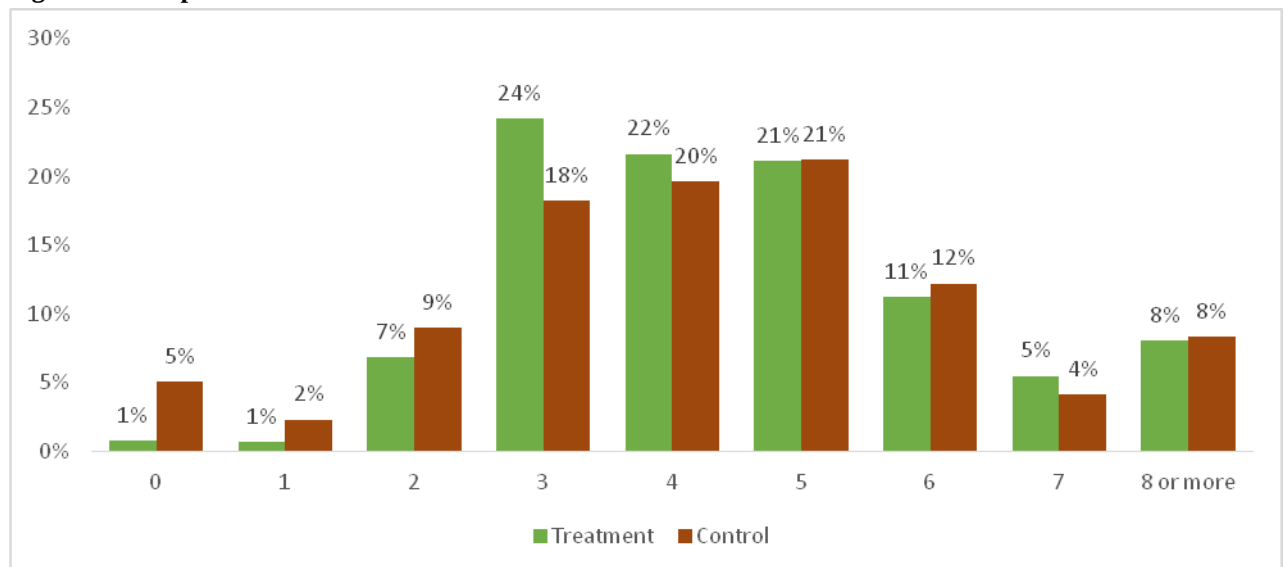
as they are not similar, with the treatment group having a characteristic associated with higher incomes. This means the two groups are skewed and the control is not a genuine counterfactual to the treatment group. More significantly, this suggests some form of beneficiary selection bias for the skills training programme. The bias could be as a result of the selection process for young people to receive skills training. Local government officials responsible for the project implementation might have had a stronger affinity to select a particular type of young people, a preference for married young people.

Age and household sizes

The research instrument did not collect data on age of respondents, however it can be assumed that all respondents ranged from 24 to 35 years of age, as this was a criteria to be eligible for the skills training programmes. Figure 4.3 below shows that the household average size was 5.18 people per households, significantly higher than the average household size in Zimbabwe was 4.2 persons (ZimStat, 2018).

The size of households was relatively smaller in the treatment than in the control group. Five per cent of control group respondents stated they were living alone - household size of zero. Compared to only 1 per cent for the treatment group living alone. This relates well with the data on marital status suggesting the young people have no partners or children. As for the treatment group, the household size for the majority of respondents was 3 to 4 additional members – a partner and children. Sixty per cent of respondents lived in homes with three to five occupants. The differences in household characteristics is likely to have an impact on incomes, with small household size likely being a proxy for higher vulnerability.

Figure 4.3: Respondent household size



Source: Author, calculated from Lachaud et al, 2018

Prevalence of disability

The control group had higher levels of disability with close to 10 per cent of the respondents reporting being ill or disabled compared to only three per cent in the treatment group. See table 4.2 below.

Table 4.2: Prevalence of disability

	Treatment	Control
Able bodied	97%	91%
Disabled	1%	4%
Ill	1%	5%

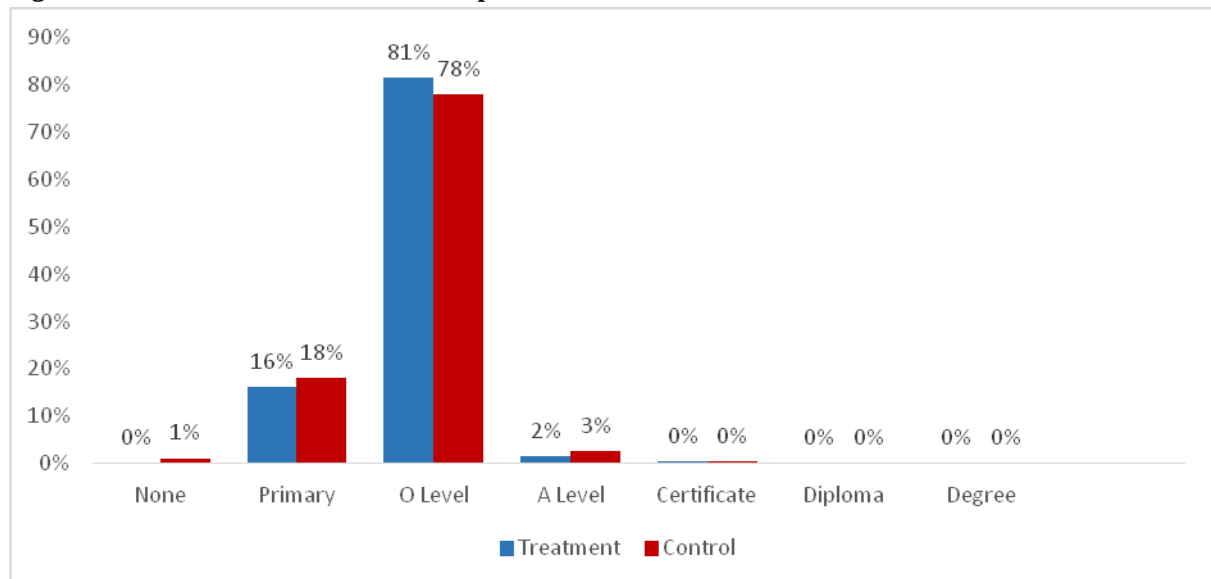
This is likely to have a negative impact on the comparability of the income data, since higher prevalence of disability and illness can be used as a proxy for vulnerability associated with lower incomes. The conclusions of the impact of the programme need to be rethought, as the control group is associated with a disadvantaged group likely to have lower incomes.

Educational attainment of respondents

The treatment and control groups had largely comparable levels of educational attainments. There were also negligible differences between men and women in terms

of highest level of educational attainment. Figure 4.4 below, shows that the majority of respondents reported Ordinary Level as their highest qualification, 80 per cent, followed by Primary Education, 17 per cent. Some outliers did exist with less than one percent reporting having either no education or a post-secondary qualification. The number of respondents with no education, A Level, Certificate, Diploma and Degree is very small making it difficult to do analysis and draw reliable conclusions from such a small population.

Figure 4.4: Educational attainment of respondents



Source: Author, calculated from Lachaud et al, 2018

The discussion on the profile of study participants has shown that there is a significant regional bias with some districts providing a disproportionate proportion of the respondents – albeit this is likely to have negligible effect on the outcomes. There is also a bias on marriage status with the treatment being predominately married, having higher level of dependents. Thus the treatment population tended to have the characteristics often associated with better outcomes. This means the treatment group had higher odds of success-inbuilt bias-compared to the control group. This also reduced the comparability of the two groups. However, the two groups were comparable on gender composition, both being close to gender parity and having relatively comparable educational qualifications.

4.3 Restatement of primary study findings

4.3.1 Economic impact of TREE on its beneficiaries

The income for the control and treatment groups in 2011 was estimated to be USD 219.00. In 2015, both groups had realised increases in incomes, indicating that even in the absence of the programme, the income for both groups would have increased due to other factors. The income for the control group had risen to USD 320, a 46 per cent increase, while that of the control group had gone up significantly to USD 1,172, a 435 per cent increase (Lachaud et al., 2018). The original study attributes the significant growth in incomes to the participation in the treatment (a skills training programme), however, a re-examination of the comparability of the treatment and control suggests that other additional factors could have been at play. The increase could be accounted for by an evident bias in terms of selection of the treatment group which is associated with demographic factors associated with better economic outcomes.

The results also suggest substantial heterogeneity in the income distribution at baseline. For instance, it is worth noting that in 2011 women were, on average, significantly worse off than men in terms of income. In addition, the education level of participants plays a role in determining the level of income. In general, 78.1 per cent of men have a higher level of education (O-Level and above) compared to 73.6 per cent of women (Lachaud et al., 2018).

The original study found that respondents with more education started the programme with an advantage compared to those who had no or a lower level, and these results are statistically significant. Similarly, the treatment led to an increase in the household investment in child welfare and household health by the treatment group. In fact, the estimated coefficient associated with consumption is negative but non-significant, suggesting that TREE beneficiaries probably devote money gained to buy assets or incur other expenses instead of consumption (Lachaud et al., 2018).

The original study, however, did not discuss the correlation between educational attainment and incomes for the sub-populations. There was also no discussion on the impact of targeted low cost training on income inequality. The data collected in the study makes it possible to undertake such secondary analysis. This information is

important to establish the extent to which specific subpopulations benefit from the programme, compared to the picture of success presented by the initial aggregate analysis for the entire sample. When looking at sub-populations special interest would be on establishing if the programme had the same effect on young people with different levels of education and gender.

4.4 Secondary analysis of results at baseline

4.4.1 Relationships between educational attainment and incomes

Table 4.3 below presents data for 2011 for the entire population, it is evident that before the skills training the young people were struggling to earn incomes, with 89 per cent of respondents reporting that they did not earn anything in the previous year. Around 8 per cent earned between USD 1- USD 200 while less than 1 per cent had incomes higher than USD 401. The median income for the entire population was USD 0 while the mean income for the group was USD 16 per year. There were not enough respondents with post-secondary qualification to make a meaningful analysis,

Table 4.3: Earnings by educational attainment for the population at baseline

Income (USD)	None		Primary		O Level		A Level		Certificate		Diploma		Degree	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
0-50	170	89	460	89	1371	90	18	64	5	63	1	100	1	100
51-100	10	1	35	16	55	85	0	0	0	0	0	0	0	0
101-200	7	9	15	10	50	7	0	0	1	13	0	0	0	0
201 - 400	3	2	4	1	42	3	8	29	0	0	0	0	0	0
401 -600	1	1	0	0	2	0	2	7	2	25	0	0	0	0
< 601	0	0	0	0	2	0	0	0	0	0	0	0	0	0
Total	191	100	514	100	1522	100	28	100	8	100	1	100	1	100

Source: Author, calculated from Lachaud et al, 2018

Table 4.3 above also shows the relationship between income and education. Those with no education fared better than all other categories with 12 per cent reporting some income compared to 11 per cent for those with primary education and 10 per cent for those with ordinary levels. The few young people that had incomes were earning USD 1 to USD 200, the levels of educational attainment for young people in this income bracket was mixed with some reporting having no education while others had completed primary and secondary education.

Additional analysis was done to establish the mean incomes and the median income for the different sub-populations. The median income was used as the data had many outliers. Table 4.4 below presents the findings, most notably, the analysis suggests that those with no education in 2011 were earning more than those with Primary and Ordinary level qualifications, with a mean annual income of USD 17 per annum compared to USD 9 per annum. The median incomes of USD 0 across all the groups shows that the majority of respondents have no income and the mean discussed above is as a result of a few outliers.

4.4.2 Multicollinearity test

Multicollinearity occurs when one or more of the predictor variables highly correlates with the other predictor variables in a regression equation. It is a phenomenon in which one predictor variable in a multiple regression model can be linearly predicted from the others with a substantial degree of accuracy. In this situation the coefficient estimates of the multiple regression may change erratically in response to small changes in the model or the data (Cohen, Cohen, West and Aiken, 2003). Having explained the correlation relationship between income and various categories of education on Table 4.3, Table 4.4 explains the correlation between income and all the regressors, which include household expenditure and education.

Table 4.4: Multicollinearity test at baseline (2011)

	Income	Household Expenditure	None	Primary	O Level	A Level	Certificate	Diploma	Female Education	Male Education
Income	1									
Household Expenditure	0.13	1								
None	-0.01	-0.06	1							
Primary	-0.02	-0.04	-0.02	1						
O Level	0	-0.02	-0.06	-0.7	1					
A Level	0.04	-0.01	-0.01	-0.07	-0.19	1				
Certificate	-0.02	-0.01	-0.02	-0.04	-0.1	-0.09	1			
Diploma	0.17	0.01	-0.01	-0.02	-0.04	-0.04	-0.02	1		
Female Education	0.08	0.05	-0.02	0.05	0.04	-0.04	-0.04	0.02	1	
Male Education	0.07	0.05	-0.02	0.05	0.04	-0.04	-0.03	0.02	0.79	1

Source: Author, calculated from Lachaud et al., 2018

Table 4.4 shows multicollinearity test of the variables before the intervention. Multicollinearity means the existence of perfect, linear relationship among some or all explanatory variables in a regression model (Gujarati, 2004). Presence of multicollinearity causes inflation of variances, large R-squared, large confidence interval thereby accepting the null hypothesis and precise estimation will be difficult to find.

Pearson correlation matrix show that correlation coefficients are less than 0.8, the limit or cut off correlation percentage commonly suggested by prior studies after which multicollinearity is likely to exist (Gujarati, 2004). Table 4.5 shows that, there is no problem of multicollinearity except on female education and male education with a pairwise correlation coefficient, which is close to 0.8. This is probably due to the fact that Zimbabwean families have moved from the view that a woman is only good for cooking and bearing children to the perception that all children deserve to be educated, whether male or female.

However, the statistics indicate a possible problem of variable selection given that most of the correlation coefficients are below 0.1 indicating weak correlation between education and income. A possible explanation may be that there are other variables that affect income in Zimbabwe apart from an individual's education level. The study classified education according to gender so as to capture level of education on gender basis, given the background that women were not privileged to venture more into education.

Table 4.5: Multicollinearity test at end line (2015)

	Income	Household Expenditure	None	Primary	O Level	A Level	Certificate	Female Education	Male Education
Income	1								
Household Expenditure	0.01	1							
None	-0.03	0.2	1						
Primary	-0.01	-0.19	-0.09	1					
O Level	0.02	0.04	-0.05	-0.27	1				
A Level	0.07	-0.03	-0.03	-0.15	-0.01	1			
Certificate	0.01	0.03	-0.01	-0.08	-0.01	-0.01	1		
Female Education	0.01	-0.02	-0.08	0.07	-0.04	0.04	0.02	1	
Male Education	0.06	-0.04	-0.06	0.06	-0.04	0.03	0.02	0.04	1

Source: Author, calculated from Lachaud et al, 2018

Table 4.5 shows a multicollinearity test after the intervention, in 2015. After the intervention where most individuals have been equipped with the training, there is no problem of multicollinearity among the independent variables as experienced by a pairwise correlation coefficient of less than 0.8. The correlation between income and male education is positive, a household with much income will likely further the education of their male children.

4.4.3 Regression Analysis at Baseline

To extract the general impact of education on income, the study firstly used ordinary least squares using the 2011 data set. The results are presented in Table 4.6

Table 4.6a. Ordinary Least Squares

Income	Coef.	Std. Err.	T	P>t	[95% Conf. Interval]
Gender	64.38954	20.30467	3.17	0.002***	24.57161 104.2075
Marital status	100.403	18.20866	5.51	0.000***	64.69535 136.1106
Education					
O Level	67.67854	25.83497	2.62	0.009***	17.01556 118.3415
A Level	33.5111	69.16303	0.48	0.628	-102.1192 169.1414
Tertiary	189.8778	115.2259	1.65	0.100	-36.08281 415.8385
_cons	-99.63923	41.66603	-2.39	0.017	-181.3473 -17.93119

*** Entails significant at 1 percent level of significance

Source: Author, calculated from Lachaud et al., 2018

Table 4.6a shows the results of Ordinary Least Squares of the main variables before treatment. It was found that gender is statistically significant at 1 per cent level of confidence with a coefficient of 64.38. This implies that male participants are likely to have more (USD 64.38) income in rural areas than their counterparts before the treatment. This is expected in the rural economy, as men tend to have better access to productive assets such as land, livestock and agriculture inputs. This higher level of access is done without considering the level of productivity of the beneficiary.

Marital status was found to be statistically significant and having a positive impact on the level of income. Marital status was classified as a dummy variable; married people

are likely to have approximately USD 100 more income. This could be due to collaboration of resources and ideas as well as greater access to social capitals.

Finally, education, which is a categorical variable with base variable primary education, was found to be statistically significant. Those who have secondary education were found to be having USD 64 more income than those who acquired only primary education. However, A-level and Tertiary were found to be positively related to income but with an insignificant relationship.

4.5 Results after treatment

4.5.1 Regression Analysis after treatment

After the treatment, marital status continued to be positively related to the level of income. Marital status has a coefficient of 42.6, which is statistically significant at 1 per cent level. This implies that married people are likely to have incomes that are higher by USD 42.6 dollars. This a decline from USD 100 at the baseline stage.

Table 4.6b: Regression results after treatment

Income	Coef.	Std. Err.	t	P>t	[95% Conf. Interval]
Gender	.6119436	14.22514	0.04	0.966	-27.28389 28.50778
Marital status	42.61307	12.75671	3.34	0.001***	17.59686 67.62928
Education					
2	20.58407	18.09959	1.14	0.256	-14.90964 56.07778
3	-33.42874	48.45456	-0.69	0.490	-128.4493 61.59178
4	49.68757	80.7255	0.62	0.538	-108.617 207.9922
_cons	-35.52923	29.19059	-1.22	0.224	-92.77264 21.71419

*** entails significance at 1 per cent level

Source: Author, calculated from Lachaud et al., 2018

However, after the treatment all categories of education were found to be statistically insignificant in influencing the level of income in rural areas of Zimbabwe.

Post estimation techniques

The ordinary Least Squares should exhibit Best Linear Unbiased Estimator (BLUE) property for it to be reliable. In that regard the study tests for autocorrelation, heteroscedasticity, normality and Ramsey RESET for model specification. The results are presented in the Table 4.6c below.

Table 4.6 c: Post estimation techniques

Test	P Value (before treatment)	After treatment
Serial LM test	0.4047	0.5122
Residual Heteroskedasticity test	0.1300	0.2664
Normality test (J-Bera)	0.0000	0.0024
Ramsey RESET	0.1042	0.2110

Table 4.6c presents three post estimation procedures namely correlation test, heteroscedasticity test, normality test and model specification test indicating the p values of the test. The lagrange multiplier (LM) test of serial correlation under the null hypothesis that there is no serial autocorrelation.

The study found that there is no serial correlation with p values 0.4047 and 0.5122 we can accept the null hypothesis. The Breusch-Pagan test (BP) for heteroskedasticity shows that the disturbance term in the model is homoscedastic with p-values of 0.1300 and 0.2664 since it is tested under the null hypothesis that errors are homoscedastic.

Also, the Jarque-Bera normality test implies that the residuals are not normally distributed with joint p-values of 0.0000 and 0.0024. However, at individual variables, there is normality and normality is not much of a problem in statistics as it doesn't affect results. The Ramsey RESET test has p values of 0.104 and 0.2110, we fail to reject the null hypothesis that the model is correctly specified. Thus the model is correctly specified

4.5.2 Tobit model

Given that our dependent variable, which is income, has some zeros it entails that it is a censored model where we can use Tobit Model, Truncated regression and Heckman Selection Model. This study used Tobit Model. The table below presents the results of the Tobit Model before experiment.

Table 4.7a: Tobit results

Income	Coef.	Std. Err.	T	P>t	[95% Conf.	Interval]
Gender	137.379	28.99798	4.74	0.000***	80.51329	194.2446
Marital status	241.8834	26.90171	8.99	0.000***	189.1286	294.6383
Education	100.2391	31.07266	3.23	0.001***	39.3049	161.1732
_cons	-696.0779	79.62076	-8.74	0.000***	-852.2159	-539.9398
/sigma	611.8411	11.74767			588.8037	634.8786

806 left-censored observations at income <= 0

1,441 uncensored observations

0 right-censored observations

Note: *** entails significance at 1 per cent level

Source: Author, calculated from Lachaud et al., 2018

Table 4.7a shows that all the variables consider were statistically significant. Gender was found to be statistically significant at 1 per cent level with men having 137 more latent income than female. Married couple were found to be having 241 more latent income than the single. Finally before treatment, the more educated respondents were found to have 100.23 more income than the uneducated. This corroborates with the findings of Rwezuva et al. (2012) and Psacharopoulos and Patrinos (2004)) that higher educational attainment increases incomes.

After treatment

After the treatment, the following tobit results were found:

Table 4.7b: Tobit results after treatment

Income	Coef.	Std. Err.	T	P>t	[95% Conf.	Interval]
Gender	65.9842	39.66125	1.66	0.096*	-11.79237	143.7608
Marital Status	346.2751	39.09867	8.86	0.000***	269.6017	422.9484
Edu	-38.43144	42.07443	-0.91	0.361	-120.9403	44.07742
_cons	-1095.691	113.796	-9.63	0.000***	-1318.848	-872.5347
/sigma	692.312	20.73984			651.6407	732.9833

* and *** entails 10 percent and 1percent level of significance respectively

Source: Author, calculated from Lachaud et al., 2018

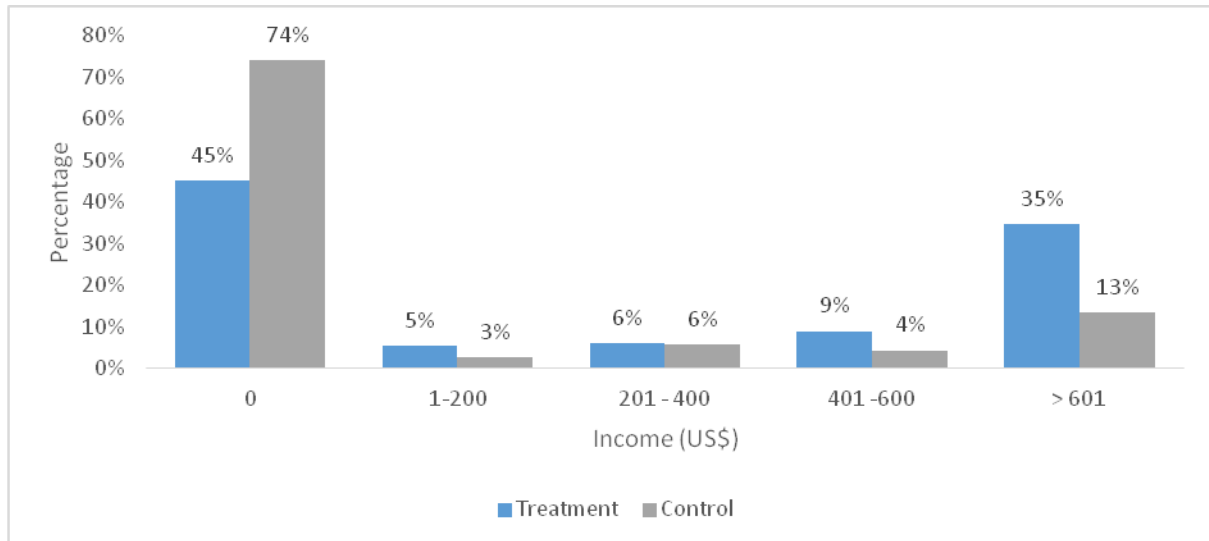
After treatment and using truncation, gender and marital status were found to be statistically significant and had a positive impact on level of income. Gender has a coefficient of 65.98, which implies that male have 65.98 more latent income than women. This is a decline compared to the sample before the treatment, which suggests that the treatment was gender sensitive. However, married people continued to have more latent income than single. Consistent with the results from regression, level of education was found to be insignificant.

Specification test for Tobit

Using the likelihood ratio test under the null hypothesis that all the regression coefficients are equal to zero. We found that the p values are 0.0031 and 0000 for before treatment and after treatment respectively. This implies we reject null hypothesis and the model is correctly specified.

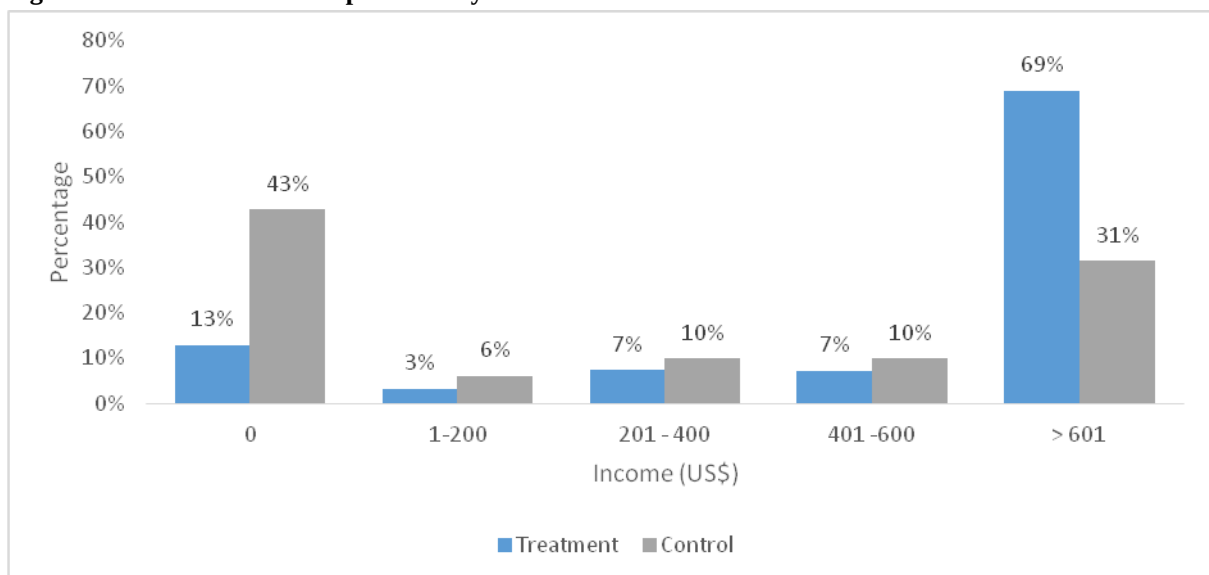
Figure 4.5 below shows that there are inter group differences between the control and treatment groups. At the baseline, the young people in the control group reported much lower incomes with 74 per cent of this cohort having no income compared to 46 per cent for the control group. Huge inequalities are visible with the young people clustered in the no income or the highest level of income – earning more than USD 600. In the control group, 36 per cent of young people were earning more than USD 600 per year compared to 14 per cent of those in the treatment group, this means at baseline the control group was associated with better outcomes. It is also notable that at the baseline level that gender was a weak determinant of income with limited differences on income between the young men and the young women.

Figure 4.6: Distribution of respondents by income in 2011



Source: Author, calculated from Lachaud et al., 2018

Figure 4.7: Distribution of respondents by income in 2015



Source: Author, calculated from Lachaud et al., 2018

However, it is also evident that at the baseline, the income distribution was not normal but the young people were clustered on the two extreme ends either having no income or earning more than USD 600. Notable from the data is the fact that the demographic characteristics of the treatment group suggests that they should have higher incomes as

the group has higher levels of education, marriage and low levels of illness or disability status but it is striking that the young people in the treatment group are clustered in the no income category.

Figure 4.6 above shows that although there had been an increase in incomes in 2015, the income distribution of the control group remained largely unchanged. The largest proportion of those in the control group, 42 per cent, had no incomes – marginally lower than the 2011 level of 45 per cent. In contrast the treatment group saw a 31 percentage point drop from 74 per cent to 13 per cent in the proportion of young people with no income.

It is evident that the skills training and support for business start-up had been effective in providing young people with incomes. Also notable is that the rest of the young people are clustered in the highest bracket of incomes earnings. In the treatment group 69 per cent of respondents had earnings higher than USD600, a 34 percentage point increase from the 2011 level. In contrast only 31 per cent of young people in the control group reported incomes higher than USD 600, this an increase in the proportion of young people in this income segment of 18 percentage points from the 2011 level.

What remains unchanged is the broader picture on the distribution of incomes. The young people are clustered in the no income or the very high income category. This shows that income inequality is a significant issue for young people working in the rural informal economy. It also points to the intervention having benefitted some young people more than others.

The data from the control and treatment group shows that women are over represented in the lower income categories and are underrepresented in the higher income bands, the intervention did not alter this trend. Also notable is that for both in the treatment and control groups the distribution is not normal.

Table 4.8 below shows that, in 2015, the control group had mean incomes ranging from USD338 for those with no education, young people with primary education had a mean annual income of USD746 and USD1086 for young people with A Level. However, the incomes decline for those with Certificate, Diploma and Degrees. However, considering

the small number of young people in these higher categories of educational attainment, it is not meaningful to compare the data.

Table 4.8: Earnings distribution by educational attainment at end line

	None	Primary	O Level	A Level	Certificate	Diploma	Degree
Mean annual income (Control)	\$338	\$746	\$1,086	\$1,455	\$480	\$105	\$216
Mean annual income (Treatment)	\$9,300	\$2,644	\$6,706	\$3,993	\$12,038	\$2,250	\$1,680
Median annual income (Control)	\$ 0	\$60	\$260	\$60	\$690	\$435	\$216
Median annual income (Treatment)	\$9,300	\$960	\$1,560	\$3,600	\$5,310	\$2,250	\$1,680

Source: Author, calculated from Lachaud et al., 2018

In contrast, in 2015, young people in the treatment group with no education had a mean income and a median income of USD 9300. This suggests that the distribution is much more normal with limited outliers. Also notable, young people with 7 additional years of education earned four times less than those with no education. It is important to be mindful that the population of those with no education was significantly small, reducing its comparability. Young people who completed primary education has a mean income of USD 2643 but a median income of USD 960, suggesting that outliers have inflated the mean annual income. Respondents who completed ordinary level earned up to three times more than those with primary education, but the median is significantly lower. Data for the other levels of education should be treated with some scepticism considering the limited number of respondents in these categories.

The data also has many outliers with significant differences between the mean and median income for young people with different levels of educational achievement. No obvious trend emerges from an analysis of the median incomes with young people with primary education earning the same as those with A-Level, while those with primary education earn four times more than those with two more years of education.

In table 4.8 above, no clear patterns emerge on the link between the level of education and the income, with some groups having fewer years of education are earning more than those with more years. In addition, the median incomes suggest a few young people earn significantly more and tend to push up the group mean. What is evident is that the skills training has turned the young people who were clustered in the no income

category and allowed them to realise incomes. The incomes across the different levels of educational attainment have recorded significant growth after the treatment. To some extent the gap in earnings between men and women has widened in the treatment group after the intervention, while the inequality in the entire treatment has been improved.

4.6 Effect of targeted short training income inequality among workers in the rural informal economy

Income inequality is the extent to which income is distributed in an uneven manner among a population (inequality.org, 2017). The Gini coefficient, is a statistical measure of the relationship between an actual income or wealth distribution and an equal distribution. In income or wealth analysis, the Gini coefficient is calculated as the difference between the actual income or wealth distribution in a society and a perfectly equal distribution in which every member of society has identical income or wealth (Everett and Everett, 2015).

The Gini coefficient is based on a scale from 0 to 1 with 0 being perfect equality and 1 representing perfect inequality. In a totally equal income distribution, 10 percent of the people would have 10 percent of the income. If, on the other hand, all of the wealth or income in a society were in the hands of a single person (which pushes the curve as far away from the straight line as possible), the Gini would be 1 (Everett and Everet, 2015).

To achieve the second objective a Gini-coefficient was used to compare income inequality between the lowest 5th percentile and the highest 95th percentile for the treatment and control groups. The Gini coefficient was formulated using the Buchan (2002) approach.

The first step was to order the units of analysis—total individual income—from the lowest to highest output and plot a curve that shows the cumulative output. The first point in the plot corresponds to output of the individual with the lowest income. The data was classified into percentiles, and total income for every fifth percentile calculated, this was used to plot a Lorenz curve. If there was perfect equality in the rural informal economy, the Lorenz curve would be a straight line.

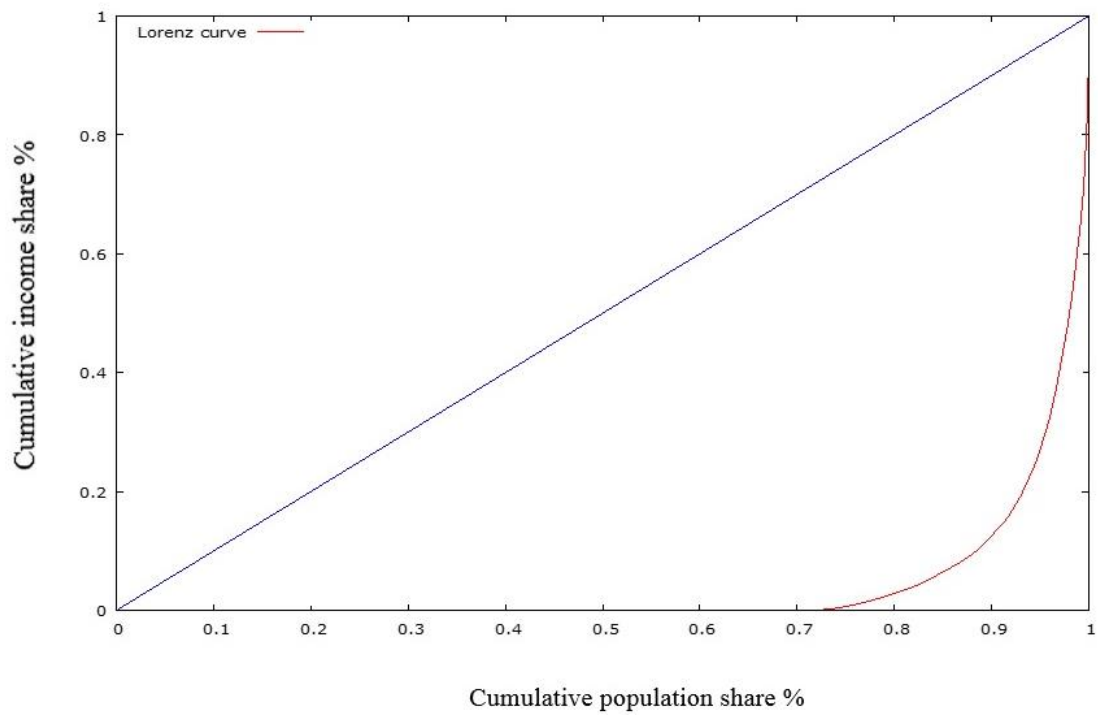
The Gini coefficient is a measure of inequality of a distribution. It is defined as a ratio with values between 0 and 1: the numerator is the area between the Lorenz curve of the distribution and the uniform distribution line; the denominator is the area under the uniform distribution line.

Data from 2010, Figure 4.7 below, created a belly shaped Lorenz curve which implies high levels of income inequality, across the entire population, before the introduction of the treatment – a short terms skills training programme. In tandem with the results on the Lorenz curve, GRETl produced a Gini coefficient of 0.94. This represents very high levels of income inequality with 10 per cent of the population receiving more than 80 per cent of the earnings - a huge skew towards the top of the distribution. Data from 2015, Figure 4.8 below, was also analysed. This analysis focused on the treatment group. The objective was to establish if the treatment had affected income inequality.

In Figure 4.8, the right side of the Lorenz curve has increased, meaning more people now have a share of the incomes. Compared to 2011, where all the income was shared among 26 per cent of young people, the incomes are now shared among 37 per cent of the young people. At the end of the intervention the treatment group reported a marginally improved Gini coefficient of 0.85.

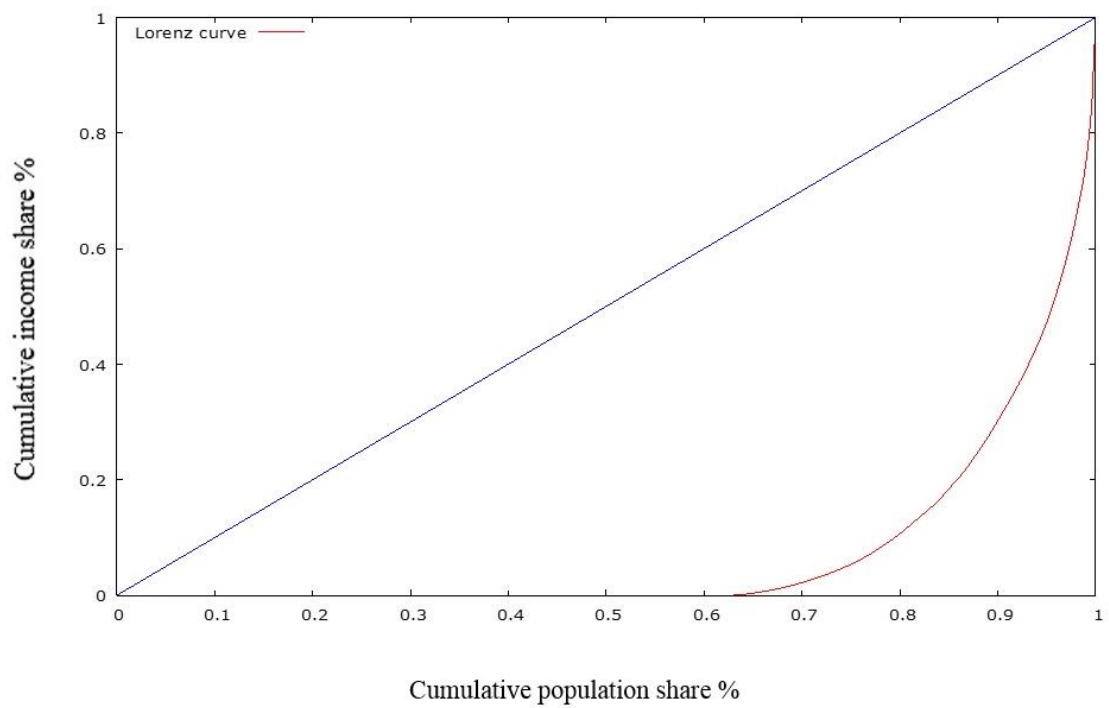
The inexpensive (short term skills development) interventions did not change the income gap between the highest (95th percentile) and lowest (5th percentile). It appears the treatment has led to marginal decline in levels of income inequality for the treatment group.

Figure 4.7: Distribution of income at baseline (2011)



Source: Author, calculated from Lachaud et al, 2018

Figure 4.8: Distribution of income at end line for treatment group baseline (2015)



Source: Author, calculated from Lachaud et al, 2018

In tandem to the second objective of the study, a decrease of Gini coefficient after training shows that the training had an impact in reducing the dispersion in income between the highest (95th percentile) and lowest (5th percentile) despite the fact that it is a small margin.

Table 4.9: Gini decomposition by income source

Total Income Variable: inc

Source	Sk	Gk	Rk	Share	% Change
Male	0.0139	0.5051	0.0219	0.0002	-0.0134
Female	0.0136	0.4949	-0.0219	-0.0002	-0.0141
Total Income		0.9064			

Source: Author, calculated from Lachaud et al., 2018

The process was repeated for purposes of decomposing income inequality by gender, see table 4.9 above. There are relatively lower levels of income inequality within the same gender. Gini coefficient among men was 0.5, while the Gini coefficient among women was marginally lower, 0.49. This means that the incomes of men tend to be clustered in the same range, while those of women are also clustered in the same range. The significant difference between the gender decomposed Gini coefficient and that of the entire population suggests that there are significant differences in earnings between men and women.

The percentage on the last column refers to the impact that a 1 per cent change in the respective income source will have on inequality. Thus for both males and females, a 1 per cent change in gender that is a 1 per cent change in number of males or females will result in a -0.01 percentage change in income inequality. The source Gini coefficient (Gk) of 0.5 each indicates an equal distribution of income.

4.7 Conclusion

The chapter gave the estimation, presentation the results from the secondary analysis. A description of the population under study was undertaken. The descriptive analysis also focused on the comparability of the control and treatment groups. The analysis also presented the extent to which the intervention impacted subpopulations and discussed

the effect size on incomes for the control and treatment groups as well as the extent to which income dispersion patterns are affected by the introduction of a skills training programme.

In order to estimate the returns from education given that the income is a continuous variable, the study used ordinary least squares technique and found that vocational training has no impact on the level of income. However, the study considered that few people in the target population earn income and to estimate the impact of vocational training on whether or not people earn income the study adopted a Tobit model. This took account of the fact that those that earn income are a sample of the treatment group. The study found that through Tobit, education does not have a relationship with the levels of earning of young people working in the rural informal economy after they received the short vocational training.

Furthermore, the analysis reconfirmed that the treatment led to significantly higher incomes compared to the population. However, the increase in incomes was disproportionate, affecting those at the top end of distribution much more significantly. As a result, the intervention had a positive but negligible effect on reducing income inequality among the young people. The next Chapter will present summary and conclusion of the findings from the study, policy implications and recommendations.

CHAPTER 5

CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter presents a summary of the study, beginning with a summary of what the literature says on the relationship between educational attainment and incomes – theories from empirical literature. This will be followed by a summary of the findings on the two research objectives. This discussion will focus on the contribution of the findings to the literature. The chapter will conclude with a discussion of the findings and recommendations.

5.2 Restatement of the problem and the objectives

There is a growing emphasis on expanding access to technical vocational education and training. However, there is limited evidence on the rates of return to technical and vocational education particularly in developing economies. There has been a limited discussion on the relationship between incomes and educational achievement in the informal economy.

The study was motivated by two objectives, firstly to establish if educational attainment is related to income across the population. The second and main aim of the study was to conduct a next level analysis to check the extent to which the intervention impacted subpopulations within the study population based on the initial relationship between the educational attainment and income. The analysis explores the extent to which relatively inexpensive (short term skills development) interventions affect the income gap between the highest and lowest percentiles - establishing how the dispersion patterns are affected by the introduction of a skills training programme.

5.3 Insights from literature review

Authors such as Clark (2011); Eyben (2004); Rolleston and Oketch (2008); Schultz (1960) and Mincer (1958) agree that human skills and abilities enhanced through

education may be considered analogous to physical capital in their productive capacities and investment potential. The theory states that it is possible to estimate the extent of compensatory income differences due to differences in the cost of training.

Other authors such as Becker (1964); Wolf (2002); Ashton and Green (1996) and Psacharopoulos (2004) have argued that upgrading of skills results in benefits commonly measured by changes in incomes. Cost-benefit analyses of education by Strumilin (1929); Becker (1960); Schultz's (1961); Psacharopoulos (1981) and Montenegro and Patrinos (2014) have shown that private returns to schooling are generally positive and the cross-economy average rate of return to schooling is 10 per cent a year. Returns to schooling seem to be higher in low or middle-income economies than in high-income economies with tertiary education displaying the highest average private rates of return. In addition, estimated returns to schooling are higher for women than for men. Chung (1995); Bennell and Segerstrom (1998); Kahyarara and Teal, (2008) confirmed that vocational education in developing countries tended to deliver high rates of returns.

Bennell and Malaba (1993); Appleton, Hoddinott, and Mackinnon (1996); Bennell et al. (1999); Bigsten et al. (1998) and Psacharopoulos (1994) found that Zimbabwe had declining rates of returns to education over the years as a result of the structural change of the economy that led to informalization.

The Human Capital Theory states that higher levels of educational attainment will lead to higher incomes. It has however been noted that as economies develop, the returns for every additional year of school diminish. The existing body of knowledge is largely from the developed world, the data is aged and data quality in some cases, being questionable. In developing countries, the majority of jobs are now in the informal economy but the education system remains largely designed for the formal sector. Although older literature exists, the work on earnings determination and rates of return to education has been confined to the public sector, formal employment workers largely in the public sector, due to the paucity of data (Verner, 1999). There is inadequate literature to determine whether educational attainment has the same effect on incomes in the informal economy. There is limited knowledge of how these skills development

interventions affect incomes. It also remains unclear if such training affects the already existing income distribution patterns.

5.4 Summary of findings

The findings begins with a discussion on the findings of the primary study, the research reconfirmed the outcomes. The next element is a presentation of the analysis on the relationship between incomes in the rural economy and level of educational attainment. The findings then explore if the short term vocational training altered the relationship between educational attainment and incomes.

Reconfirmed original findings, skills training led to significant increase in incomes

The secondary analysis confirms that the income for the control and treatment groups rose over time growing by 46 per cent and 435 per cent respectively. The original study attributes the significant growth in incomes to the participation in the treatment (skills training programme), however, a re-examination of the comparability of the treatment and control suggests that other additional factors could have been at play. The increase could be accounted by an evident bias in terms of selection of the treatment group, which is associated with demographic factors associated with better economic outcomes.

However, subpopulations were impacted differently by the intervention

When analyzing the population it appears as if the intervention was a resounding success but when the cohort is broken down into different subgroup different patterns emerge. The increase in incomes was disproportionate, the average increase masks the impact of the outliers. A few young people recorded astronomical increases in incomes lifting the population average. The skills training, impacted those at the top end of distribution much more significantly. When disaggregated by educational attainment the mean annual income ranged from \$1680 for those with a degree to \$12,038 for those with a certificate. The difference between the mean and median income was also significant. For young people with O Level the mean was four times larger than the median. This implies the treatment is positive on all young people, but for a maximum return on investment, it is key to understand the characteristics of the young people that excelled more.

Strong relationship between educational and income in the rural informal economy

Education, a categorical variable with base variable primary education was found to be statistically significant. Those who have secondary education were found to be having \$64 more income than those who acquired only primary education. However, completing Advanced Level and Tertiary education were found to be positively related to income but with an insignificant relationship. The results coincides with the findings from the truncated Tobit Model.

This implies the conventional strong positive relationship between primary education and incomes is valid in Zimbabwe's rural informal economy. While holding a high qualification provides an insignificant advantage concerning earnings in the rural economy. This is in line with the work by Psacharopoulos and Patrinos (2004) found that primary education tends to provide the highest returns. However, the findings contradict more recent work by authors such as Montenegro and Patrinos (2014) who found that returns tend to increase as one progresses through the educational system. Thus, those who complete tertiary education enjoyed the highest rates of return. The study's discord with more recent literature could be due to a number of factors, firstly the study focused on those in the informal economy where productivity and incomes are much lower. Secondly, the economic activities are in the rural economy where incomes are more likely to be influenced by other factors such as ownership of land and livestock.

After the skills, training education became a poor predictor of incomes

The study looked at the treatment group in 2015 to establish if the correlation between educational attainment and incomes could have been altered because of the introduction of a low cost, targeted, short skills training programme. Different to the findings from 2011, the level of educational attainment as a variable remained a poor predictor of income level. Informal economy workers who had reached, "Advanced level", had the highest odds to earn an income. However, even this shift is not large enough to state that education affects incomes. This means women saw lower increases in incomes compared to men for additional levels of education reached.

These findings suggest that the human capital theory may not be highly applicable in a highly informal rural economy similar to Zimbabwe. Confirming Bennell (1996) position that “the conventional rate of return on education patterns almost certainly do not prevail in sub-Saharan Africa under current labour market conditions.” It also reinforces findings by Bennell and Segerstrom (1998) that the returns to education depend substantially on the general level of economic development, the availability of private sector jobs, and whether or not people are employed in a field related to their training. If there is shortage of quality employment opportunities then the rates of return will not be valid.

Another interesting aspect to note is that, there has been a discussion on the utility of using earnings as a proxy for productivity, Psacharopoulos (1981) and Tilak (1989). The bulk of the workers in the rural informal economy are self-employed and as a result there a stronger relationship between income and productivity.

Intervention had a positive but negligible impact on reducing income inequality

The study used the Gini coefficient to examine how the introduction of targeted short training affected income inequality among workers in the informal economy. In 2011, the Gini coefficient was 0.94, this translates to 10 per cent of the population earning 80 per cent of the total earning. In 2015, the Gini coefficient had declined to 0.8. A decrease of Gini coefficient after training shows that the training had an impact in reducing the dispersion in income between the highest (95th percentile) and lowest (5th percentile). This is similar to the findings by Attanasio et al. (2017). However, the declines in the levels of inequality appear to be small.

It appears the introduction of skills training for informal economy workers led to significant income increases across the board. Young men reported higher growth in their income compared to women. Kluven et al. (2016) found that in low-income countries, with large cohorts of disadvantaged youth, marginal investments in skills and employment opportunities lead to larger changes in outcomes. Thus, the researcher assumed the skills training would have a significant income redistribution effect - it would be an equaliser. The theory was since most of the workers are engaged in work of

a similar level of complexity getting access to standardised skills training would allow them to compete on an equal footing. In this regard, the study contradicts findings by Kluven et al. (2016).

The control was not a genuine counterfactual

The secondary analysis established that the treatment group had higher rates of marriage, associated with larger households, reported higher educational attainment levels and had lower levels of illness or disability, all these are attributes that are associated with better economic outcomes. This means any conclusions about the impact of the programme using the control group have to be tempered with the realization that there was some selection bias leading to skewed samples. The control is not an equivalent sample and thus not a genuine counterfactual to the treatment.

5.5 Recommendations

On rates of return to education – the findings question the utility of formal education for an economy that is highly formalised. It is evident that the individual or society at large will not be able to benefit from the appropriate right level of incomes due to the labour market distortions. It is evident that the targeted skills intervention delivered had better odds of improving labour market outcomes compared to the longer and costly formal education. It could be beneficial for government to reflect on the design of the education system, which remains largely unchanged over the last 40 years while the economy has undergone fundamental changes and is now 96 per cent informal.

On education and training policy and allocation of public funds – policy maker could consider adjusting their mix of education and training programmes. Currently 90 per cent of government resources are spent supporting the formal education system, which is only serving 4 per cent of the economy. The study makes a case for the Government to explore increasing public resources allocated to more targeted, market oriented short term skills development programmes focusing on the rural informal economy where 76 per cent of Zimbabwean workers can be found. In addition, there is value on recognising that although the net effect will be an increase in incomes across the board, impact can be strengthened by focusing the intervention on the specific type of young

person that appears to register phenomenal growth in incomes through a data driven approach.

On income inequality – the study establishes that dealing with income inequality is fairly complex, improving skills may increase earnings but have limited impact on creating a more equal society. It could be key to explore additional strategies to deal with income inequality in the rural informal economy.

5.6 Areas of further study

Data on rates of return to education is very outdated, it could be beneficial to use the same data set to calculate rates of return to education in Zimbabwe. Using other existing data to establish the cost of attending a year of school, it could become feasible to do this analysis.

Considering that the study found no correlation between educational attainment and incomes in the rural informal economy, it could be useful to do additional analysis to relationship between income and other variables that could be predictors of income. These could be age; sex; location; number of children, marital status or other forms of social capital. It could be interesting what factors has the strongest positive relationship with income.

5.7 Conclusions

The study found that there is no linear relationship between educational attainment and incomes in Zimbabwe's rural informal economy. These findings suggest that the human capital theory may not be highly applicable in a highly informal rural economy similar to Zimbabwe. The study also established that skills development interventions have some effect on income inequality.

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