General or Vocational Education? Evidences from the Returns to Education in Tanzanian Manufacturing Firms

Godius Kahyarara and Francis Teal
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Abstract

Although the debate over the returns to vocational versus general education has become an important research in education, adequate empirical work in Africa is still lacking. We add new evidence to this debate by comparing returns to vocational and general education of workers in Tanzanian manufacturing firms. Whereas most of the previous evidences are based on cross sectional data, this paper provides a comparison of the returns to general and vocational education using firm level panel data with substantial information that allows a control for time invariant firm attributes, endogeneity of education and other worker- firm characteristics. Findings of this paper are that general education is more rewarding than vocational education and on the job training. The marginal rates of returns to one year of education ranges between 4.8 and 17.5 percent compared to the rates of returns to one year of vocational education that ranges between 1.4 and 2.8 percent. The results are stable even after we control for endogeneity, firm-worker characteristics and firm fixed effects. Therefore we reject the hypothesis that returns to vocational training are higher than the returns to general education. The paper also shows that at high level of general education unemployment in the Tanzanian labour market is low. Based on this paper's findings vocational education cannot substitute general education. Hence it is justifiable for individuals to acquire more of general education and acquire vocational education and training after general education. There is economic rationale for allocating more resources to the general education.

Keywords: *Vocational and General education in Tanzania, manufacturing.*

1. Introduction

In this paper we compare the returns to vocational versus general education in Tanzanian manufacturing. The comparison allows us to tackle one of the central aspects of education and vocational training literature i.e., the debate on whether it is general education or vocational training that has the highest returns. Up till now empirical results related to this question are inconclusive. Zymelman, 1976 in an internal review of school-based vocational training concluded that there was no clear evidence either for or against this type of education provision. In 1984 George Psacharopoulos, and John Loxley undertook a major evaluation of diversified vocational training provision in secondary schools in Colombia and Tanzania (see Psacharopoulos and Loxley, 1985). Their main conclusion was that from both efficiency and effectiveness point of view, academic secondary education had better outcomes in each country. The Education Sector Review of the World Bank (1995) on the general and vocational secondary curricula indicated that the rate of return was much higher to investments in general than in vocational secondary education. However, Bennell (1996) reports some higher rates of returns to vocational education than the rates of return to general education. A new wave of studies is stressing the fact that the returns to vocational education depend substantially on the general level of economic development, the availability of private sector jobs, and whether or not people are employed in a field related to their training (Bennell and Segerstrom, 1998; Middleton et al., 1993).

An explicit solution to the debate question addressed in this paper is vital from empirical and policy perspectives for several reasons. Provision of adequate education and training service is an expensive venture in any setting, but it is particularly costly in a poor country like Tanzania.

For instance, in implementing Poverty Reduction Strategy (PRS) Tanzania has pledged to allocate more financial resources for education and training sector development, so as to facilitate attainment of universal primary education by the year 2015. This allocation of financial resources needs a proper guide on the potential returns. In connection to that World Bank has adopted a policy that supports general education rather than school based vocational education training. This policy, which affects funding for vocational training in many developing countries, is based on research findings of studies that compare the returns to vocational versus general education. Furthermore, information on labour market outcome of investment in education and training is crucial for graduates who are potential labour market entrants. Empirically, education and training are central sources of human capital and earnings determinants. But the important question is whether and how each of these sources of human capital affects earnings? By addressing the research question this study will add to our knowledge on the role of different dimensions of human capital on the labour market.

In assessing the returns to either education or training an issue that has received a lot of attention in the literature is whether education or training can be treated as exogenous. Previous that have compared the returns to vocational versus general education have mostly relied on cross sectional data that potentially suffers from inability to test and control for endogeneity. The data used here has information on family background, type of school attended by a worker, and other sets of controls. This information provides us with potential instruments for the education variable. Furthermore, time invariant firm specific attributes can influence the estimated earnings effect of education and training. A number of research studies in African labour market (see for example Söderbom, Teal and Wambugu, 2005) demonstrate that firm characteristics such as size have significant influence on the estimated earnings effect of education. The data used here is a panel over the period 1992-2001 which allows us to control for the time invariant firm characteristics along with a broad range of observable firm characteristics. After this introduction we introduce the Tanzania's education and Training system in section two. Our discussion in this second section includes a review of the structure of Tanzanian labor market. In section three we provide a theoretical framework for models estimated in this paper. We present our empirical results in section four, and section five provides summary and conclusion.

2 Education Training System and Labor Market of Tanzania

The Tanzanian education system follows a seven- four- two- three pattern. This pattern implies that after seven years of primary school, pupils can pursue four years of lower secondary education at a public school or training at a post primary training institution that provides basic vocational training. Lower secondary education is followed by two years of higher secondary education. Individuals can also enter training institutions after completing either lower secondary or higher secondary education. However, beyond primary levels, opportunities for formal education and training are tightly allocated. Since the distribution of labour force by training level can reflect the labour force quality and the likely rates of returns to each level of education attained we discuss the trends in enrolments and the way Tanzanian labour force is divided among various levels of education.

2.1 Trends in Enrolments and Labour Force Participation Rates by Types of Training

Overtime, the delivery of education services in Tanzania has been unsatisfactory leading to current low levels of academic achievement, literacy and fluctuating gross enrolment rate especially for primary school pupils. The observed situation in the education sector has potential implications for the returns to education in Tanzanian labour market. For instance, in 1961, there were very few educated workers in the Tanzania labour market due to low enrolment and small size of the education sector. Pay policy during that period favoured market determined wages and the gaps between the top and bottom wage scales were high. In Stevens (1994) for example, it is reported that wage differences between educated, high-level staff and less lower-level staff was 40:1 during the 1960s. Tanzania adopted 'Education for Self-Reliance' in 1967[1]; followed by the

[1] The other change introduced in the education system after 1967 was a nationalization of private schools

Musoma Resolution on education of 1974. Implementation of these two policies resulted into rapid expansion in the education sector. The education sector registered significant improvements during the 1970s in adult literacy, expansion of education systems at all levels and vocationalization of secondary education.

However, these achievements could not be sustained during 1980s due to the economic crises experienced in the early 1980s. The World Bank (1998) estimated that the gross enrolment rate has been declining since the school age population continues to grow faster than the primary education system and suggests the 1997-98 rate of increase in the gross enrolment rate was about 1.2%, less than a fourth of what is needed. In 2005 some 501,152 students completed primary education, but fewer than 70,000 places in secondary education (lower secondary schools and post primary training institutions) were available in public and private institutions. Furthermore, about 21,001 openings were available in upper secondary schools and other equivalent institutions for the 59,037 students who finished lower secondary school (Ministry of Education, 2005).

Following major reforms in the vocational training system enrolments in vocational education training centres has grown from only 39,160 in 1995 to 101,759 in 2004 (VETA, 2005). Given the trends in enrolments described above, the level of education and training of the labour force is extremely low - 30 percent of it is uneducated. Less than five percent of the labour force is educated above the secondary level. Table 1 below shows the employment and unemployment status of Tanzania labour market by type of training and education based on the two national labour force surveys of 1990 and 2000. The figures in the table confirms general poor quality of labour force as more than 80 percent of the labour force has less than post primary education. The largest proportion of the workforce has primary education (about 60 percent) followed by non- educated who makes about 30 percent. The remaining share is distributed among the post primary graduates. Of this share, majority have either vocational or related job training qualifications such as formal and informal apprentices and on the job training. Workers with higher education make less than 1 percent of the labour force as estimated in both of the national labour force surveys. The low level of trained workers in the Tanzanian labour force indicated here partly reflect the empirical findings of convexity of the earnings function reported in previous studies in this area (see Knight and Sabot (1990), Mans et. al. (2005)).

TABLE 1

EMPLOYMENT AND UNEMPLOYMENT STATUS OF TANZANIA LABOUR FORCE BY TYPE OF TRAINING OVER THE PERIOD 1990-2000

Training Type	Employed	Unemployed	Employed	Unemployed
	Status during 1990/1		Status during 2000/1	
No Education	5,074,442	423,750	4,956,816	981,104
	(30)	(46)	(32)	(42.5)
Primary	10,171,688	410,748	9,048,724	1,083,904
	(60)	(45)	(58.3)	(47.0)
Vocational Training	349,931	16,370	313,335	63,261
	(2.1)	(1.8)	(2.0)	(3.0)
On the Job Training	338,211	26,665	309,015	45,566
	(2.0)	(3.0)	(2.0)	(2.0)
Informal Apprentices	387,660	9,331	336,328	60,604
	(2.3)	(1.0)	(2.7)	(5.2)
Formal Apprentices	28,114	2,125	23,328	7,237
	(0.2)	(0.2)	(0.2)	(0.3)
Diploma	54,725	2,504	51,924	5,302
	(0.3)	(0.3)	(0.3)	(0.2)
Polytechnics	319,260	14,540	299,208	34,581

and the encouragement of a public sector monopoly in education provision. However, some private schools were retained.

	(1.9)	(1.6)	(2.0)	(1.5)
Other certificates	167,271	6,331	149,370	24,226
	(1.0)	(0.7)	(1.0)	(1.1)
Degree	20,107	409	30,113	559
	(0.12)	(0.04)	(0.2)	(0.02)
Total	16,914,805	912,773	15,521,229	2,306,348
	(100)	(100)	(100)	(100)

Values in parentheses indicate the percentage of the labour force with a particular type of training who were either employed or unemployed during the time of labour force and employment survey.

3. Theoretical Framework Data And Model Specification

In this section we describe the theoretical framework for estimating returns to vocational and general education. We begin by discussing the theoretical framework. Then we specify the models to be estimated in analyzing the schooling and training effect on earnings profile in our data. Finally we describe data available for the study. The discussion of the data used includes a description of the type of data used, its source and the creation of variables to be used in the earnings specification.

3.1 Theoretical Framework

The theoretical framework for analysing the link between education, training and earnings is based on human capital theory pioneered by Becker (1964), Becker and Chiswick (1966), Mincer (1974) and Ben Porath (1967). In the models of Becker (1964), Mincer (1974) and Ben-Porath (1967) education and training increases earnings through raising human capital. A systematic conceptual framework to analyse the impact of training in the labour market was first proposed by Gary Becker (1962 and 1964). Becker's work identified two types of training, i.e. general and specific. According to Becker, general training is the type of training that once acquired is equally useful (that is it enhances productivity) in all other firms. Specific training is the type of training that enhances productivity only in the firm where it is acquired, and the value of training is lost once the worker leaves the firm. Hence earnings dispersion in human capital theory is due to the fact that skills differ across the labour force.

Empirical works for estimating the returns to education have mostly used the standard OLS earnings function proposed by Jacob Mincer (1974). Nonetheless, the OLS approach to earnings function estimates of the returns to schooling has faced estimation problems. The effects of omitted variable and measurement error in evaluating returns to schooling and training are among the problems of estimating returns to schooling cited in many previous studies (Card and Krueger (1996), Griliches (1977), Card (1995) and Ashenfelter and Zimmerman (1997), Chowdhury and Nickell (1985)). The major concern in applying OLS to estimate the Mincerian earnings function is that the disturbance term captures unobservable (omitted) individual effects that also might influence the schooling decision. Therefore, when we estimate returns to schooling, the precise measurement of the economic returns to schooling is plagued by difficulties in isolating the causal effect of schooling from the joint process of schooling and earnings.

In addition to the estimation problems outlined above, different forms of training might be endogenous in the earnings function leading to biased estimates. To overcome this problem, we need to allow for time invariant unobserved characteristics. Our data do not allow us to address this problem. However, our data set allow us to control for such a broad range of firm and individual characteristics along with time invariant firm characteristics and mitigate the endogeneity problem in estimating the training impact on earnings.

3.2 Model Specification

In the previous section we described the theoretical framework for estimating returns to education. In this section we specify the models to be estimated in analysing the education effect on earnings profile. Our empirical strategy is to estimate an earnings function. The model for estimating the earnings function is specified in the next section.

Earnings Function

$$\ln E_{ijt} = \beta_1 Age_{ijt} + \beta_2 Age_{ijt}^2 + \beta_3 Tenure_{ijt} + \beta_4 Educ_i + \beta_5 Educ_i^2 + \beta_6 [Educ_i \cdot timeleftsc\ hool]_{ij} + \beta_7 [Educ^2 \cdot timeleftsc\ hool]_{ij} + \beta_8 CJT_{ij} + \beta_9 PJT_{ij} + \beta_{10} Timed_t + \mu_j + \varepsilon_{ijt} \quad [1]$$

Where i, j and t are subscripts of individual, firm and time respectively,

LnE	is	log of real earnings,
Age	is	the age of the worker
Tenure	is	the length of time spent in their current firm
Educ	is	years of education,
CJT	is	worker receiving current on-the-job training
PJT	is	worker received on-the-job training in the past.
Timed	are	dummies for the time period
μ	are	Firm fixed effects
ε	is	the error term

The model specified above includes the squares of education and age that allow us to test the concavity of the age-earnings profile and the non-linearity of returns to education respectively in our data. Firm specific training is measured by tenure, i.e. the time spent in the current job. The age variable is intended to capture skill accumulated through general work experience. We have two measures of training; the first (CJT) is whether the worker is currently receiving on-the-job training; the second (PJT) is whether such training occurred in the past. The model also allows for an interaction term between the level of education and the time education was completed. This last term allows us to capture whether the returns on education have varied across cohorts. In this semi-log specification the coefficient on years of education and training can be interpreted as the average private rate of returns to one additional year of education or training. For comparing the rates of returns to general versus vocational education we will determine the relative earnings differentials of workers with different types of education controlling for various firm and worker characteristics. In particular we will aim at obtaining the following coefficient estimate;

$$\beta vt = \frac{\delta LnW}{\delta S} = \frac{EarningsDifferential}{YearsofEducation} = \frac{[(\text{Re}turnstoGeneralwithVocational) - \text{Re}turnstoGeneral]}{YearsofVocationalEducation} \quad [2]$$

Where βvt is the marginal difference in the rate of returns to the increment in returns to vocational education resulting from attending vocational education δLnW is the change in earnings δS is the years of educational attainment. To compare returns to vocational versus general education will use the value of βvt and the coefficient estimates on education estimated in the earnings function specified in equation [1].

3.3 Data and variables

The data used in this study is from the Tanzanian manufacturing firm surveys of the Regional Program of Enterprise Development (RPED) surveys. Schooling is measured as the total number of years of schooling from the highest level of education that the worker completed. The tenure variable is a direct response of the worker to the question that asked how long has he/she been with the current firm. Work experience is represented by age of a worker. The occupational groups are formed by grouping workers into the following categories; managers, service workers, office workers, professionals and production workers. Managers include the employed managers

and owners. Service workers are mainly cleaners, guards and other service workers. Professional workers are engineers, economists, accountants etc. Production workers are foremen, supervisors, electricians, plumbers, machine operators and the related employees. Earnings variable was obtained by taking the total monthly earnings, plus any allowances received. Data on training history of the workers are from questions about various forms of training attended by interviewed workers. Variables for firm characteristics used in this study are sector, ownership, location and other characteristics such as firm size. To create a firm size proxy the log of employment size for each firm was computed.

TABLE 2:

SUMMARY STATISTICS OF HUMAN CAPITAL CHARACTERISTICS AND REAL EARNINGS OF THE WORKERS IN THE SURVEYED FIRMS (1993-2001)

Years		1993	1994	1996	1998	1999	2000	2001
N		695	334	185	456	544	756	796
Real Earnings (in TZS)	Mean	25,660 (7620)	27,158 (7658)	26,580 (7,994)	31,607 (11,243)	32,456 (9,933)	35,698 (7,647)	36,240 (7,720)
Age	Mean	36.66 (1.05)	35.35 (0.91)	36.5 (1.26)	35.98 (1.85)	36.17 (1.78)	36.22 (1.14)	36.27 (1.30)
Years of Education	Mean	8.78 (0.62)	8.82 (0.60)	8.23 (0.66)	8.41 (0.91)	8.40 (0.85)	8.79 (0.62)	8.81 (0.65)
Years of Tenure	Mean	8.81 (0.82)	8.93 (0.72)	8.96 (0.98)	8.50 (1.62)	8.52 (1.56)	8.58 (0.86)	8.81 (0.97)
Current Job training	Percentage[b]	7.30	7.20	5.00	8.30	9.10	10.8	11.4
Past Job training		20.0	27.0	15.0	26.0	25.0	16.3	15.8
Father Education	Mean				1.82 (2.17)	1.96 (2.24)	1.72 (2.02)	1.74 (2.03)
Mother Education	Mean				1.20 (1.93)	1.42 (2.14)	1.18 (1.74)	1.24 (1.76)
None	Percentage[c]	4.00	2.00	2.60	3.00	4.00	3.00	2.20
Primary		54.0	53.0	59.3	53.0	52.0	50.0	50.0
Middle		5.00	6.00	3.60	3.00	2.80	2.00	1.82
Vocational1		4.70	1.20	1.00	12.0	12.0	14.0	14.1
O-level		20.1	24.0	22.0	11.0	12.0	11.1	11.0
Vocational2		2.60	1.00	1.00	10.0	10.0	12.0	13.0
A-level		3.50	6.00	3.50	2.00	1.20	2.00	2.00
Professional		1.00	1.40	2.00	3.00	3.00	3.40	3.20
Higher Education		5.10	5.40	5.00	3.00	3.00	2.51	2.70

Note: Figures in parenthesis are standard deviations; N is the number of observations. Real earnings are in Tanzanian shillings (1994) constant prices. Primary indicates the percentage of workers with primary education, O-level indicates the percentage of workers with ordinary level of secondary education and the A-level indicates the percentage of workers with advanced level of secondary education, vocational1 indicates the percentage of workers with vocational training education obtained after primary/middle school, vocational2 indicates the percentage of workers with vocational training education obtained after ordinary level secondary school, professional

indicates the percentage of workers with the professional education and higher education indicates the percentage of workers with higher education. [a] The real earnings growth variable is constructed using information about the earnings when a worker started job, the current earnings and the time elapsed from when a worker started job to the current period. [b] Is the percentage of workers with either current or past job training. [c] Is the percentage of workers with a specific level of education indicated in the table across the years of survey (1990-2002). Variables of time effects reported in the Table 2.2 controls for time, size and sector effects This control involve estimation of average variables that are predictions based on OLS regressions in which the regressors are sector, time and size dummies (for details see Soderbom, Mans, and Francis Teal (2002))

3.4 Summary Statistics of the variables used in our estimates.

Table 2 above shows summary statistics for various variables used in the empirical analysis of this chapter. The summaries are for the means of worker's monthly real earnings and human capital characteristics over the period 1990-2002. The data in Table 2 show that during the period 1993-1994, average real earnings increased by 5.8 per cent from 25,660 Tanzanian shillings in 1993 to 27, 158 Tanzanian shillings in 1994. After a slight decline to 26,580 in 1996, the average real earnings increased to 31,607 shillings in 1989 (i.e. an increase of 18.9 per cent), and then to 32,456 in 1999. The average real earnings further increased to 35,698 in 2000 and to 36,240 shillings in 2001.

The means of years of education over the period 1993-2002 are also presented in Table 2. The data shows that the mean years of education were 8.78 in 1993. It then slightly increased to 8.82 in 1994 before it declined to 8.23 in 1996. The mean years of education increased to 8.4 during 1998 and 1999, 8.79 in 2000 and then to 8.81 in 2001. In sum the average years of schooling is about 8 years. This implies that most of the workers in our sample have less than post secondary education. To illustrate: the percentage of workers with primary education in our sample over the entire period (1993-2001) of survey is above 50 per cent. The table also shows that during 1993-1996 the second largest group in the sample was made of workers with ordinary secondary education (i.e. 20.1, 24 and 22 per cent respectively). From 1998, the percentage of workers with vocational education has substantially increased. However the percentage of workers with higher education has remained small. This observation can result in a persistent higher rate of return to higher education. We will analyse the trends in distribution of workers by education levels in our sample in section 4 of this chapter.

The means of workers age over the period 1990-2002 are also reported in Table 2. The data show that the average age was 36.66 in 1993, declined to 35.35 in 1994 and then increased to 36.5 in 1996. The data further shows that during 1998-1999, the average years of age of the workers were 35.98 and 36.17 respectively. There was very little change in the average years of age between 2000 and 2001, the average years of age being 36.22 and 36.27 years respectively. The average age of workers in all rounds of survey is about 36 years. Age is a proxy for investment in human capital accumulated through long work experience. How the years of age influence the workers earnings and its implications for work experience, are matters we are investigating in the next section.

The mean of years of tenure, is another variable described in Table 2. The data show that the mean tenure was 8.81 in 1993 and then increased to 8.93 years in 1994. It further increased to 8.96 years in 1996 and then declined to about 8.5 years during the years 1998, 1999 and 2000. Furthermore, it is indicated that the average years of tenure increased to 8.81 years in 2001. The average years of tenure of the workers in Tanzanian manufacturing sector is likely to be influenced by the economic changes. First, until late 1980s, Tanzania manufacturing was dominated by state owned enterprises, and a centralised pay system. From early 1990s, most manufacturing enterprises have been privatised, and several new private enterprises have been established. This might have changed composition of the workers and job patterns. Since tenure proxies for firm specific human capital, or firm specific job training, we will estimate how much earnings rise generally with length of tenure of the workers in our data.

In Table 3 we present the means of real earnings of the workers in our sample by the levels of education and by the time period when they completed school. Two categories of vocational education are included in the education levels presented. The first category is vocational education attended after primary school or middle school. The second category is

vocational education attended after completing ordinary level of secondary education. The results in Table 3 are expressed in absolute values of Tanzania shillings at 1994 constant price. The results reported in the table indicate that the average real earnings for workers with different levels of education increase almost monotonically with the level of schooling. In particular we find that the average real earnings for non-educated workers are the lowest, while the average real earnings for the workers who completed higher education is the highest in our sample. A comparison of the earnings differential between vocational and general education indicates that if a worker after lower secondary school attended vocational training he would gain a premium of 13,590. This is lower than the earnings premium he/she would get by attending upper secondary, i.e. 27,852. The premium of attending upper secondary rather than vocational is more than two folds that of attending the vocational training. We explore more about the earnings differences between vocational and general education in the subsequent sections.

TABLE 3.

THE MEANS OF REAL EARNINGS OF THE WORKERS BY SCHOOLING LEVEL (1960-2000) (VALUES ARE IN TANZANIAN SHILLINGS[e] AT 1994 CONSTANT PRICES)

Education Level	Mean	Median	Standard Deviation	Minimum	Maximum	Total[a]
Means of Real Earnings by education level (with the full sample)						
None educated	17,932	15,287	9,958	1,064	74,626	121
Primary school	20,808	17,808	14,592	907	202,035	2,000
Middle school	28,825	23,999	24,552	1610	220,000	125
Middle+ vocational	27,000	22,307	18,470	4,999	169,328	406
O. Level secondary	28,079	23,140	20,817	726	241,898	494
O. Level +vocational	41,669	29,038	41,965	3,629	411,225	329
A. Level secondary	55,931	40,834	44,904	6,289	206,443	71
Professional courses	76,035	57,587	64,268	7,256	348,003	82
Higher education	113888	61,997	112,577	13,710	575,061	138

Notes: [a] Total is the total number of observations. [b] The workers who attended vocational education after primary school are also included in this category, but because of space we denote this group as middle+ vocational. The exchange rate between Tanzanian shillings and United States Dollar in 1994 was 580 shillings for one dollar.

4 Empirical Findings

4.1 Comparison Of The Returns To Academic And Vocational Education With Estimates Based On OLS Approach.

We present the results in Table 4 below. To address the question raised in this section we ask, which type of education has higher returns general or education? As Table 4 reveals, workers who have general education have higher rates of returns to education than those with vocational training qualifications. In particular, by comparing the marginal rates of returns to one year of vocational training with that of one year of academic education, we find that academic education has higher returns than vocational education in our data. For instance, the rate of returns to one year of vocational is in the range of 1.4-2.8. This is very low compared to the rates of returns to education reported in the above sections.

Moving from column [1] to columns [2-4] we see that the returns to education operate through other factors such as worker occupation and firm fixed effects. For instance, when we control for occupation the returns to vocational attended after completing primary school is reduced by about 10 per cent. The returns to vocational education are almost halved after we control for the firm fixed. These results suggest that OLS estimates of the returns to vocational

training reflect not only the effect of vocational training on earnings, but also other time invariant firm specific characteristics. In particular, a vocational graduate will get high returns by working in high paying firms. Therefore the OLS estimates in columns [1-3] are upwardly biased and cannot fully account for the impact of vocational training on earnings.

In column [2] we consider the effects of job training, controlling for education and other human capital characteristics. The results show a positive effect of job training attended in the past. Specifically, it is indicated that if a worker attended any job training in the past he gains an earnings premium of 9 per cent. We find an effect, significant at the one per cent level. The estimated coefficient on the job training attended currently is not statistically significant.

In column [3] we consider the effects of on the job training on earnings after controlling for the workers occupations. We do so because the incidence of job training can be influenced by a worker's occupation. The results show that when a worker's occupation is controlled for, there is still a positive effect of job training attended in the past. However, the estimated earnings premium is reduced to 8 percent. The coefficient on job training attended currently is positive but not statistically significant. This finding suggests that the job training effect on earnings operate through worker's occupation.

In column [4] we present estimates of the on the job training effects on earnings after controlling for the firm specific time invariant characteristics. There is dramatic shift in the estimated effect of on the job training in our data. The results show that the coefficient on job training attended currently, which has been insignificant in all our specifications, is now significant. But it has a negative sign implying that workers who are currently attending job training have about 10 percent less earnings than those who are not currently attending on the job training. Therefore, earnings impact of job related training is a firm specific phenomenon. Specifically, the results suggest that workers with on the job training are in firms that pay more, rather than the expectation that workers with job training are paid more because of the job training they possess. We present the evidences of changes in returns to vocational education in the third part of Table 4. We still have evidences that the returns to vocational education have changed over time since the 1960s. Specifically, the results in Table 4 show that the returns vocational education attended after primary school increased from 2.4 over the period before 1969 to 3.2 during the period of 1969-1985. This rate declined to 2.8 during the period of 1986-2000. Likewise the returns to vocational education attended after middle school increased from 1.2 during the period before 1969 to 1.6 over the period 1986-2000. We also find similar trends with the vocational training attended after completing ordinary secondary education. The results also show that the highest returns to vocational education are for workers who completed school during the period of 1969-1985. This change in returns to vocational education is observed even after we control for the firm fixed effects. Nonetheless the returns to vocational education presented in Table 4 are lower than the returns to academic education.

4.2 Comparison Of The Returns To Academic And Vocational Education With Estimates Based On Control Function Approach.

In section three of this paper we mentioned that OLS estimates of the returns to education and training are likely to be biased. In this section attempt to reduce the bias our estimates by controlling for variables that might capture part of the unobserved components in the error term in equation. Recently, a control function approach has been used as alternative to the instrumental variable method when controlling for endogeneity of education and training variables. By using the control function we can directly identify the correlation between the endogenous variable (education) and its unobserved determinants. We also predict a residual from education equation, which is used as an additional regressor in the earnings function. A significant parameter estimate of the residual means the unexplained variation of our endogeneous variable of schooling also affects variation in earnings. On the other hand if the parameter turns to be insignificant then we do not accept the hypothesis of endogeneity. The estimates also enable us to directly test for the linearity of the earnings function specification. The results of estimating our earnings function are reported in appendix 2. The residual term is positive and significant at 1 percent.

TABLE 5.

THE COMPARISON OF THE RETURNS TO ACADEMIC AND VOCATIONAL EDUCATION

Columns	1	2	3	4	Number of observation
Returns to vocational education attended after primary or middle school based on years of education					
Variable Name					
Primary School	4.82***	4.94***	4.18***	2.21***	2,000
Middle School	6.30***	6.34***	5.22***	2.93***	125
Middle/Primary+ vocational	7.70***	7.74***	6.78***	3.64***	406
Marginal difference in the rate of returns[a]					
Primary +Vocational	2.88***	2.80***	2.60***	1.24***	
Middle + Vocational	1.40***	1.40***	1.56**	0.71***	
Current Job Training		4.0	5.0	-10**	
Past Job Training		9.0**	8.0**	-0.4	
Returns to vocational education attended after O-level secondary school based on years of education					
O-level Secondary	10.5***	10.5***	8.3***	5.1***	494
O-level Secondary+ vocational	13.3***	13.3***	10.4***	6.5***	329
Marginal difference in the rate of returns[a]					
O-level Secondary + vocational	2.8	2. 8	2.1	1.4	
Returns to vocational education by the period of school completion					
Attended Before 1969					
Primary + vocational	2.4***	2.4***	1.46***	1.34	125
Middle + vocational	1.2***	1.2***	0.74***	0.66	406
Attended between 1969-1985					
Primary + vocational	3.2***	3.2***	2.24***	1.84	125
Middle + vocational	1.6***	1.6***	1.12***	0.92	406
Attended between 1986-2000					
Primary + vocational	2.8***	2.8***	1.84***	1.40	125
Attended Before 1969					
O-level + vocational	1.2***	2.4***	0.74***	0.66	125
Attended between 1969-1985					
O-level + vocational	3.2***	3.2***	1.12***	0.92	125
Attended between 1986-2000					
O-level + vocational	1.4	2.8	1.84	1.4	125
Control Variables					
Job Training	NO	YES	YES	YES	
Occupations	NO	NO	YES	YES	
Firm fixed Effects	NO	NO	NO	YES	

Notes: [a] The results presented in this table are computed from the regression results reported in appendices 1 and 2 as reported in table 6 of this chapter. [a] The marginal differences in the rate of returns refers to the increment in returns to education resulting from attending vocational education. It is computed as the ratio of estimated coefficient of returns to academic education minus the estimated coefficient of the returns to vocational education to the total number of years spent in vocational education. Based on Tanzania vocational training system, we use one year as the time spent in vocational. PR is the point of reference

This suggests that the unexplained variation of schooling also affects variation in earnings. Therefore we reject the exogeneity of schooling. The test for exogeneity based on hausman test also confirms that we cannot accept the exogeneity at 5 percent. The test for the linearity of earnings profile shows that we cannot accept the linear specification of the education earnings profile in our data. We use the coefficient results on education to compute the marginal returns to attending vocational training reported in table 6 below. The marginal rates of returns to one year of vocational and general education reported in Table 6 still point to the fact that general

education has higher returns than vocational education in our data. The difference is that estimates with control function show earnings effect that are higher than what we reported with OLS in Table 5. However, the finding of higher coefficient estimates on schooling after control for endogeneity of schooling is well documented in the literature. As we pointed out earlier there are other possible reasons from empirical studies for this observation. Measurement errors in reported years of schooling is the main possible reason (see card (2001). In columns [3-4] we report control functions that consider firm characteristics and firm fixed effects. In both columns, we still have strong evidence that we cannot accept exogeneity and linearity of the schooling earnings profile. The estimated coefficients are larger than what we observed in the OLS estimates after controlling for these factors. These results suggest that the estimated returns to schooling by OLS are downward biased. The main conclusion is still that there is no evidence to support the previous findings that vocational education has higher returns than general education.

TABLE 6.
THE COMPARISON OF THE RETURNS TO ACADEMIC AND VOCATIONAL EDUCATION WITH ESTIMATES BASED ON COTROL FUNCTION APPROACH.

Columns	1	2	3	4	Number of observation
Returns to vocational education attended after primary or middle school based on years of education					
Variable Name					
Primary School	5.1***	6.2***	4.00***	2.50***	2,000
Middle School	6.7***	8.0***	5.1***	3.3***	125
Middle/Primary+ vocational	8.3***	9.8***	6.3***	4.1***	406
Marginal difference in the rate of returns[a]					
Primary +Vocational	3.2***	3.6***	2.3 ***	1.6***	
Middle + Vocational	1.6***	1.8***	1.2***	0.8***	
Returns to vocational education attended after O-level secondary school based on years of education					
O-level Secondary	11.5***	13.4***	8.7***	5.7***	494
O-level Secondary+ vocational	13.1***	15.5***	9.9***	6.5***	329
Marginal difference in the rate of returns[a]					
O-level Secondary + vocational	1.6	2.1	1.2	0.8	
Control Variables					
Job Training	NO	YES	YES	YES	
Occupations	NO	NO	YES	YES	
Firm fixed Effects	NO	NO	NO	YES	

Notes: [a] The results presented in this table are computed from the regression results reported in appendices 1 and 2 as reported in table 6 of this chapter. [a] The marginal differences in the rate of returns refers to the increment in returns to education resulting from attending vocational education. It is computed as the ratio of estimated coefficient of returns to academic education minus the estimated coefficient of the returns to vocational education to the total number of years spent in vocational education. Based on Tanzania vocational training system, we use one year as the time spent in vocational. PR is the point of reference

5 Summary and Conclusions

In this paper we have addressed the critical question in the education and training literature; how do the returns to general education compare with the returns to vocational training? It will be recalled, that empirically no conclusive evidence exists on which type of education vocational or academic has the highest returns. We have added new evidence to the debate by comparing the rates of returns to academic, vocational education and on-the- job training. Our results have strongly indicated that formal education in the surveyed firms is more rewarding than both, the vocational education and on the job training. Our OLS earnings function estimated rates of returns to schooling for primary school completed at 4.82 per cent, while middle school graduates had 6.3 per cent earnings premium. This marginal rate of returns increases up to 17.5 if the same worker would have a higher education qualification. When the results were compared with the rates of returns to vocational training we found that the marginal rates of returns to vocational ranged between 1.4 to 2.88 percent.

The OLS estimates indicated a positive effect of job training attended in the past. A worker attended any job training in the past was estimated to gain about 9 per cent more of earnings. But the estimates based on fixed effects within estimators indicated that, controlling for firm fixed effects on job training attended currently is negatively correlated with earnings, which was insignificant in OLS estimates became significant. Hence the fixed effects regressions suggest that the job training impact on earnings is influenced by the time invariant firm specific characteristics.

We have also reported estimates that control for endogeneity of education variable via control function approach. The results suggested that the unexplained variation of education also affects variation in earnings, rejected exogeneity of education and linearity of our earnings profile. We still found that the returns to general education are higher than the returns to vocational education. But with control function we have earnings effects that are higher than what we reported with OLS. We pointed to factors highlighted in literature such as measurement errors in reported years of schooling is the main possible reason (see card (2001), to partly explain the higher coefficients with control function.

We conclude out paper as follows. There is no evidence to support the previous findings that the returns to vocational training are higher than the returns to general education in our data. We note that most of the studies that have compared the rates of returns to vocational versus general education have used cross sectional data that suffers from inability to control for endogeneity of education along with several other factors. We have seen how the estimated coefficients are driven by factors like worker occupation, firm characteristics and time invariant fixed effects. We argue that failure to control for these factors might explain an upward bias of the earnings effect of education. Based on our results, it will be economical for individuals in Tanzania labour market to invest more in general education and attend vocational training later, and vocational training is not a good substitute of general education. In the fight against poverty, Tanzania government should solicit and allocate more funds in general education and continue to provide demand –supply balanced vocational education.

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APPENDIX 1
THE RETURNS TO EDUCATION AND JOB TRAINING IN TANZANIAN MANUFACTURING (WITH FULL SAMPLE)[a]

Columns	1	2	3	4	Number of observation
Returns to education based on years of education[+ see note to table]					
Variable Name					
None					121
Primary School	4.8	4.9	4.18	2.21	2,000
Middle School	6.3	6.3	5.22	2.93	125
Middle/Primary+ vocational	7.7	7.7	6.78	3.64	406
O-level Secondary	10.5	10.5	8.34	5.06	494
O-level Secondary+ vocational	13.3	13.3	10.42	6.48	329
A-level Secondary	13.3	13.3	10.42	6.48	71
Professional	16.1	16.1	12.5	7.91	82
Higher Education	17.5	17.5	13.54	8.62	138
Current Job Training		4.0	5.0	-10**	
Past Job Training		9**	8**	-0.4	
Total Observation					3,766
Returns to education based on dummies for the highest level of education completed.					
Variable Name					
None	-20.7***	-21.0***	-17.4**	-14.9**	121
Primary School	PR	PR	PR	PR	2,000
Middle School	13.2*	12.5*	6.12	0.31	125
Middle/Primary +vocational	14.6***	15.0***	7.07*	7.50**	406
O-level Secondary	29.9***	29.6***	18.9***	10.0***	494
O-level Secondary+ vocational	48.0***	48.4***	32.1***	23.2***	329
A-level Secondary	84.8***	83.7***	60.4***	26.9***	71
Professional	102.4***	100.0***	68.7***	42.8***	82
Higher Education	135.0***	134.0***	94.7***	48.8***	138

Current on Job Training		4.0	4.7	-9**	
Past on Job Training		9**	7**	-0.5	
Total Observation					3,766
Control Variables					
Job Training	NO	YES	YES	YES	
Occupations	NO	NO	YES	YES	
Firm fixed Effects	NO	NO	NO	YES	

Notes: [a] The results presented in this table are computed from the regression results reported in appendices 1 and 2 of this chapter. [+] All coefficient estimates of returns to education based on the years of education are statistically significant at 1% level. Significance at the 1 per cent, 5 per cent and 10 per cent level is indicated by *** , ** and * respectively. PR is the point of reference.

APPENDIX 2

REGRESSION RESULTS OF THE ESTIMATES OF EARNINGS EFFECT USING CONTROL FUNCTION AND FIXED EFFECTS WITHIN ESTIMATES

	OLS	CF1	CF2	FE (Within)-CF
Years of Education	-0.061	-0.064	-0.045	-0.031
	(4.00)***	(4.23)***	(2.89)***	(2.11)**
Education squared	0.008	0.009	0.006	0.004
	(10.54)***	(10.36)***	(6.70)***	(4.88)***
Age	0.054	0.058	0.053	0.034
	(6.20)***	(6.58)***	(6.08)***	(3.52)***
Age squared	-0.001	-0.001	-0.001	-0.000
	(4.82)***	(5.12)***	(4.92)***	(2.75)***
Years of Tenure	0.001	-0.000	-0.000	0.006
	(0.07)	(0.03)	(0.02)	(2.19)**
Residual		0.059	0.060	0.031
		(3.84)***	(3.76)***	(2.05)**
Current Job training	0.005	-0.004	0.019	-0.181
	(0.03)	(0.08)	(0.34)	(3.31)***
Past Job training	0.122	0.127	0.105	0.004
	(2.97)***	(3.10)***	(2.59)***	(0.11)
1997	0.024	0.041	0.060	0.155
	(0.51)	(0.85)	(1.26)	(2.97)***
1998	0.001	0.013	0.040	0.173
	(0.07)	(0.30)	(0.90)	(3.60)**
1999	0.064	0.066	0.064	0.038
	(1.41)	(1.44)	(1.43)	(1.02)
Control Variables				
Job Training	YES	YES	YES	YES
Occupations	NO	NO	YES	YES
Firm Fixed Effects	NO	NO	NO	YES
Test: Education earnings Profile linear (P-value)	0.000	0.000	0.000	0.000
Test: Exogeneity Hausman test (P-value)		0.462	0.197	
Observations		2333	2333	2338
R-squared	0.23	0.24	0.27	0.16

Significance at the 1 per cent, 5 per cent and 10 per cent level is indicated by *** , ** and * respectively. All other variables are as defined before. CF is a control function. The instrument variables are family background, distance to school and school type.