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by

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**Schooling and Institution Quality Linked to Earnings in the Eastern Cape.**

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## **Abstract**

Return to investment for tertiary education is not equal for all. Human Capital Theory imposes a linear pathway between education and earnings, that fails to recognise other sources of capital, ignores social returns and does not explain why socio-economic variables influence employability and earnings. Those returns, rather than simply incrementally delivering returns for additional years of education, are however heterogeneous across students, with field of study, gender and population group influencing earnings; and schooling type and university attended filtering whether one finds a job. This study utilises data from Rhodes University and the University of Fort Hare, illustrating the extreme positions within the South African education landscape, employing a Heckman selection to predict the returns on education. The regression is found to be partially successful in predicting a graduate's ability to find a job, in the first instance, and thereafter their returns. It is crucial to analyse the heterogeneity of socio-economic parameters to understand aspects of the economy, and develop education policies to take advantage of this understanding, especially against the backdrop of the student protests being experienced in the country and the funding models proposed. Access to tertiary education, through policy inducement, such as the recent increase of the grant limit from R122 000 to R350 000, requires disaggregated returns to education to be investigated.

## **CHAPTER 1 INTRODUCTION**

### **1.1. INTRODUCTION**

The quintiles of school and institution attended might be a good predictor of establishing the likelihood of finding employment in South Africa, and thereafter different fields of study as well as gender and population group result in different earnings; once employment has been found. The aim of this study is to model this concept as an equation and analyse the outcomes as previous studies have found that a student's background, ability, gender and population group are linked to their tertiary outcomes (Rogan and Reynolds, 2016; Walker and Zhu, 2011; Chevalier, 2011; Webber, 2014). Mechanisms whether these be signalling (Arum and Rokstra, 2014), employer's perceptions (Pauw et. al. 2006) or networking (Kraak, 2012) are not fully understood and are outside the scope of this study.

### **1.2. GOAL AND OBJECTIVES**

The goal of this research is to establish the impact of tertiary university education on employability and earnings potential, and postulates that this is generally a good investment, although returns differ for graduates. This is relevant to the current debate around 'free education' and whether increasing the pool of those who pay tax will eventually justify this. Making the earnings premiums by field of study more transparent could provide students with more information when selecting their fields of study. If people are selecting different fields due to guaranteed employment, then government, by subsidizing education, could increase education attainment levels (Dickson and Harmon, 2011).

The first objective relates to investigating those factors that influence earnings. The link between earnings and schooling, institution, field of study, race and population group was analysed through individual regressions of these variables, to provide context. For calculating student's earnings premiums to tertiary education in South Africa, a Heckman Selection Model, acknowledging the increased role of non-cognitive skills, was applied to estimate the likelihood of finding employment, based on type of school and quality of institution and thereafter the earnings premium. Higher education was hypothesised to be a positive investment and Bhorat, Cassim and Tseng (2016); Cloete (2015) and Van Den Berg (2015) all found that tertiary education brings returns for individuals. A diagram of the proposed earnings model and hypotheses is depicted below.

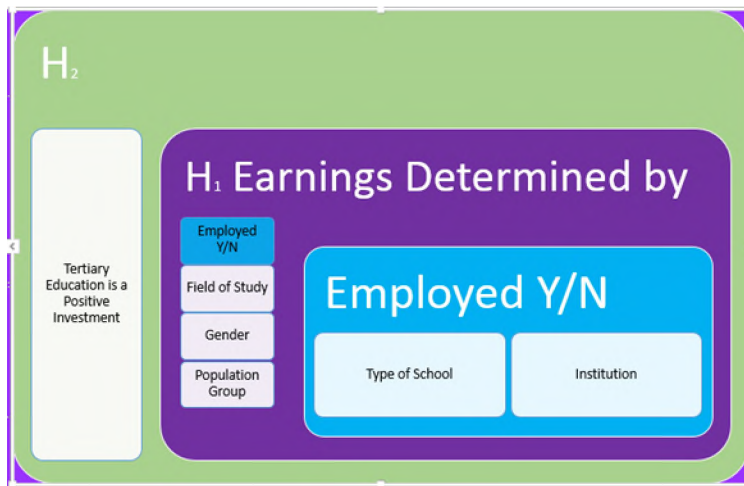


Figure 1 Diagram of proposed Earnings Model and Hypotheses (Cuthbert, 2018).

A dataset from a study pertaining to the significance of schooling background, race and gender of Rhodes University (RU) and University of Fort Hare (UFH) Bachelor degree students was utilised (Rogan and Reynolds, 2016). This study focuses on the initial degree attainment as well as the subsequent transition into the labour market, 3-4 years after graduation. The 2016 Rogan and Reynold's study obtained data relating to the graduate's earnings, but did not analyse these earnings. The results found that type of schooling, population group and gender are linked to both career selection and unemployment.

The second objective relates to the explicit (tuition and loan) and implicit (opportunity) costs, based on a theoretical exercise, for the two institutions, being calculated to establish, the payback period and whether a Bachelor's degree is a sound investment. This was compared to the return of a similar investment at the time.

### 1.3. HUMAN CAPITAL THEORY VS HETEROGENEITY

There are currently two schools of thought around Human Capital Theory. The essence of Human Capital theory is founded on education investment (Walker and Zhu, 2013). Wage income, a linear equation, is explained as a function of the sum of schooling years and a quadratic function of years of experience in the Mincer Earnings function (Mincer, 1974). Further education is deemed desirable if the present discounted earnings exceeds the present discounted value of the direct costs (tuition and loan), plus the foregone earnings during the education period, which is known as opportunity costs (Paulsen and Toutkoushian, 2008).

Mincer, the founder of the Mincer Equation, (1974) felt that schooling causally affects earnings stating that a worker's productivity and skills are driven by education, which form the foundation. As stated previously, Human Capital Theory considers education as homogenous



across members of a population, however Heckman (2001) found that heterogeneity is embedded and difficult to extricate. Earnings will therefore differ across people within the population and there may be 'ability bias' (Hauser and Daymont, 1977) a concept first recognised in 1977, implying that a person attending tertiary education possesses unobserved endowments such as ability or outlook that would win through regardless (Heckman and Vytlačil, 1999). In terms of earnings it is imperative that one must first find a job, thus, filtering the population, and thereafter earnings are observed to be different within the various groups (Keane and Wolpin, 1997; Henderson, Polachek and Wang, 2011) and across multiple outcomes (Heckman, Humphries and Veramendi, 2017).

Human Capital Theory must be interpreted in terms of the meta-method in science, and therefore is unrealistic (Marginson, 2017). Further the mathematisation of Human Capital Theory assumes that all other capital sources other than human capital lose their determination of importance. Regardless of whether parameters such as education years, or the quality of the institution or work experience are used, the sharp discontinuity of the top income levels is difficult to explain (Piketty, 2014). Differences in a country's knowledge capital, commonly measured through International Maths and Science tests, are observed to be linked to economic growth, but simply increasing schooling appears to have little systematic impact on economic growth (Hanushek, 2016).

Heckman, Humphries and Veramendi (2017) feel that more than just 'ability bias', which is considered to be the correlation between what a person would earn independent of schooling and years of schooling (Griliches, 1977), one also needs to consider sorting gains which refers to a relationship between years of schooling, and the return to a unit of schooling, and is allowed to vary for different graduates.

#### **1.4. SOUTH AFRICAN HIGHER EDUCATION SCENE**

South Africa is one of the most consistently unequal societies in the world; its Gini coefficient ranges from 0.66 to 0.69 (Statistics South Africa, 2014) and its unemployment rate has been ranked as the worst in the world in a new global competitiveness report (IMD, 2016). The higher education sector is currently in turmoil, as characterised by student protests related to student fees erupting in 'historically white' universities (Research and Policy, 2016). This has been accompanied by increasing bad debt reflected in NSFAS currently being owed R13 billion (Financial Mail, 2016). The World Economic Forum produces a Human Capital Report every year utilising a Human Capital Index to quantify how countries develop, deploy and track their human capital. The index covers a 124 countries as well as 98% of the world's GDP (gross Domestic Product) (World Economic Forum, 2015). In response to the question as to how well a country's education system meets the needs of a competitive economy, South

Africa ranked 122 out of a possible 124 (World Economic Forum, 2015). Its unemployment ranking for the 15-24 year old group as reflected in the table below was also a 122 out of a possible 124 (World Economic Forum, 2015).

15-24 Age Group	Score	Rank
<b>Quality of Education system</b>	20.31	122
<b>Unemployment rate</b>	47.40	122
<b>Not in Employment, education or training rate</b>	68.60	68

Table 1 South Africa's Country Profile and Key Indicators (World Economic Forum, 2015).

In terms of those not in employment, education or training (referred to as NEET's), the age group between 15 and 24 was found to have an unemployment figure of 68.6% (World Economic Forum, 2015). This has been ascribed to low schooling quality as well as tertiary institutions that do not meet the needs of learners.

It is imperative that South Africa's policy makers understand the return on investment for funding the tertiary education sector in terms of whether students are likely to find employment. This would then justify 'free education' on an income contingent loan system or incremental tax for graduates. Webber (2016) states that those that benefit from tertiary education appear to be healthier individuals, who commit less crime, and have better workplace environments and therefore should be funded (Webber, 2016). Higher earnings are returned to the government through taxes and participation in the economy (Taskinsoy, 2012), which include social returns (Oreopoulos and Salvanes, 2011).

Previous studies correlate higher education with economic growth (Valero and Van Reenen, 2016). Education is also valued for producing technical skills hereby improving productivity (Bhorat, Cassim and Tseng, 2016). Cloete (2015); Collins (2013); Schofer and Meyer (2005) as well as Piketty (2014) all established a relationship between inequality in populations and returns to education, concluding that the higher the inequality the higher the returns to education for wealthier individuals. Van Den Berg et. al. (2011) established that 80% of inequality is driven by wages linked to education. It is important to note in this context that South Africa has a skilled worker shortage (Bhorat, Cassim and Tseng, 2016) and qualifications are used as recruitment screening devices (Brown, 2013).

South African challenges are heightened, due to its small proportion of college students as opposed to University students and the number of unemployed and uneducated persons as illustrated by the fact that our pyramid is inverted when compared to that of the United States of America, and this trend is being exacerbated over time.

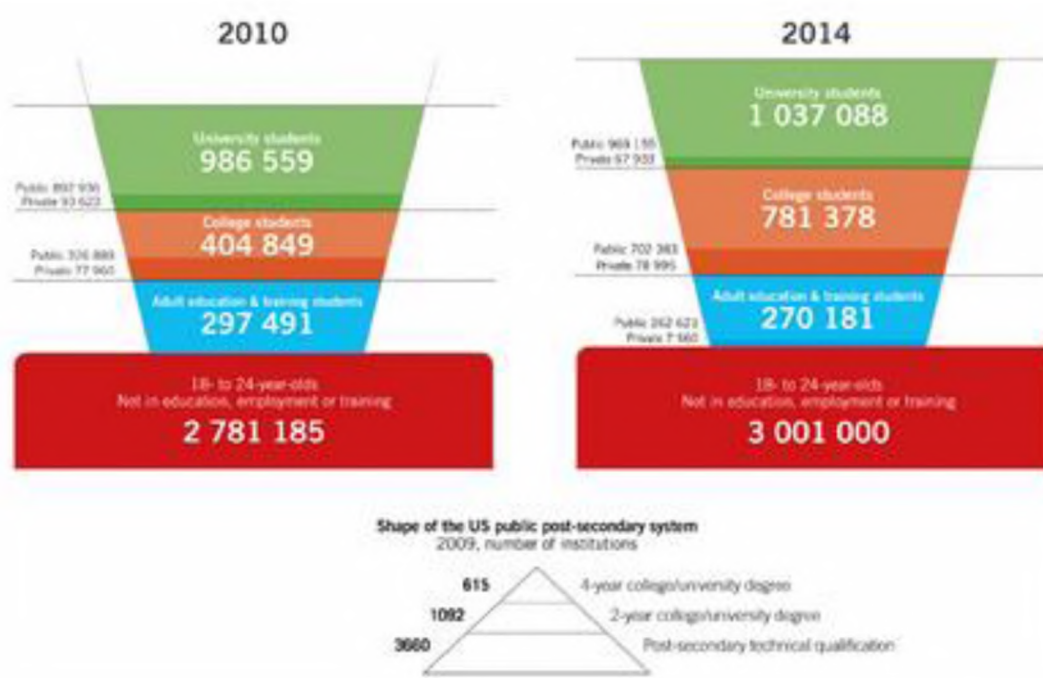


Figure 2. The shape of the PSET system in South Africa and 2014 compared to the USA pyramid indicating the NEET challenge (World Economic Forum, 2015). (Commission of Inquiry into Higher Education and Training, 2017).

The Heher report was instigated by the Commission of Inquiry into Higher Education and Training and was released to government during November 2017 (Republic of South Africa, 2017). The Heher report recommended that government increase tertiary education expenditure by 1% of Gross Domestic Profit and that the National Student Financial Aid Scheme be replaced by an Income Contingent Loan System (ICL) (Republic of South Africa, 2017).

### 1.5. PROPOSED HIGHER EDUCATION FUNDING MODELS

An understanding of the returns to education will be able to better inform the debate around the repayment of loans or incremental tax levied against those that benefit from education. The Heher report outlined three funding models.

### **1.5.1 Fee Free**

The first is the 'Fee Free' model where education is free and there is no cost recovery from those who benefit. Opponents have pointed out that this is unaffordable to South Africa, and would need to cover the 'full cost' of education. This model is currently being implemented, as a result of an announcement made by President Zuma in December 2017, solely for students entering first their year of tertiary education whose family earn less than R350 00 (Muller, 2018).

- i) Students whose parents earn between R122 000 and R350 000 receive a grant.
- ii) Returning students previously denied funding as they fell below the R350 000 threshold but above the previous R122 000 NSFAS (National Student Financial Aid Scheme) ceiling, have registered their protest, and are demanding the same benefits. A calculation in the Medium-Term Budget Policy Statement for 2015, by the Department of Higher Education and Training, suggested that the threshold be lifted to R217 000 for all students not only first years (Parliamentary Monitoring Group, 2015).
- iii) Those that come from households who earn more, can apply for loans, and are therefore often burdened with high debt repayments once they graduate (Republic of South Africa, 2017).
- iv) Finally where the students are able to do so, they pay.

The disadvantage of this model is that only 5% of South Africans aged between 15 and 34 are students while the remaining 34% are unemployed, so this model will benefit a small proportion of the population (Muller, 2018). Tax increases to fund this would have negative consequences, and measures like increasing Value Added Tax could actually increase inequality (Muller, 2018). As very few poor youth would be able to access this education, they are unlikely to increase the economic contribution, especially since a high percentage of these students don't complete within three years (Scott, 2016). If the funding model is continued to second and third years over the next two years this would cost at least R40 billion or more, which is currently unaffordable to the country, and provides private benefits for few without refunding the community (Muller, 2018).

### **1.5.2 Graduate Tax**

The second model is that of Graduate Tax, where graduates pay for the next generation of students through a special graduate tax (Republic of South Africa, 2017). Critics say this is difficult to implement as not all income is easily linked to a graduate for example trusts (Republic of South Africa, 2017) and would require a link between Tertiary institutions and the South African Revenue Services to be administered.

### **1.5.3 Income Contingent Loan Model**

The third option, the model recommended by the commission is that of an Income Contingent Loan model, where the bank provides a loan to the student, facilitated by registering all students with SARS (South African Revenue Service). The Income-contingent loans with universal eligibility are considered to promote equality, access, fairness and efficiency (Hull, 2016). In the event where the student does not commence repayment after five years of studying the state will repay the bank. The disadvantage of this model is that it burdens students with high amounts of debt although this must be considered together with the rates of return (Webber, 2016; Hillman, 2014; Republic of South Africa, 2017).

A system of differential fees has also been mentioned and is currently implemented to some extent in some South African universities as well as elsewhere in the world (Republic of South Africa, 2017). There is an international trend towards funding based on performance formulae and cost sharing, however it is important to be mindful that these performance based models can affect access for the lower socio-economic groups (Jongbloed and Vossensteyn, 2016).

## **1.6. LINK BETWEEN SCHOOLING AND RETURNS**

The relationship between poor schooling and lower earnings produces high inequality in South Africa (Case and Deaton, 1999; Lam, 1999; Van Den Berg, 2015 and Allais, 2017). Early intervention childhood programmes are often missing. Dynamic Complementary refers to the marginal production of investment being dependent on the level of skills in previous investments (Cunha and Heckman, 2007). Early childhood interventions, as early as the age of three, are deemed critical for later development (Cunha and Heckman, 2007). Thereafter schooling is compromising the tertiary education returns of lower quintile schools as the pupils are denied access to tertiary schooling in the first instance, and when they do access tertiary education are less prepared (Allais, 2017). If socio-economic status is significant and linked to labour success in South Africa, as found by Koen (2006) and Rogan and Reynolds (2016) correlating with attainment (Van Den Berg et. al., 2011), then the link between socio-economic status and tertiary earnings, needs to be investigated.

The figure below depicts the various quintiles and how many of those are cognitively on track as measured through annual national assessments or where they should be in each grade. As can be seen for most quintiles, students are no longer on track cognitively as measured through annual national assessments, from as early as Grade 4.

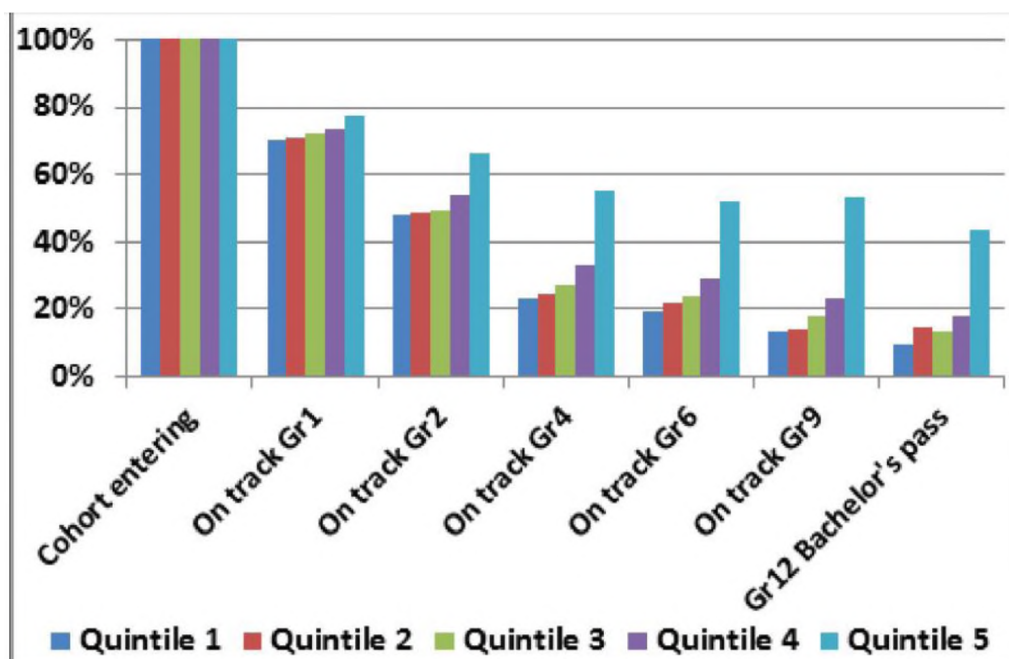


Figure 3 Proportion of entering cohort on track in various grades in ANA 2012, and Bachelor's passes in Grade 12, By School Quintile (Van Den Berg, 2015).

## 1.7. CONCLUSION

Establishing the link between school type and institution in securing employment, could be utilised by the government to invest in schooling, especially foundation phase, as well as institution quality; thus ultimately ensuring better returns. It is crucial to analyse the heterogeneity of socio-economic aspects to understand aspects of the economy, and develop education policies, and funding models to maximise this.

Extreme returns and inequality are found in the top deciles and elite institutions worldwide and earnings are not as linear as implied in Human Capital theory with those with elite socio-economic backgrounds benefitting the most. This is important in the context of South Africa as this country provides a more polarised education context than most countries.

South Africa has an extremely unequal society and as such the model proposed is appropriate, more so than for a country with less inequality and more centralised control of labour. This understanding is essential in matching the most appropriate funding model. Loan policies impact retention and graduation as owing large amounts may cause students to select high paying jobs rather than 'public interest' jobs. Higher education is an important investment for government, as individuals that earn more, contribute more tax, and the products of education provides substantial government fiscal benefits.

South Africa's system is currently inefficient, as a large number of students receive access to the tertiary education system without success, with only 7% of the African and Coloured Youth succeeding (Scott, 2016) within the three year expected period. As a result, Scott recommended expanding the curricula from 3 to 4 years to increase success of these students.

The next chapter turns to the literature to investigate previous studies in returns to tertiary university education and their findings in this area. The third chapter outlines the methodology. Chapter four notes the results. Chapter five discusses the impact of each of these variables on higher education as well as possible reasons for these. Chapter 6 concludes, while outlining limitations and recommendations.

## CHAPTER 2 LITERATURE REVIEW

### 2.1. INTRODUCTION

This chapter discusses Human Capital Theory and the earnings literature contrasted to the heterogeneity debate. Education as a positive investment and the Sharpe Theory is discussed. Each component of the proposed model and its literature is examined and finally the social benefits of education are outlined.

### 2.2. EARNINGS AND THE HUMAN CAPITAL THEORY

Becker (1962) was one of the founders of Human Capital Theory in that he proposed that an investment in education be treated as a capital investment. Assuming the human capital market based on education investment works efficiently, it follows that the returns on a degree should be similar to those of any other similar financial investment, which is known as the rate of return (Walker and Zhu, 2013). Human Capital Theory states that marginal productivity is improved through education which in turn determines earnings (Walker and Zhu, 2013). Within this view Mincer (1974) developed an equation with earnings as the independent variable and years of experience as a quadratic function. This has been subsequently criticised by Heckman, Lochner and Todd (2006) and more recently by Marginson (2017).

If the additional return associated with a degree is  $(w_1 - w_0)/w_0$ , where  $w_1$  denote earnings for a graduate with a degree and  $w_0$  is for the person without, then this should only differ randomly. The difference in earnings is the log of earnings. The theory can be denoted as  $\log w_1 - \log w_0 = rD + e$  (Walker and Zhu, 2013).

If  $\log w_0$  is a linear vector  $X$  of other characteristics like gender and population group then a person's equation would be  $\log w = \alpha + X'\beta + rD + e$  (Walker and Zhu, 2013), where  $\beta$  is an associated  $X$  variables vector.  $X'\beta$  is the sum of the products of the  $X$ 's and their  $\beta$ 's. Thus,  $\alpha$  is the log wage of someone without tertiary education and  $\alpha + r$  is the log wage of the default graduate (Walker and Zhu, 2013). This means the coefficients on the explanatory variables (for example gender and population group) translate to percentage effects: where for example women earn 30% less than men on average. Simply put, this means that the difference in earnings can be explained by the  $X$  differences as well as a random component explaining the unobserved factors. The  $X$  vector also includes work experience (hence the human capital name) and is expressed as a quadratic function because this has diminishing returns (Walker and Zhu, 2013). A proxy for work experience without other data is age.

Devereux and Fan (2011) who studied causal effects on education and earnings consistent with human capital models, found that educational attainment results in returns. Heckman, Lochner and Todd (2008) find that an extra year of tertiary education, does increase earnings,



but this relates to the additional information provided to the student, reducing the uncertainty of returns to education, facilitating better-informed decisions. Taskinsoy (2012) aimed to establish whether there is a correlation between higher education and wages, and whether human capital is a prerequisite for economic development. It was found that the life time earnings of the various degrees in Malaysia are just under half those of the United States of America (USA) until the Master's degree when if one attains the latter, the jump in earnings is 87.5% (Malaysia) compared to 14.5% (USA) (Taskinsoy, 2012).

In the USA earnings increase significantly with a Bachelor's degree (40.65% increase) and the premium for a doctorate is 33% more than a Master's degree and 53% more than a Bachelor's degree (Taskinsoy, 2012). Walker and Zhu (2013) found that a degree effects the income lifecycle by 28% for men and 53% for females. Harmon, Hogan and Walker (2003) estimated that education increases earnings by 7% with a standard deviation of 4%.

Walker and Zhu (2011) found that the Return on Investment (ROI) of education depends on the student's field of study, ability level, probability of passing as well as their level of debt. Webber (2016) concurred that all fields of study have greater returns than those of a high school degree. Taskinsoy (2012) ascertained that tertiary education is a major investment, providing financial returns immediately after graduation. In the USA, the heterogeneity in returns was huge (Trostel, 2008).

Becker (1962) stated that in an efficient capital market, the Return of Investment (ROI) of a degree ( $r$ ) should be similar to the returns on an equivalent investment. Other studies have found that tertiary education delivers a premium over basic schooling (Morris and Western, 1999) regardless of gender (Bobbitt-Zeher, 2007) or social circumstances (Gerber and Schaefer, 2004).

### **2.3. HETEROGENEITY AND SELECTION BIAS**

A contrary view asserts that differing educational resource allocations and outcomes do not rule out productivity but it does not consider this to be causal (Tsai and Xie, 2011). This view holds that the positive association lies not within the years of education but some graduates benefit more from education than others. Heckman (2001) argues that the returns to education are heterogeneous so the causal effect of tertiary education differs across the population. This concept is also known as Heterogeneity (Heckman, Urzua and Vytlačil, 2006).

'Ability bias' implies that firstly those with underlying characteristics like ability are more likely to attend University, and secondly, in terms of filtering, those that will benefit the most from attending tertiary institutions are those that attend quality schools (Hauer and Daymont, 1977; Heckman and Vytlačil, 1999; Heckman, Humphries and Veramendi, 2017).

Tsai and Xie (2011) found that people in Taiwan who attend tertiary education differ in unobservable ways from those that do not, resulting in heterogeneous effects on education earnings, whereas it was previously assumed that variables (like population group, parent's education etc. region) only indirectly affected earnings. Marginson (2017) concurs with this view and feels that the Human Capital Theory is flawed.

Blackaby, Murphy and O'Leary (2010) estimated the returns to various university degrees in the United Kingdom making use of a Labour Force Survey and found considerable heterogeneity in returns, specifically for gender. Borgen (2015) feels that simply using averages for the various diversity characteristics masks heterogeneity across the earnings distribution, and that networks, and social stratification are non-homogenous across institutions and fields of study.

The Heckman correction also known as Heckman's Lambda was developed by James Heckman and allows for correction of selection bias. The method uses a control function and involves a normality assumption. In the second stage of a Heckman selection one corrects for self-selection by including the predicted individual probabilities as an explanatory variable in linear regression (Heckman, Lochner and Todd, 2006).

The probability of employment  $\text{Prob}(E=1)$ , is often modelled as a linear function of observable variables (such as gender and population group)  $Z$ , and  $D$ , as well as unobserved factors –  $u$ . (Walker and Zhu, 2013).

$$\text{Prob}(E=1) = \phi D + Z'\delta D + uD$$

$$D=0,1.$$

This log also includes age and the quadratic function of age, and then allows for cohort effects. This is known as a Probit model predicting the dependent variable between 0 and 1 and can therefore be interpreted as a probability (Walker and Zhu, 2013). Whereas Walker and Zhu assume normality, normality is not essential (Heckman and Hotz, 1989).

## 2.4. SHARPE RATIO

The Sharpe ratio of investment allows one to calculate risk-adjusted returns (Sharpe, 1994). Palacios-Huerta (2003) calculated the Sharpe ratio for differing groups and levels of education, and most groups and levels enjoyed higher returns than investing on the open market. It was found that policies reducing or eliminating the risk of pursuing an education, such as eliminating debt through subsidising education, and increasing the persistence and graduation on campus, should be implemented (Webber, 2016).

## **2.5. EARNINGS BY TYPE OF SCHOOL**

Many South African researchers use the type of school as a proxy for socio-economic status (Van Den Berg, 2015; Rogan and Reynolds, 2016; and Allais, 2017) and this study has employed the same concept. Ilie and Rose (2016) linked access to, as well as success of tertiary education to socio-economic status.

Those from a poor background are less likely to graduate, and then go on to earn less when they do (Crawford et. al., 2016). Family background (Walker and Zhu, 2011) and quality of institution (Chevalier, 2011) therefore influence earnings. Perold, Cloete and Papier (2009) link South Africa's unemployment figure to poor schooling, as do Case and Deaton (1999) as well as Lam (1999). Taylor (2016) labelled the South African government school system as weak due to poor academic test achievement. Van Den Berg (2015) concluded that this can be remedied through strengthening the schooling system, especially in the lower quintiles foundation phase.

South African government schools are divided into quintiles that are supposed to represent an equal splitting of the government population of schools into 5 groups. In reality, as the norms and standards for education in South Africa allocates more funding to lower quintile schools, most schools clamour to be classified lower quintiles (Van den Berg, 2015). Based on school data and household income data, over 80% of those who qualify for degree study come from the top two school deciles (Van Den Berg, 2015). Quintile 1 contains 25% of the population but only produces 13% of the University exemptions (Van Den Berg, 2015). Van Den Berg (2015) concluded that greater emphasis is required in foundation phase regardless of whether this is caused by weak education or the fact that disadvantaged home environments require more support.

## **2.6. EARNINGS BY INSTITUTION**

Battu, Belfield and Sloane (1999) stated that those graduating from large research based universities earn 8% to 11% more than those from other universities. Hoxby (2009) found that students from elite colleges in the United States earn more than their counterparts. Hoxby and Avery (2012) found that most low-income high result students do not apply to selective colleges, despite financial aid offers. Hoxby additionally found that expensive elite universities in America invested on average more than \$15 000 more per year per student, and ensure entrance selectivity through Scholastic Assessment scores (Hoxby and Avery, 2012). Brown, Lauder and Ashton (2011) explained the 'beauty parade' function that elite universities in the United States perform for the elite workplace which corroborates Castells (2011) finding that higher education functions as an elite company selection criteria. Walker and Zhu (2013), contrarily found that when one controls for family background in the United Kingdom, their

study found the differences in earnings from students originating from elite higher education institutions to be statistically insignificant.

Ding, Hartog, and Sun (2010) compared 100 universities in China and reported that the institution's quality affects their earnings. Li however found that when ability, field of study, location, social characteristics were held constant the earnings premium reduced from 26% to 10% (Li, Meng, Shi and Wu, 2012). They claim there is a complex interaction between the variables that determine whether one attends a tertiary institution in the first place and that multi-variate analysis is limited. Similarly, Gerber and Cheung (2008) deduced that students graduating from high quality institutions would enjoy high returns regardless of which institution they graduated from.

Borgen (2015) finds that at the upper half of the earnings distribution of those that attend a high quality institution are most likely to benefit most and this is where family background plays a role. Hu and Vargas (2015) reported that institution quality serves as a signal of prestige to employers. Gerber and Cheung (2008) found that elite institutions impart more human capital, send elite signals, garner more social capital and enjoy advantages such as family network or ability. Blundell, Dearden and Sianesi (2005) found that elite universities may be more valued by students from wealthier backgrounds.

## **2.7. EARNINGS BY FIELD OF STUDY**

Differing returns to field of study were reported by Blundell et. al. (2000), Heckman, Lochner and Todd (2008), Walker and Zhu (2011), Machin and McNally (2007), Chevalier (2011), Webber (2016) as well Arcidiacono, Hotz and Kang (2010).

Blundell et. al. (2000) utilised a database populated from a study on national child development in Britain and determined that males had lower earnings in Biology, Chemistry and Environmental Sciences and women had higher rates of returns in Accounting, Economics and law.

Rates of return were estimated by Heckman, Lochner and Todd (2008) incorporating tuition and income taxation. Studies on majors report large differences (Arcidiacono, Hotz and Kang, 2010). Returns may however be overestimated as social attributes that correlate with wages are linked to education, for example Elite Universities may be more valued by students from wealthier backgrounds (Blundell, Dearden and Sianesi, 2005). Walker and Zhu (2011) found that women's returns in England and Wales, do not seem to differ by subject, but men studying Law, Economics and Management (LEM) earn more. LEM's premium is 33% for men and 42% for women (Walker and Zhu, 2011). Machin and McNally (2007) reported similar rankings for Germany, United States and France.

Chevalier (2011) extends the work of Walker and Zhu controlling for individual differences, finding large differences in the average earnings of graduates in the United Kingdom from differing fields and a bigger differences by subject, with unobservable characteristics obtaining premiums double those of the worst performers. Within subjects, Medical students earn more than students studying Physics (Chevalier, 2011). Medicine, Architecture and Engineering enjoy a 10% premium over Physics, and Linguistic, Communication and Creative Arts deliver premiums 90% lower than Physics (Chevalier, 2011). Fee status, accommodation and school attended seem to have little influence on the differences between subjects, and the large variation within subject (three times larger) may affect subject choice (Chevalier, 2011).

Studies conducted in the United States suggested that students select their majors based on perceived returns per field (Arcidiacono, Hotz and Kang, 2010). Webber (2016) builds on the work done by Heckman, Lochner and Todd (2008) and finds that the Return on Investment (ROI) is sound for all scenarios. Webber (2016) includes the risk of failing, and finds the present discounted value of tertiary education, ranges between \$85K and \$300K depending on major.

Du Toit and Roodt found that in South Africa graduates from the Humanities are less likely to be employed than those from Medicine or Engineering (Du Toit and Roodt, 2008). Walker and Zhu (2011) simulate lifetime earnings for each major in the United Kingdom, but are unable to account totally for major choice due to data constraints (as pointed out by Dickson and Harmon (2011)). Cognitive and non-cognitive factors also have to be accounted for (Webber, 2016). All major categories can expect more returns than if they simply completed school, even when dropouts are taken into consideration, although some majors only show a return later in life in the United States of America (Webber, 2016). Arts and Humanities average costs and ability, results in return on investment by 40 (Webber, 2016); while a Commerce qualification is predicted to be a sound investment for just over 70% of graduates (Webber, 2016).

## **2.8. EARNINGS BY GENDER**

Blackaby, Murphy and O'leary (2010) find substantial returns to education with returns for a Bachelor's degree for women being higher than those for men. Chevalier (2011) found the gap between genders to be around 3% with men earning more. Baum and Payea (2004) conclude that there is a link between education and higher returns for all population groups for both sexes.

The earnings premium for Organisation for Economic Co-operation and Development countries (OECD) data is more than 50% in most of them, with females consistently earning less than males (Taskinsoy, 2012). In support of this male full time workers with tertiary education earn on average 28% than their female counterparts in an OECD data study conducted in 2016 (Van der Velden and Bijlsma, 2016)

Walker and Zhu (2011) however reported higher returns for females with degrees, in the United Kingdom. People with one degree earn 20% for males and 31% for females more than those that have A-levels only; and 12% for males and 17% for females for a further degree; and 4% for males and 7% for females for a Doctorate (Walker and Zhu, 2011). Cohort effects were found when lifecycle coefficients were imposed, and in women, panel data provided higher age-earnings profile estimates as opposed to the cross section estimates, supporting the theory of separating cohort and life cycle effects (Walker and Zhu, 2011). Previously a change in the funding model had re-distributional effects differing by gender (Dearden, Fitzsimons, Goodman and Kapan, 2008). In a 2013 study Walker and Zhu found that returns to a degree compared to no degree are 23% for men and 31% for women (Walker and Zhu, 2013).

Livanos and Pouliakas (2009) found that the areas that women are over represented in are Education and Humanities and that these are also the subjects yielding the lowest returns. They found that 8.4% of the earning difference in Greece was accounted for by gender differences, as women were opting for safer educations translating to lower wage premiums (Livanos and Pouliakas, 2009).

Blundell, Dearden, Goodman and Reed (2000) associated a higher return to education with being male. Olsen et. al. (2010) found that the gender gap looms largest in the skilled trades (between 26% and 34%) and is smallest in the professional occupations (between 1% and 4%) In the United States. Walker and Zhu (2013) reported that females who don't complete their Higher Education are actually worse off in terms of earnings than those who never attended tertiary education.

## **2.9. EARNINGS BY POPULATION GROUP**

Henderson, Polachek and Wang (2011) discovered that returns to education are not homogenous employing a nonparametric kernel regression finding different earnings both across and between groups. The black population group's higher education returns were found to be higher than those of the white group and that indigenous returns outstrip those of immigrants, exhibiting significant heterogeneity (Henderson, Polachek and Wang, 2011).

In South Africa a number of studies have associated population group and quality of institution (historically black as opposed to historically white universities) with employment (Pauw, Oosthuizen and Van Der Westhuizen, 2007; Bhorat, Mayet and Visser, 2010). Finally, the Cape Higher Education Consortium (CHEC) performed a study tracing the 2010 students graduating from four universities in the Western Cape in 2012 and found that black graduates were most likely to be unemployed (CHEC, 2013).

## **2.10. SOCIAL BENEFITS**

College educated labour produces positive externalities such as better health and less crime, so should be funded by government (Avery and Turner, 2012). Furnee, Groot and Van Den Brink (2008) linked education and better health.

Loan policies also impact retention and graduation as high debt levels may cause students to select high paying jobs rather than 'public interest' jobs (Rothstein and Rouse, 2011). Students from poorer social-economic backgrounds, dropouts and those with lower post-tertiary education earnings are most likely to default, leading to a structural accumulation of human capital (Hillman, 2014).

Trostel (2008) found that the real fiscal impact or rate of return for government on university spending is around 10% above inflation, and that targeting people that would not otherwise be studying, makes good economic sense. Taskinsoy (2012) reported that higher earnings are returned to the government in the form of taxes and general participation in the economy. Dickson and Harmon (2011) report that the Mincer equation underestimates returns as it does not account for the social returns.

Haveman and Wolfe (1984) include higher savings rates and improved marital sorting benefits, in the social benefits of education, while Lochner (2004) links education to reduced criminal behaviour, finding returns of between 14% and 26%. Milligan, Moretti and Oreopoulos (2007) associated education to being politically informed and Valero and Van Reenen (2016) found that the regional economic growth was positively associated with the number of universities in a country. Finally, Oreopoulos (2007) determined that lifetime wealth was improved by 15% and additionally extra years of schooling results in better health, less unemployment and happier citizens. Oreopoulos and Salvanes (2011) state that education changes one as a person and makes one more decisive promoting trust and civic engagement along with better budgeting and lifetime planning.

## **2.11. CONCLUSION**

This chapter set out to review the earnings literature related to institution, schooling, field of study, population group and gender. The literature seems to conclude that education delivers returns, but those returns are not homogenous across students. The Human Capital theory is not as linear as initially proposed and as South Africa provides a polarised education context with extreme returns and inequality in the top deciles and elite institutions where higher elite socio-economic backgrounds benefit the most. The next chapter outlines the methodology.



## CHAPTER 3. METHODOLOGY

### 3.1. INTRODUCTION

This section will include a discussion on each variable on its own, to provide context, but it should be remembered that previous studies, holding variables constant, have found lesser returns than those initially reported for one variable employing averages (Li, Meng, Shu and Wu, 2012). Simply using averages for the various diversity characteristics masks heterogeneity across the earnings distribution and networks, and social stratification are non-homogenous across institutions and fields of study (Borgen, 2015).

Recognising the variables interdependency, a Heckman selection was used to, firstly sort for those who are employed by school type and institution. Thereafter including this as a variable, it was examined whether earnings can be predicted using a population group, gender and field of study. The explicit cost such as tuition and loan costs as well as the implicit opportunity costs, for the two different institutions as well as the payback period, was calculated to establish whether a Bachelor's degree is a sound investment. These returns were then compared to what one could earn with a similar investment at the time, to provide a benchmark.

### 3.2. RESEARCH PARADIGM

A research inquiry should be based on ontology, epistemology and methodology (Antwi and Hamza, 2015). This study is positivistic and strives to predict earnings, and study the relationship between the variables by empirical means (Henning, Van Rensburg and Smit, 2004), through replication and verification of observable findings (Guba and Lincoln, 2005), variable manipulations (Trochim, 2000) and statistical analysis (Kim and Whitt, 2013). A deductive approach with hypotheses is used to arrive at conclusions from propositions for the best explanation (Antwi and Hamza, 2015).

### 3.3. RESEARCH GOALS AND OBJECTIVES

The aim of the research was to employ a Heckman Selection to predict the probability of employment, based on the independent variables of type of school and Rhodes University (RU) versus the University of Fort Hare (UFH) and thereafter earnings premiums (the dependent variable) with employability, field of study, gender and population group as independent variables. The following multi-level equation was proposed.

$$Y_1(\text{Employability Success}) = \alpha_0 + \alpha_1(X_1(\text{Type of School}) + X_2(\text{Institution})) + \varepsilon_1$$

$$Y_2(\text{Earnings Premium}) = \beta_0 + \beta_1 Y_1 + \beta_2 (X_3(\text{Field of Study}) + X_4(\text{Gender}) + X_5(\text{Population Group})) + \varepsilon_2$$

$Y_1$  and  $Y_2$  are endogenous (dependent variables) and  $X_1$  through  $X_5$  are independent variables;  $\varepsilon_1$  and  $\varepsilon_2$  are the error variables.

Objectives were established to facilitate a comprehensive understanding of tertiary education earnings premiums. Each objective was accompanied by a hypothesis, providing grounds for assessment.

1. A two stage regression was used to predict the likelihood of being employed and thereafter earnings premiums for graduates from two South African Universities.
2. The explicit (tuition and loan) and implicit (opportunity) costs, based on a theoretical exercise, for the two institutions, was calculated to establish, the payback period and whether a Bachelor's degree is a sound investment. This was compared to the return of a similar investment at the time.

### 3.4. HYPOTHESIS 1

To construct a model that predicts the probability of being employed and thereafter earnings:

$H_0$ : All the variables in the model take the value zero

$H_1$ : The model under consideration is accurate in predicting earnings and is fundamentally different to the null of zero, predicting significantly more accurately than the random prediction level of the null hypothesis.

This model has sub-hypotheses namely:

To sort likelihood for being employed based on Type of School and Institution.

$H_0$ :  $H_{1a}:X_1(\text{Lower cost schools})$  and  $H_{1a}:X_2(\text{Rhodes}) = 0$

$H_1$ :  $H_{1a}:X_1(\text{Lower cost schools})$  and  $H_{1a}:X_2(\text{Rhodes}) < 0$

To interrogate the heterogeneity by field of study as it was suspected that different fields of study have different rates of return. SET and Business/ Commerce were hypothesized as having higher earnings premium.

$H_0$ :  $H_{2a}:X_3(\text{SET}) = 0$

$H_1$ :  $H_{2a}:X_3(\text{SET}) > 0$

To establish whether females earn less than males

$H_0$ :  $H_{3a}:X_4(\text{Female}) = 0$

$$H_1: \mu_{3a:X}(\text{Female}) < 0$$

To establish whether population group influences earning

$$H_0: \mu_{4a:X5}(\text{Black}) = 0$$

$$H_1: \mu_{4a:X5}(\text{Black}) < 0$$

### 3.5 HYPOTHESIS 2.

To ascertain whether tertiary education is a positive investment:

$H_0$ : Education is not a positive investment

$H_2$ : Education is a positive investment.

The explicit (tuition and loan) and implicit (opportunity) costs for the two institutions was calculated, as well as the opportunity costs of what they would have earned during that period if not studying. It was hypothesized that tertiary education delivers differing returns by institution, and that graduates earn more than matriculants, and that tertiary education is a favorable investment when compared to investing on the stock exchange.

The heterogeneity by field of study was interrogated as it was suspected that different fields of study have different rates of return. Field of Study was broken down by CESM (Classification of Educational Subject Matter) as prescribed by the South African Classification of Educational Subject Matter manual. Example groupings are Business/ Commerce; Education; Humanities; and Science, Engineering and Technology (SET). Schools were characterized by their various types i.e. public versus private and high cost versus low cost within those categories. The average earnings was analysed by type of school, gender, university, field of study (CESM) and population group.

It was hypothesized that there would be a negative correlation between the lower cost schools and earnings premium. Quality of institution is hypothesized as being positively linked to a higher premium. SET and Business/ Commerce were hypothesized as having higher earnings premiums. It was hypothesized that women would earn less premiums than men.

### 3.6. DATA COLLECTION

The researcher was granted access to a tracer study's database of graduates from RU and the UFH which are both located in the Eastern Cape, for a study which sought to develop a framework for skills planning, and to promote a skilled workforce (Rogan and Reynolds, 2015). Researchers from the Neil Aggett Labour Studies Unit, constructed a stratified random sample compiled of graduates who graduated from a three or four year Bachelor degree in 2010 or

2011 comprising of 469 graduates from RU and 742 from UFH. This sample of 1,211 graduates represented a total population of 4,927 graduates. Response rates of 39% and 47% respectively were achieved from the two universities. The fieldwork included an online survey and telephonic interviews.

### **3.7. METHOD**

Descriptive analyses were conducted with bi-variate cross-tabulations as well as summary statistics, although these should be interpreted with care due to the heterogeneity of the variables. The regression analyses utilised linear regressions with standard errors, with earnings as the dependant variables to determine the relationship between earnings and type of school, university, field of study, gender, and population group.

The Heckman selection regression has two stages to determine the probability of being in the employed group and thereafter the effect of field of study, gender and population group on earnings. Each stage has a residual for each observation. Both stage residuals are examined to determine if bias exists. If the residuals from both stages are unrelated then selection into the second stage is considered to be random (Stata, 2017).

In the second stage of a Heckman selection, self-selection is corrected for by including the predicted individual probabilities as an explanatory variable in the linear regression (Heckman, Lochner and Todd, 2006). The likelihood ratio test to test for significantly different probabilities is employed, as the predictor model reflected in model chi square, less the baseline model likelihood ratio containing only the constant. Significance at the .05 level or lower would mean that this model with its predictors is significantly different from the null hypothesis with all coefficients being zero. A significant chi square measures the improvement that the explanatory variables (type of school, university, field of study, gender and population group) make as compared to the null method (Stata, 2017).

During the selection stage the dependent variable must be a dichotomy, and in this case indicates whether someone found employment or not. The estimation stage categories must be mutually exclusive and exhaustive. The logistic regression gives each predictor a coefficient measuring its affect to differences in the dependent variable (Stata, 2017).

### **3.8. RESEARCH ETHICS**

The use of publicly available information limits the number of ethical considerations pertaining to this study. Ethical considerations regarding the research involve ensuring the data is treated in an impartial manner to obtain unbiased results. Additionally, misrepresentation of findings must be avoided to conclude any meaningful results.

Ethical considerations were adhered to when the Graduate Tracer Study was conducted initially, and permissions to utilise the data were acquired. Value judgements around the quality of schooling and quality of institution could cloud the study, but as far as possible this is countered by using accepted HEMIS (Higher Education Management Information System) classifications.

### **3.9. CONCLUSION**

This study is positivistic and strives to predict earnings, and study the relationship between the variables. To achieve the first objective a Heckman Selection to predict the probability of employment, based on type of school and RU versus the UFH and thereafter earnings premiums with employability, field of study, gender and population group, was employed. The second objective was achieved through comparing the return on investment for RU and UFH to a matriculant, as well as to an open market investment, to determine if tertiary education is a positive investment.

The results of the study are now discussed.

## CHAPTER 4. RESULTS

### 4.1. INTRODUCTION

Initially the descriptive statistics of the individual variables were investigated with their population weightings. Students were asked to provide their net income and additionally had the option to indicate their salary within a range. Where an earnings range was indicated, but no specific earnings completed, the mid-point was derived for an earnings field to complete the regressions.

### 4.2. DESCRIPTIVE STATISTICS FOR EARNINGS

The findings are presented in the table below and thereafter the variables will be analysed individually:

Category	Category	Mean Monthly Earnings By Institution in Rands	Mean in Rands	Std. Err	95% Interval	P.z
<b>Type of School N= 754</b>	Public School/ Elite		17858	564	16750	18966
	Public School/ Elite RU	18938				
	Public School/ Elite UFH	16025				
	Public School Low Cost		15514	530	14473	16555
	Public School Low Cost RU	18633				
	Public School Low Cost UFH	14918				
	Private Elite		21055	1095	18903	23206
	Private Elite RU	21711				
	Private Elite UFH	17689				
	Private Low Cost		14671	1212	12291	17052
<b>Institution N= 846</b>	Private Low Cost RU	18077				
	Private Low Cost UFH	13016				
	RU		19457	553	18370	20544
	UFH		15397	409	14595	16200
	SET		18557	933	16725	20388
	SET RU	20861				
	SET UFH	16219				
	Commerce		18259	682	16919	19599
	Commerce RU	22152				
	Commerce UFH	15899				
<b>CESM N= 846</b>	Education		17266	980	15342	19191
	Education RU	17421				
	Education UFH	17261				

Category	Category	Mean Monthly Earnings By Institution in Rands	Mean in Rands	Std. Err	95% Interval		P.z
	Humanities		15894	448	15013	16775	0.005**
	Humanities RU	17534					
	Humanities UFH	14484					
Gender N= 846	Male		18202	581	17061	19343	
	Male RU	21753					
	Male UFH	16025					
	Female		16310	407	15511	17110	0.003**
	Female RU	18084					
	Female UFH	14918					
Population Group N= 846	Black African		16037	400	15252	16823	
	Black African RU	19760					
	Black African UFH	15032					
	Coloured		15718	2187	11425	20012	0.876
	Coloured RU	17694					
	Coloured UFH	14406					
	Indian or Asian		26865	2715	21534	32195	0.000***
	Indian or Asian RU	24633					
	Indian or Asian UFH	38400					
	White		19046	631	17806	20286	0.000***
	White RU	18977					
	White UFH	19575					

Asterisk: \*\*\*p<0.01, \*\*p<0.05, p\*<0.10

Table 2: Descriptive Statistics. Average Earnings by category.

#### 4.3. EARNINGS BY TYPE OF SCHOOL

It was hypothesized that earnings differ by type of school and that the lower cost schools earn less.  $H_1: \mu_1 > \mu_2$  (Lower cost schools) and  $H_1: \mu_1 > \mu_2$  (Rhodes)  $< 0$ . Earnings is disaggregated by type of school, divided into Public School/ Elite, Public School/ Low cost, Private Elite and Private Low cost. There were too few respondents to the Home Schooling and Farm School category so these categories were excluded.

If the average earnings of the variable type of school (754 observations), are examined, the Private Elite category earns the most. If this is compared by University, RU graduates earn more than UFH students in all categories. The biggest percentage difference relates to Private

Low Cost where students from Rhodes earn on average around 28% more than their counterparts. All differences in earnings between RU and UFH are greater than 12%. We therefore accept the alternative hypotheses.

#### **4.4. EARNINGS BY INSTITUTION**

The differences between earnings of a RU versus a UFH are more than R4000. Regress by RU as compared to UFH, finds the relationship statistically significant ( $P = 0.000$ ). We therefore accept the alternate hypotheses  $H_1: \mu_{1a:X1}(\text{Lower cost schools})$  and  $\mu_{1a:X2}(\text{Rhodes}) < 0$ .

#### **4.5. EARNINGS BY FIELD OF STUDY**

The categories offered by the Universities in the tracer study are SET (Science, Engineering and Technology), Commerce, Education and Humanities. The average earnings (846 observations) of SET and Commerce are higher than Humanities. Regress SET against the other categories shows there is little difference between Commerce and SET but the difference to Humanities is statistically significant at  $P = 0.005$ . We therefore accept the alternate hypothesis  $H_1: \mu_{2a:X3}(\text{SET}) > 0$

#### **4.6. EARNINGS BY GENDER**

This section explored whether males on average earn more than females. With 846 observations males were found to earn R1 891 more than females. Comparing the regression for males as opposed to females, the difference is statistically significant ( $P=0.003$ ). We accept the alternative hypothesis  $H_1: \mu_{3a:X}(\text{Female}) < 0$

#### **4.7. EARNINGS BY POPULATION GROUP**

This section explored earnings by population group and with 846 observations. Black Africans earn less than the white population group. Regressing the difference between Black Africans and the other groups the relationship is found to be significant for all groups ( $P= 0.0000$ ) excepting for those belonging to the coloured group, however there were too few respondents in this category at less than 2% of the population. We accept the alternative hypothesis  $H_1: \mu_{4a:X5}(\text{Black}) < 0$ .

#### **4.8. HECKMAN SELECTION**

The likelihood of employment is filtered by type of school and university, and thereafter earnings, are predicted with field of study, population group and gender as variables is statistically significant ( $\lambda$  p value = 0.012). When probability reaches the 5% significance level, the alternate hypothesis is retained i.e.  $H_1$ : The model under consideration is accurate in predicting earnings and is fundamentally different to the null of zero, predicting significantly more accurately than the random prediction level of the



null hypothesis. Knowing the predictors (type of school and university) assists us in predicting the dependent.

The Heckman Selection Model was run to predict whether students would be in the employed or not group, and thereafter their earnings using the type of school and university they attended as predictors for 972 students. A test of the proposed research model as compared to the baseline model was statistically significant, indicating that type of school and university reliably distinguished between those that found employment and those did not and thereafter their earnings (chi square = 38.01,  $p < .000$  with  $df = 7$ ). Looking at the significance of the predictors, university was a stronger predictor than type of school although Public School low cost was significant at  $p=0.035$ . This model is however only 38% accurate at predicting in the first instance whether someone will find employment and then their earnings as indicated by the Wild Chi(2) indicator. The findings are presented in the table below:

Number of observations		N = 972			
Censored Observations		220			
Uncensored Observations		752			
Wald Chi2(7)		38.01			
Prob > Chi2		0.000			
Earnings		Coef	Std E	Z	P.z
CESM	SET				
	Commerce	370.5366	1056.911	0.35	0.726
	Education	98.04327	1753.496	0.06	0.955
	Humanities	-1897.14	975.8631	-1.94	0.052*
Gender	Female				
	Male	1943.2	729.6911	-2.66	0.008***
Population Group	Black				
	Coloured	1373.495	2041.815	0.67	0.501
	Indian or Asian	8744.648	2244.202	3.90	0.000***
	White	1849.887	991.8467	1.87	0.0652*
School Type	Public High Cost				
	Public School Low Cost	-.2284659	.1083685	-2.11	0.035**
	Private Elite	-.2833815	.1453315	-1.95	0.051*
	Private Low Cost	-.3110054	.1738455	-1.79	0.074*
Institution	RU				
	UFH	-4000659	.1076347	-3.72	0.000***

<b>Lambda</b>		-12051.73	4774.807	-2.54	0.012**
<b>Rho</b>	-0.96868				
<b>Sigma</b>	12441.353				

Asterisk: \*\*\*p<0.01, \*\*p<0.05, p\*<0.10

Table 3. Heckman Selection for Earnings

The adjusted standard error for the earning equation regression is given by sigma=12441.352 and the correlation coefficient between the residuals that determine selection into the employed group and the residuals that determine earnings is given by rho= -0.96868. The estimated selection coefficient lambda = sigma×rho = -12051.73 and indicates by how much the earnings are shifted down due to the selection. The chi-square value for rho is statistically significant at 0.000 and those that select into the sample enjoy higher wages than those from a baseline group. Model chi square at 38.01, has 7 degrees of freedom, and a probability of p < 0.000.

#### 4.9. COSTS

The fees, food, accommodation and books cost at RU for three years for that period (2009 to 2011) is estimated at R207 910. This figure was calculated by using the information in the Rhodes University Calendars for the years 2009, 2010 and 2011 (Rhodes University, 2009, 2010, 2011). As the figures for FHU were not available to the researcher for the years in question, and the difference in fees for 2018 is currently 30% between the different universities, the cost of UFH is estimated to be roughly 30% less than a RU degree for three years (fees, food, accommodation and books) at a cost of R145 537. The three years of foregone earnings have been calculated, indicating a 20% difference between UFH and RU, using the average income of a South African with a Matric derived from 2014 survey conducted by Payscale from a sample size of 126 000 South Africans (Business Tech, 2016). This results in a R506 957 cost for the UFH degree and a R657 686 cost for the RU degree. Hard costs include opportunity costs of foregone earnings.

The RU student would earn a salary of R19425 in their first year (average salary for a RU student as per the study) and a UFH student would earn R15412. This was converted to an annual salary and increased by 8% a year assuming 6% inflation. The loan option was calculated at 12% interest. The Matriculant column is calculated based on the Stats SA survey amount earned by a matriculant (annual salary of R151 820). Finally, the study investigates returns for the open market in South Africa for the amount spent on studies, on the open market. The initial investment amounts for UFH was taken as R145 537 and R207 910 for the RU student, which includes the opportunity costs of foregone earnings. The investment was

calculated at 11% interest. This illustrates that in 2012 the UFH student would be earning R185 000 while the RU student would be earning R233 000 (due to the amount of the cost of tuition and accommodation at the respective Universities). The annual income (less the loan where relevant) after ten and then twenty years are illustrated

Returns	Fort Hare	Fort Hare Loan	Rhodes	Rhodes Loan	Matriculant	Stock Market Fort Hare	Stock Market Rhodes
2012	184944.00	151222.00	233100.00	184104.00	151820.00	161546.00	230780.00
2022	685628.34	196355.00	864153.29	153270.00	562830.34	458697.00	655281.00
2032	2541775.99	727934.00	3203607.49	568207.00	2086536.63	1302434.00	1860621.00

Table 4. Annual Income by University (with loan and without), Matriculant as well as Stock Market for UFH and RU Initial Investment Amount for 2012, 2022, 2032 in Rands.

If we have to deduct the cost of studies and consider the fact that both the Matriculant and the Stock Market earnings would have been accruing during the period that the student was not earning (opportunity cost of Matric salary lost) then the Matriculant and the Open Market would have earned more. The loan scenario is burdening the students with debt and constraining their earnings. Also the starting salary was the average for RU and then the average for UFH whereas the costs were taken for a BSc Computer Science student. All these figures and percentages are only indicative and could vary greatly based on assumptions, field of study or university. Failing must also be factored in and students sometimes take longer to complete their degrees. The matriculation earnings also differed vastly in the two surveys, and the fact that one may not find a job in the South African context with its high unemployment rates, must also be factored in. The stock market can go up or down.

UFH	UFH loan	RU	RU loan	Matric Stats SA	Matric My Broadband	MUFH	MRU
9,7	5,8	12,15	4,7	15,9	7,3	11,6	16,6

Table 5. Total Income by University (with loan and without), Matriculant as well as Stock Market for UFH and RU Initial Investment Amount by 2032 in Millions of Rands.

Our alternative hypothesis H<sub>2</sub>: Education is **always** a positive investment is therefore rejected however we need to consider the fact that a tertiary education provides wider returns and these are not homogenous for all (Heckman, Humphries and Veramendi, 2017).

#### 4.10. CONCLUSION

The first objective related to establishing the link between earnings and the variables schooling institution and field of study, population group and gender. This chapter looked at the results of the individual regressions of earnings, as well as a Heckman Selection statement of the various variables combined. When earnings are regressed against type of school, graduates from low cost schools earn significantly ( $P = 0.004$ ) less (R2 343) relative to those from Private Elite schools (R3197) (also statistically significant as  $P = 0.004$ ). The differences between earnings of a RU versus a UFH are more than R4000. Comparing the various field of study categories by University results in RU students earning more than students from the UFH, in every category. The most pronounced difference is between RU and the UFH for Humanities with a difference of more than R3 000. Comparing the difference by University the difference between a RU male and a UFH female is more pronounced with the RU male earning 32% more.

The proposed model is a partial fit, indicating that the predictors do have an effect and essentially create a different model. This model could however be improved by the inclusion of more variables such as ability, location and parents level of education.

The second objective required an investigation as to whether education is a positive investment and from the costs table outlined in 4.9 we can deduce that tertiary education is not always a positive investment, and those burdened with debt will take a considerable time to recover these costs supporting the argument for free education as opposed to contingent based loans. This must however be seen in the context of affordability for the country.

## **CHAPTER 5 DISCUSSION**

### **5.1. INTRODUCTION**

The study findings will now be outlined and their implications discussed against the backdrop of current literature.

### **5.2. TYPE OF SCHOOL**

The higher cost private schools as well as some of the higher cost public schools often enjoy low learner to teacher ratios and are well resourced with good infrastructure, whereas at least half of the Fort Hare graduates come from the often poorly resourced lower cost schools (Rogan and Reynolds, 2016). In 2017 the IEB board reported a pass rate of 98,76% compared to the 2017 government pass rate which was reported as 75.1% (0.24 distinctions per learner). A local Grahamstown private school reported a 100% pass for 2017, with all students able to pursue tertiary education (SACschool.com, 2018). The IEB produced 88.5% while the government produced 28.7% Bachelors passes (National Professional Teachers' Organisation of South Africa Gauteng Branch, 2018). This highlights the differences in the schooling systems.

If you include those that enrolled for Government Schools Grade 10 in 2014 and then calculate the 2016 pass rate, the true pass rate would be around 40.2% (Evans, 2017) and a similar percentage in terms of the 2017 figures, can be inferred. In 2016, including all students that first enrolled for Grade 1 (1 207 996 students), only 26% passed matric in 2016 (Timeslive, 2017). In terms of Quintiles for the 2016 cohort of learners 16% of the Quintile 1 students writing Matric received Bachelor passes while in Quintile 5 it was 92% (Equal Education, 2017).

Rogan and Reynolds (2016) reported graduate unemployment and lower earnings to be linked to the Fort Hare students who are more likely to have attended low quintile schools, and recommended that interventions for students be aimed at these schools (Rogan and Reynolds, 2016), especially during Foundation phase (Van Den Berg, 2015).

The 31% difference in earnings between Rhodes Private Elite and Fort Hare Public Low Cost illustrates the concept that those that are educated at elite institutions earn the most. This reinforces the view that the Human Capital Theory is flawed as it relies on Human Capital as the only source of capital, and ignores socio-economic benefits experienced by the population. In this instance, as identified by Piketty (2014) and Borgen (2015) the top deciles and elite institutions with elite socio-economic backgrounds are benefitting the most.

### **5.3. INSTITUTION**

In terms of the University Ranking by Academic Performance, RU is 9<sup>th</sup> in the country and 997 in the world compared to the UFH which is placed 17 out of the 18 Universities listed in South Africa and 2273 in the world (URAP, 2017). This must be interpreted against the backdrop that rankings measure what is easily measured and hence have many critics that claim that URAPs six indicators prejudice the softer sciences.

The My Broadband survey found that different universities had different starting earnings ranging from R17 438 per month for Stellenbosch to R10 233 per month for the University of South Africa (Skade, 2015). In the case of the institutions reviewed in this study, the starting earnings for RU is R19 425 and R15 412 for the UFH, thus placing both universities in the upper and mid range of Universities in South Africa (Skade, 2015). The difference of more than R4000 between each other is statistically significant, and reflects the outcome of other surveys conducted during the same period.

This could be because the elite universities perform a signalling function (Hu and Vargos, 2015; Gerber and Cheung, 2008) and that higher consumption universities are valued by richer students (Blundell, Dearden and Sianesi, 2005) or because certain students are benefitting more from education than others (Tsai and Xie, 2011) and are therefore more inclined to opt for tertiary education (Borgen, 2015). Certain countries also place higher value on the extent to which tertiary education signals skills, and this premium is highest in countries where the signal is strong for example Belgium and lowest where this is weak for example in Cypress (Van der Velden and Bijlsma, 2016).

The higher quality institution also seems to sort positively, enabling employment and this may relate to the fact that the students have better established networks (Kraak, 2012), signal better (Gerber and Cheung, 2008; Arum and Rokstra, 2014; Hu and Vargas, 2015), have higher earnings expectations (Delaney, Harmon and Redmond, 2011) and that elite institutions are perceived as producing better equipped graduates (Pauw et. al. 2006).

### **5.4. FIELD OF STUDY**

The difference in earnings between SET and Humanities was R2 663 and was found to be statistically significant. The SET category was found to earn R18 557. Similar amounts were found in a recent My Broadband qualifications and salaries survey pegging a Bachelor of Science in Engineering at just over R19 000 in terms of earnings for their first job (Skade, 2015). This survey was conducted with 4 638 South Africans who joined the workforce in 2013 (Skade, 2015). Education was found to be R17 292.9 a month, My Broadband found this to be R15 825 (Skade, 2015). The largest difference is between Commerce and SET graduates from RU who earn almost 29% and 33% respectively, more than Humanities graduates from

the UFH. This needs to be interpreted against the backdrop that graduates are often not pursuing their initial field of interest choice as highlighted in the Rhodes and Reynolds (2016) study, and that many students do not achieve the prerequisite requirements for the gateway subjects for certain fields.

RU graduates earned more than the UFH for every category, especially in Humanities where the difference was more than R3 000. Once again, this has to be viewed against the Heterogeneity argument as Blundell et. al. (2000) found that males and females had differing rates of returns for different field of study, and Chevalier (2011) found that unobservable characteristics obtained premiums double those of the lowest return categories.

The fact that different fields earn different premiums is consistent with the literature as Chevalier (2001); Heckman, Lochner and Todd (2008); Machin and Macnally (2007) as well as Arcidiacono, Hotz and Kang (2010) who found different returns for differing field of studies while Walker and Zhu found differing returns per subject for males. Webber (2016) also found differing returns but concluded that all scenarios pay off although some only do so later in a graduate's career. It must be remembered that the lack of panel data also clouds these results. Education students may have higher initial returns, due to guaranteed employment in the form of bursaries, and this may plateau later in the earnings curve, while Commerce may curve upwards overtime. This is also consistent with the South African environment as Du Toit and Roodt found that in South Africa graduates from the Humanities are less likely to be employed than those from Medicine or Engineering (Du Toit and Roodt, 2008).

## **5.5. GENDER**

Black females are more likely to be unemployed (Rogan and Reynolds, 2016) and once they do find employment earn less, with males earning R1 891 more than females, which is statistically significant at  $P=0.003$ . However when broken down by University the difference is more pronounced, with the RU male students earning 32% more than the RU female graduates. Once again the interaction of the socio-economic variables may be key; for example Livanos and Pouliakas (2009) found that the areas that women are over represented in are Education and Humanities and that these are also the subjects yielding the lowest returns, so individual variables should not be isolated as causal on their own.

The finding of males earning more than females is consistent with the literature as Blackaby, Murphy and O'leary (2010) find returns for a Bachelor's degree for men being higher than those for women, while Chevalier (2011) Blundell, Dearden, Goodman and Reed (2000) and Olsen, et. al. (2010) and Taskinsoy, (2012) all found a gender gap. Only Walker and Zhu (2011) found higher returns for females with tertiary degrees than males.

## **5.6. POPULATION GROUP**

RU was historically a white university and 57% of the 2010 and 2011 cohorts were white and 35% black, whereas Fort Hare University, being a previously black university had 93% black and less than 5% white students (Rogan and Reynolds, 2016). At the UFH it would appear that the Indian and Coloured group earned more, but it must be remembered that this represents only 1% and 2% of the population and therefore make it difficult to infer findings (Rogan and Reynolds, 2016). Regressing the difference between Black Africans and the other groups, displays a statistically significant relationship for all groups ( $P = 0.0000$ ) excepting for those belonging to the coloured group who had too few respondents at less than 2% of the population. Rogan and Reynolds came to the disappointing conclusion in their tracer study that race appears to be linked to success in employment (Rogan and Reynolds, 2016) and this study seems to infer that this is also the case with earnings, as the Black African group earns R16 037 while the White group earns R19 046. As in the previous sections, the interaction between the variables must be considered, before drawing conclusions.

## **5.7. HETEROGENEITY**

As outlined in the previous sections, isolating one variable as causal to higher earnings can be problematic. The Heckman selection in this study initially filters by schooling and university in determining likelihood of employment and thereafter investigates earnings by field of study, gender and population group. A regression analysis was employed to predict whether students would be in the employed or not employed group and thereafter their earnings using the initial filters as predictors for 972 students. The model is found to be partially accurate (38%). The proposed model against the baseline only model was statistically significant, indicating that type of school and university attended reliably distinguished between those that found employment and those did not and thereafter their earnings (chi square = 38.01,  $p < .000$  with  $df = 7$ ). When running the descriptive statistics without controlling for any other factors, the private elite earnings as well as those for the White population group are overstated whereas Education and Humanities earnings were understated.

The fact that the heterogeneity should be considered (Heckman and Vytlačil, 1999; Tsai and Xie, 2011; Borgen, 2015; Marginson, 2017) and that a Heckman Selection (Heckman, 2001; Heckman, Urzua and Vytlačil, 2006) is suitable for the situation, is supported in the literature.

## **5.8. COSTS AND RETURN ON INVESTMENT**

Once opportunity costs in terms of lost earnings are included the UFH graduates would have an amount of R506 957 to recover and the RU graduates R657 569, for the period during which they were studying. Extrapolating for another ten years the RU graduate will have made around 31% more than the Fort Hare student and the divide would grow.



If a calculation for an average person with Matric earning R12 651 (Stats SA survey) who incurred R60 000 food and accommodation costs but no foregone earnings, is included, then after ten years this person would have made around half a million rand (R562 830 according to Stats SA and R227 506 to the My Broadband survey as the My Broadband starting salary for a person with Matric is R5 830) (Skade, 2015). After the next ten years this person would only have R2 million rand (and R843 000 as per My Broadband survey starting salary). The risk factor of not finding employment at all, must however be considered against the backdrop of the high unemployment rate of NEET's between 15 and 24, at 65.5% for 2016 (Equal Education, 2017). Those burdened with debt are severely constrained in earnings, and would also be contributing less tax.

The open market investment return, reflects minimal effort and secondly the risk of the student not graduating at all and therefore not realizing their return, must be factored in. This is even more significant given the heterogeneity in returns influenced by type of schooling, field of study, population group and gender. The likelihood of being unemployed seems to be 7% for RU students and as much as 30% for the UFH (Rogan and Reynolds, 2016). A University education is therefore not always a good investment as returns are not homogenous, and this is consistent with the literature (Keane and Wolpin, 1997; Heckman, Humphries and Veramendi, 2017).

## **5.9. CONCLUSION**

The data seems suggests that university and type of school do filter for whether one would find employment or not. Some students are therefore less likely to find gainful employment depending on these variables. This could be that as success in passing Grade 12 and obtaining a university degree, along with the associated returns are already largely impossible for most South Africans by the end of Foundation Phase and so early intervention in the schooling system is required. Early intervention skills programmes for young children, as early as 3, is critical to the marginal production of skills later on. To ensure that students find gainful employment our lower quintile schools, especially the Foundation Phase needs to be augmented. The RU students as well as those from higher cost schools, were more likely to find employment. Further the quality of our universities that were historically disadvantaged, needs to be improved and perhaps the programmes need to be extended to four years to provide the support needed where necessary, in order to strengthen the screening and signalling functions that these universities are performing.

Thereafter, some groups from the fields of study, gender and population variables, benefited more from the education than others, suggesting that the return to education is not linked

merely to years of education. In other words, some individuals would earn less based on their characteristics whether they attend University or not. Regardless, it makes good sense from a macro-economic perspective to attract all qualifying students to tertiary education as this could provide government with positive returns. Recommendations for future research as well as conclusions will now be discussed.

## **CHAPTER 6 CONCLUSION**

### **6.1. INTRODUCTION**

This chapter outlines the limitations of the study as well as the recommendations for future research. Conclusions as a result of the study are drawn.

### **6.2. LIMITATIONS OF STUDY**

A limitation of the study relates to selection bias as those that responded were perhaps more contactable due to being employed, which is a variable in the study. The data may also have an element of unreliability as it is self-reported.

The University cost data reflect approximations for the two Universities in question, ignoring factors like the risk of failing, as well as possible negative returns on the open market, for the comparison to open market returns. In terms of the cost calculations students were assumed to have completed their degrees in three years, however some students complete in four years and therefore their costs would be higher. In general, the risk both of not completing the education and also completing over a longer period should be considered (Heckman, Lochner and Todd, 2008; Zhou and Navarro, 2017).

The validity of the quality of institution findings can be argued as there are only two Universities in the sample. A further study should include more universities and all fields of study. The two universities surveyed did not offer all courses, for example Veterinary Science and Medicine was not offered. Field of study is assumed to be causally independent, and results thereof are deemed to be unbiased, even if unobservable characteristics explain both field of study and earnings premium. Different fields of study may therefore attract different unobserved differences in ability. The risk of correlation with unobserved variables affecting wages such as ability (where people of better ability earn more regardless of being qualified) biasing the degree effect upwards remains (Walker and Zhu, 2013).

Finally, in terms of the cohort effect (Walker and Zhu, 2013), an assessment needs to be made as to whether graduates were scarce or plentiful at the time, as this will also affect earnings. Panel data has been found to be far more effective in determining earnings as earnings may differ across the lifecycle, for example, education students may earn more initially and have guaranteed employment due to bursaries but other fields may end up earning more over the lifecycle of earnings.

### 6.3. RECOMMENDATIONS FOR FURTHER RESEARCH

The shortfalls in terms of the Human Capital Theory have been identified but it has been outside of the scope of this paper to identify a proposed future model. Further research could attempt to account for the interaction and inter dependency that may occur between variables leading to causality being overstated.

It is recognised that certain fields i.e. education have early payback premiums due to guaranteed employment. Additionally public sector employment may initially yield better returns, but be overtaken by private sector returns in the long term. Walker and Zhu (2011) found that earnings at one point in time are not representative of lifecycle earnings although earnings recorded in the later 30s provide better representation. Long term panel data would be better at determining this, and it is recommended that a follow up study with panel data be undertaken in the future to deliver a better longer term picture. Panel data will also control for unobserved heterogeneity. Lifecycle data could also provide a better picture of the cohort effect where earnings are affected by whether graduates are scarce or in over supply at the time (Walker and Zhu, 2013). Further studies could access Statistics SA and SARS databases for a wider view, with panel data, to explore longer term trends. SARS data may also prove more accurate than self-reported data, although earnings funnelled through trust funds would be difficult to link to individuals. Country wide data for all universities would also mean that all fields of study were included.

This knowledge could result in better prediction of macroeconomic performance. Knowing how certain socio economic variables affect one's ability to learn and earn are important to policy makers. The mechanisms whether these be signalling, employer's perceptions, networking etc. are not fully understood.

This model may be less successful in other countries where inequality is less prevalent, and a smaller earnings disparity and wages are established collectively by unions. South Africa is moving towards more collective bargaining within certain fields especially within the government sector but high inequality in schooling and universities drives the difference in earnings. Perhaps when more universities are included in this model it would be less effective in predicting as in this instance two polar extremes were selected.

As we do have a clear policy model intervention where students that previously were denied access, as their parents earned less than R3250 000 but more than R122 000, to tertiary education have now been granted access, we could track the returns to education for these students in years 2021 and 2022, when they should graduate.

#### 6.4. CONCLUSION

The first objective of this thesis was to determine the association between earnings in South African Bachelor's degree graduate and field of Study, type of school, gender, population group and university where the student completed their degree. The results suggest that even when controlling for other factors, the university a student graduates from as well as the type of school one attended plays a filtering role determining whether those students attain employment, and thereafter influences earnings. RU, has a higher research and through-put rate, and the students that graduate from RU earn more. The difference between the earnings of SET and Humanities is also statistically significant, as is the difference between Commerce and Humanities. The results of this study are congruent with international studies linking field of study, and quality of institution with an earnings premium.

These findings do however need to be viewed with caution as heterogeneity is a factor and the variables are interdependent and difficult to extricate, resulting in causality being overstated. In the South African context perhaps those from Private Schools and the top State schools are more likely to attend tertiary institutions, exactly because they are more likely to derive benefit thereof, and some individuals would earn less based on their characteristics regardless of whether they further their education or not as returns are disaggregated by level of schooling.

This study employs a Heckman selection, including the sorting factors of type of schooling and university as variables in the second step, and questions the validity of the linear nature of the Human Capital Theory, while recognising the heterogeneity of the returns. It acknowledges the fact that this excludes the social benefits of education, as well as the fact that there are other forms of capital besides Human Capital at play. The model is partially successful (38%) at predicting a student's earnings.

The second objective of this study was to establish whether education provides positive returns. This paper found that students from RU, while initially taking longer to recover their investment due to higher initial costs, rapidly overtake those from UFH in earnings, with an ever widening gap. All students would have increased earnings and therefore pay more tax. The government should therefore invest in better schooling, specifically in the foundation phase, and invest in all universities, especially those that were previously black Universities, as this would ensure more tax. We require a national strategy for intervention so that students from poorer groups are provided greater support at University interventions such as a four year degree, should be implemented. The contingent loan system remains a funding alternative however, cognisance should be taken of burdening students with debt as illustrated in the table providing indicative returns, including the loan options.

This thesis deals with returns to tertiary university education in South Africa, trade schools could have very different and higher returns. Regardless of this, it makes good sense from a macro-economic perspective to attract all qualifying students to tertiary education, and to ensure that more students qualify by strengthening early skills development as well as the foundation phase, and more students pass by lengthening the curriculum for those that may be less prepared for tertiary education. A degree in itself is not a passport to equalising society, however all stakeholders have a joint responsibility to keeping the doors of opportunity open to all, including those from deprived backgrounds (Crawford et. al, 2016). Current tertiary education policy may be disequalizing our society.

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## Appendix 1. Heckman Selection statement in Stata.

```
. heckman rawincome i.cesm gender i.q52, twostep select(employ_status = i.q12 university) rho=sigma
```

```
Heckman selection model -- two-step estimates      Number of obs      =          972
(regression model with sample selection)           Censored obs       =          220
                                                    Uncensored obs     =          752

                                                    Wald chi2(7)       =          38.01
                                                    Prob > chi2        =          0.0000
```

		Coeff.	Std. Err.	z	P> z	[95% Conf. Interval]	
rawincome							
	cesm						
	Commerce	370.5366	1056.911	0.35	0.726	-1700.971	2442.044
	Education	98.04327	1753.496	0.06	0.955	-3338.746	3534.833
	Humanities	-1897.14	975.8631	-1.94	0.052	-3809.797	15.51658
	gender	-1943.2	729.6911	-2.66	0.008	-3373.369	-513.0321
	q52						
	Coloured	1373.495	2041.815	0.67	0.501	-2628.388	5375.378
	Indian or Asian	8744.648	2244.202	3.90	0.000	4346.093	13143.2
	White	1849.887	991.8467	1.87	0.062	-94.09722	3793.87
	_cons	24853.79	2463.133	10.09	0.000	20026.14	29681.44
employ_status							
	q12						
	Public school/low cost	-.2284659	.1083685	-2.11	0.035	-.4408643	-.0160675
	Private elite	-.2833815	.1453315	-1.95	0.051	-.5682259	.001463
	Private low cost	-.3110054	.1738455	-1.79	0.074	-.6517362	.0297255

universityatwhichbachelordegreew		-.4000659	.1076347	-3.72	0.000	-.6110259	-.1891058
_cons		1.55426	.1824657	8.52	0.000	1.196634	1.911886
<b>mills</b>							
	lambda	-12051.73	4774.807	-2.52	0.012	-21410.18	-2693.282
	rho	-0.96868					
	sigma	12441.353					