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Education Policy and Returns to Schooling

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Abstract

This paper uses micro data from Tanzanian manufacturing firms to examine the influence of education policy on returns to schooling. The question stems from the fact that over time education systems and policies are likely to change, hence workers who attended the same level of schooling in different years are likely to display differences in returns to schooling. The paper contributes knowledge in the empirical estimation of returns to schooling where instrumental variables are usually individual characteristics such as parental background or education background. In this paper, education policy differences that affect school attendants differently are used as instruments instead. There are views that education policy is non-exogenous, and hence cannot be instrumental in endogenous schools. In this paper an attempt is made to see the extent to which this view can hold in our empirical estimations. This paper has the advantage of making use of panel data to directly estimate the effect of education policy on earnings, while controlling for schooling. The resulting estimates of the study strongly support that returns to education have changed over time. The results based on years of schooling also support this finding, but when we control for firm fixed effects, they lose their statistical significance.

1. Introduction

This paper uses micro data from Tanzanian manufacturing firms to address the question of whether returns to schooling can be influenced by education policy that existed at the time when a worker completed school. The question stem from the fact that over time education systems and policies are likely to change. Empirically, education policy has been cited as one of the potential instruments for endogenous schooling variable, and as a solution to concerns of omitted variable bias. The major concern in applying OLS to both estimates is that the disturbance term captures unobservable (omitted) effects that also might influence the determinants of returns to schooling.

Since independence, the education system in Tanzania has gone through distinct policies, partly influenced by political and economic structures. Before independence and until 1967, the education policy in the country was designed to serve the colonial rule, which was basically the British education system. After independence, Tanzania changed its education policy to serve the interests of the newly independent country. In 1967, Tanzania adopted the Arusha Declaration. This was followed by comprehensive education policy changes

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through the Musoma Resolution of 1974, and the economic reforms of the 1990s. Hence, there are Tanzanians who attended English primary schools; primary education system of 4 plus 4 (middle school), primary education that used Kiswahili as a medium of transaction, and cost-sharing versus free education mix. Thus, results based on the level of education strongly support that returns to education have changed over time. The results based on years of schooling also support this finding, but lose their statistical significance when controlled for firm fixed effects.

Using information on the changes in educational system, there are three periods that had different education systems: the period before 1969; the period extending over the years of 1969-1985; and the period between the years of 1985-2000. To estimate the effects of education policy for the various cohorts, we create a dummy variable that takes the value of 1 (one) if the year when a worker ended school falls in one of the three periods, and 0 (zero) if otherwise. Likewise, the paper estimates the schooling variable measured by both the years of schooling and the level of the highest education attained.

1.1 Education Policy Reforms and the Returns to Schooling

Estimation of returns to schooling has been very crucial in any economy for planning purposes. Although the cost of education is high, yet the returns from schooling are higher and outweigh the costs. The benefits differ widely among economies and between individuals, even among those with the same level of education. Empirically, economic benefit analysis approaches have been applied to ascertain what it costs to provide education, and how gains from it are realized by different individuals. However, major estimation problems have plagued estimation techniques of returns from schooling. Omitted variable bias, or individual effects that are time-invariant, have complicated the measurement.

There are scholars who maintain that since the random assignment to education is not the usual possibility given the nature of public good education, to some extent natural experiments can reduce the severe problems of endogeneity in the measurement of returns from schooling. If one takes cohorts of individual workers who went through the same education but in different environments where education policy might be the differencing factor, such education policy is a legitimate exogenous factor that can be used as an instrument for endogenous schooling (Denny et al., 2000). For example, Angrist and Krueger (1991) explore how an individual's season of birth may imply that some students reach school-leaving age after fewer months of compulsory education than others, allowing for the creation of suitable instruments to exploit in an instrumental variables (IV) approach. Harmon and Walker (1997) use the change in compulsory schooling law, which raised the minimum schooling age in Britain, to generate an exogenous change in education. In both of these approaches, the key variable will affect the

education decisions of a subset of a population, those who leave school as soon as they can, so one interpretation of these results is that the IV estimates identify the rate of return to the marginal or 'treated' group only. As argued by Card (1999) "… IV estimation based on an intervention that affects a narrow sub-group may lead to an estimated return to schooling."

A somewhat different approach is used by Duflo (1999), whose estimation is based on the exposure of individuals to a massive investment program in education in Indonesia in the early 1970s. Individuals were treated on the basis of their date of birth (pre- and post-reform), and the district they lived in (as investment was a function of the assessment of local level needs). On their part, Meghir and Palme (1999) pursue a similar strategy in their analysis of reforms in Sweden in the 1950s that was intended to extend the schooling level nationally. This was piloted in a number of school districts prior to its adoption nationally, and it is from this pre-trial experiment that the variation in attainment comes. Both of these studies rely on large-scale reforms, or 'natural experiments' whose effect differed across individuals.

2. Education Systems and Policy of Tanzania

As mentioned earlier, Tanzania's education system has gone through distinct regimes since independence, partly influenced by political and economic structures. Each of these education systems have had implications for the returns to schooling and training. Workers who completed school before 1967, for example, benefited from the existence of rent due to relative scarcity of educated labour force in the country. For example, in 1961 there were only 3115 primary schools with a total of 431,056 pupils (Maliyamkono & Kahama 1986); 95 secondary schools with a total population of 11,832 pupils; and a few crafts and technical schools with the total capacity of 1500 pupils (Ministry of Education, 1968). At the university level, there was the University of East Africa that admitted students from Kenya, Uganda and Tanzania. The annual intake of Tanzanian students in this university was about 200 (URT, 1964). Also, the pay policy during this period favoured market determined wages, and the gap between top and bottom wage scales were high. For example, Stevens (1994) report that wage differences between educated, high-level staff, and lower-level staff was 40:1 during the 1960s.

Workers who attended the education system introduced after 1967 went through a system that was expanding rapidly. For example, primary school gross enrolment rate rose from 25% at the time of independence (1961) to over 60% in the mid-1970s (Malyamkono & Bagachwa, 1990). The expansion of education enrolment, especially after 1967, could affect earnings level by increasing the supply of educated workers. Apart from affecting quantity (enrolment expansions), there might be changes in the quality of schooling induced by education policy changes that were introduced after 1967. For example, to

facilitate the implementation of its socialist goals, Tanzania adopted 'Education for Self-Reliance' in 1967[1]; followed by the Musoma Resolution of 1974. Major changes that were introduced by these two policy documents included the introduction of Swahili as the sole teaching language in primary schools, reduction of years spent in primary school from eight to seven, setting a target to achieve Universal Primary Education (UPE) by November 1977, and the transformation of secondary education into a mass educational system, whereby formal study would end after six years (URT, 1968).

The data set in this paper has information on workers who attended the education system marked with expansion and the changes outlined above. For instance, we have information on workers who attended either eight years or seven years of primary school education. This information will be used to compare the returns to schooling for these types of graduates from the primary education system. The other aspects that might have influenced the quality of schooling during this period were the shortage of books, and the translation of some technical academic books into Swahili, especially in the natural sciences for primary school books. At the secondary level, schools lacked enough space to accommodate new students due to a limited government budget and a shortage of teachers. Also, the severe economic crisis that faced the economy during the late 1970s through 1980s is another factor that affected the education system attended after 1967 (Galabawa & Mbele, 2000).

Workers who attended the education system introduced in the early 1990s faced an education system, which, in several respects, represented a reversal of the policies introduced in 1967. The free education system was replaced by a cost-sharing scheme, and private sector participation in educational provision was enhanced as a part of the overall economic liberalization policies. These reforms of the education system were introduced after severe budget constraints, a general economic crisis in the 1970s and 1980s, and also as part of the social, political and economic reforms introduced in the mid-1980s (Galabawa, 2000). Also, the introduction of cost-sharing and the competition between public and private education and training providers partly influenced the role of family background in education/training achieved. In the absence of free state education, the amount of investment in education might now reflected family background, such as family resources. In addition, the introduction of cost-sharing might have affected access to schooling by people from poor families.

However, in 2002 all forms of direct fees in primary schools were abolished as part of the poverty-reduction strategy. In secondary schools, cost-sharing aimed at shifting about 35% of direct costs to parents. But a survey on household

[1]The other change introduced in the education system after 1967 was a nationalization of private schools and the encouragement of a public sector monopoly in education provision. However, some private schools were retained.

expenditure and cost-sharing conducted by the Economic Research Bureau (ERB) of the University of Dar es Salaam in 1994 revealed that non-payment of fees was a major problem in implementing the cost sharing scheme even in secondary education. The survey found that parents already carried a large burden of indirect costs in the form of caution money, exam fees, travel, food, uniforms, textbooks, exercise books and many others, hence some parents—especially the poor—could not afford to pay this direct fee. We conclude that all these changes in education policies may have affected the quality of schooling, which may have in turn had an effect on returns to schooling for primary and secondary school leavers. We will, therefore, test the impact of these changes on returns to schooling using our firm-level data.

The use of levels of schooling rather than years of schooling enables us to investigate the way changes in the education system affected specific education levels. To address the question on the earnings differences induced by changes in the education system, we first present the results obtained from estimating earnings function in which the schooling variable is measured by years of schooling. One of the major questions that has emerged from empirical estimations of the returns to schooling based on econometrics models is whether education policy is exogenous, and should be used as an instrumental variable. A study by Denny et al. (2000) on how changes in education policies of Ireland influenced innovation of workers in Ireland from 1960s showed evidences that changes in education can either be exogenous or endogenous to education. In particular, the study assessed how returns to schooling was affected by free education system introduced for all school-age youth; high cost of fees for those who completed school before policy changes; and also considered changes in participation rate and enrolment, especially from poor households. Therefore, one of the major recommendations has been to find a data set that can trace changes in returns to schooling over time, and include information on changes in education policies and direct estimations of policy effects on returns to schooling. This paper uses panel data from Tanzania's manufacturing terms that has a rich information about workers' attributes, including the time they completed school, the highest level of education attained, and the total earnings they receive per month.

3. Theoretical Framework, Data and Model Specification

In this section we describe the theoretical framework for estimating returns to school and training. We begin by discussing the theoretical framework for analysing the link between schooling, job-training and earnings. Second, we review the literature and empirical models for estimating returns to schooling and on-the-job training. The problems of estimating returns to schooling and job-training, along with the possible solutions, are also discussed in this part. Third, we specify the models to be estimated in analysing the schooling and on-

the-job training effect on earnings profile in our data. Finally, we describe the 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 schooling, and on-the-job training and earnings is based on a 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), schooling increases earnings through raising human capital. A systematic conceptual framework to analyse the impact of on-the-job training in the labour market was first proposed by Gary Becker (1962 and 1964). Becker's works identified two types of training, i.e., the general, and the specific. According to Becker, general training is one that once acquired is equally useful (that is it enhances productivity) in all other firms. On the other hand, specific training is a type of training that enhances productivity only in the firm where it is acquired, and its value is lost once a worker leaves the firm. Hence, earnings dispersion in the human capital theory is due to the fact that skills differ across the labour force.

Some empirical works in the literature on human capital theory have made an attempt to proxy for specific versus general training through analysing different effects of on-the-job training versus off-the-job-training (Lynch, 1991; 1992); or by looking at the different effects of company training versus school training (Loewenstein & Spletzer, 1997) when analysing earnings or wage growth and mobility. Other scholars have focused on examining employer's willingness to invest in general training (Bishop & Kang, 1996). It is apparent from recent literature that while a conceptual separation between general and specific training is a useful tool of analysis, in reality much of job-training is a mixture of general and specific training. Katz and Ziderman (1990), and Acemoglu and Pischke (1998a) have pointed out that asymmetric information can mean that training that would otherwise be general is in effect specific. Despite the difficulty in categorizing training between general and specific, more availability of data with explicit information regarding job-training has led to the availability of evidence regarding the empirical relationship between training and earnings, the relationship between mobility and training, and other aspects such as cost-sharing in investment and determinants of training.

There are authors who have measured directly the effect of accumulating human capital through training (e.g., Lynch, 1992; Barron, Black & Loewenstein, 1989; Booth, 1991; Lynch, 1991; Gritz, 1993; Krueger & Rouse, 1998; Bartel, 1995; Holzer et al, 1993, etc.). Lynch (1992) analysed the effects of on-the-job- training versus off-the-job-training. In this study it was found that on-the-job training

raises wages at the current employer but not at future employers. With regard to mobility, Lynch (1991) found that individuals with on-the-job training are less likely to leave their current employer, while individuals with off-the-job-training are more likely to leave.

Apart from the human capital theory, there are other models that explain the correlation between learning and earnings. In signalling models, first developed by Spence (1973), it is suggested that schooling acts as a signal or a filter for ability differences among workers that firms would wish to reward but cannot reward directly. In this model, workers choose education not to increase their productivity—as in the human capital model—but to *signal* their ability to employers. It is assumed that ability differences may be positively correlated with length of schooling because, for example, more able persons receive a higher benefit from a given amount of schooling; value future earnings more highly; have lower costs of schooling in terms of lower time effort; and/or enjoy learning. According to Weiss (1988), from a firm's perspective these attributes are likely to be unobserved but are valuable nonetheless because they may enhance returns to on-the-job training within a firm, and reduce the likelihood that such a worker quits, or is absent: simply, it reduce monitoring costs.

Other explanations for the positive correlation between schooling/training and earnings are provided in the job matching theory, an incentive-based theory (Lazear, 1981), and self-selection (Salop, 1976). According to Salop (1976), rising wage profiles may serve as a self-selection device to discourage potential movers from seeking employment elsewhere. On the other hand, Lazear (1981) argues that a worker's incentive to shirk is reduced using a more steeply rising age-earnings profile. For this reason, a worker's age-earnings profiles should be upward-sloping even if the worker's productivity does not vary over her/his life cycle.

Empirical works for estimating returns to schooling and on-the-job training have mostly used the standard earnings function developed by Jacob Mincer (1974). The earnings function assumes that skills acquired by a worker through education and on-the-job training can be regarded as a stock of human capital that influences a worker's productivity by the same amount in all lines of production. In the absence of information on post-schooling training that takes place while on-the-job, experience and tenure variables have been used as proxies for job-training. Experience is represented as a quadratic term to capture the concavity of the earning profile (Porath, 1967). However, the availability of data on job-training has facilitated direct estimation of the returns to job-training. This has been through including job-training variables among the regressors in the earnings function. The traditional approach to estimate the relationship between schooling and job-training has been to apply ordinary least square (OLS) in the earnings function.

Nonetheless, the OLS approach to earnings function estimates of returns to schooling has faced estimation problems. The effects of omitted variables 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 & Krueger, 1996; Griliches, 1977; Card, 1995; Ashenfelter & Zimmerman, 1997; Chowdhury & 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.

There are a number of approaches that have been proposed to deal with problems of estimating the OLS earnings function. Empirical studies in returns to schooling have exploited within-twins or within-siblings differences in wages and education, and then applied fixed effects estimation technique that undertake data transformation to obtain the within groups or fixed effects estimators. The other approach to the econometrics problems of estimating OLS earnings function has been to find an instrument that is correlated with the true measure of schooling and uncorrelated with the unobservable fixed effects to obtain a consistent estimator of the returns to schooling.

Although finding a suitable instrument is difficult, previous works in this area have argued that information on parental background variables, school quality, education policy, and other family characteristics are potential controls for endogenous schooling (Card, 1995; Ashenfelter & Zimmerman, 1997; Butcher & Case, 1994; Card, 1993). In Card (1995) and Ashenfelter and Zimmerman (1997), parental education was used as an instrument for schooling. Other studies such as Butcher and Case (1994), report IV estimation results based on a sibling instrument. Card (1993) uses geographic proximity to a four-year college as an instrument for education.

Studies that have attempted to correct the omitted variable bias using IV have mainly obtained coefficient estimates higher than what OLS estimates (Card, 1993, 1995; Butcher & Case, 1994; Ashenfelter & Zimmerman 1997). Among the reasons advanced for such observation is the attenuation bias caused by the measurement error of schooling (Card, 1999). The other direct approach to estimation problems of earnings function has been to separate effects of ability and schooling by including direct measure or proxy for ability in the earnings function. Studies that have utilized this approach have used aptitude test scores such as IQ to proxy for unobserved ability effects (see, for example, Griliches, 1977; Knight & Sabot, 1990). Griliches (1977) noted that while unobserved ability would tend to bias the OLS estimates of the returns upwards, measurement error in the education variable would tend to bias

estimates towards zero. He suggested that the biases might actually cancel out, leaving OLS estimates as a good guide to the true return to education.

In addition to the estimation problems outlined above, different forms of training might be endogenous in the earnings function, leading to biased estimates. The main source of bias is that firms might choose whom to train, making the decision on training participation endogenous. When firms select best-motivated workers for training, the individual motivation possessed by the best workers is likely to be unobservable to a researcher (although observable to the firm), hence cannot be dealt with by simply adding observable characteristics to a standard earnings function. If higher wages associated with trained workers merely reflect the fact that these workers were more motivated in the first place, the earnings impact of training on real earnings will be biased. 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 allows us to control for such a broad range of firm and individual characteristics, along with time invariant firm characteristics, to 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 schooling and training. In this section we specify the models to be estimated in analysing the schooling and training effect on earnings profile. Our empirical strategy is to estimate an earnings function. For assessing the effect of schooling and training on earning levels, we specify an earnings function that is augmented with schooling and training variables, and use the log of real earnings as a dependent variable. The model for estimating the earnings function is specified in the next section.

Earnings Function

$$\begin{aligned} ln\, E_{ijt} = {} & \beta_1 Age_{ijt} + \beta_2 Age_{ijt}^2 + \beta_3 Tenure_{ijt} + \beta_4 Educ_i + \beta_5 Educ_i^2 \\ & + \beta_6 [Educi \cdot timeleftschool]ij + \beta_7 [Educ_i^2 \cdot timeleftschool]ij \\ & + \beta_8 CJT_{ij} + \beta_9 PJT_{ij} + \beta_{10} Timed_t + \mu_j + \varepsilon_{ijt} [1] \end{aligned}$$

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 the current firm; *Educ* is years of education; *CJT* is a worker receiving current on-the-job training; *PJT* is a worker who received on-the-job training in the past; *Timed* are dummies for the time period; μ are Firm fixed effects; and 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 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 a worker is currently receiving on-the-job training; and 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.

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). This is the richest panel data of firms in Tanzania. It was collected since 1992 by the World Bank, and later on by the Centre for the Study of African Economies. The data combines both labour market and firm surveys, where in each firm a set of 10 workers with different characteristics were interviewed. The time span of the data is from 1992 till 2010. Two measures of schooling are presented. First, schooling is measured as the total number of years of schooling, calculated from the highest level of education that a worker completed. Secondly, education is measured as the highest level of schooling completed. The tenure variable is a direct response of a worker to the question that asked how long has s/he been with the current firm. Sex and age were direct responses to the personal identification questions of one's age, and direct observation of sex of a respondent. The occupational groups are formed by grouping workers into the following categories: managers, service workers, office workers, professionals, and production workers. Managers include 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 related employees.

The earnings variable was obtained by taking the total monthly earnings, plus any allowances received. This was through taking the responses to the question on current monthly wage of a worker before tax, and excluding any allowances or overtime pay. Allowances in terms of food allowance, clothing allowance, housing allowance, and annual bonuses were added. Allowances were collected in rounds 2, 3, 4 and 5. There was no information for allowances in round 1. Allowances in round 1 have thus been calculated from information at firm level on the total amount of various types of allowances that a firm pays to its workers on monthly basis, along with information about categories of workers who receive allowances. For the construction of real earnings, the study used the consumer price index for urban dwellers in Mainland Tanzania, with 1994 as the base year.

Data on the training history of workers are from questions about various forms of training attended by interviewed workers, and have been included in all the five waves of the manufacturing surveys. There were specific questions that sought to identify whether a worker was ever an apprentice in the current firm, or previously in another firm; whether a worker was currently receiving any form of on-the job-training within the firm or outside the firm; and whether a worker received on-the-job training in the past within the firm or outside the current firm. Variables for firm characteristics used in this study are sector, ownership, location and other characteristics such as firm size. The log of employment size for each firm was computed to create a firm size proxy.

In Table 1 we ask, first, whether returns to schooling differ by the period when a worker completed school. The answer to this question is, yes. As column 1 reveals, the returns to each level of education changed over the period of 1960 to 2000. For example, using primary school graduates as a reference point, we observe that the returns to schooling of higher education graduates between 1969–1985 nearly doubled, rising from 176% to 307% between 1969–1985. The results further show that over the period 1968–2000, the returns to higher education relative to primary school more than doubled as it increased from 176% during the period before 1969, to 364%over the period of 1986–2000.

Table 1: Returns to Schooling and Job-training in Tanzanian Manufacturing (1960-2000) By the Level of Schooling Attained

Variable Name	1	2	3	4	Number of Observations
Returns to Education for Workers who Completed School Before 1969					
None	-40.9	-40.31	-41.32	-15.97	4
Primary School	PR	PR	PR	PR	274
Middle School	15.9*	15.9*	7.36	1.82	113
Primary/middle+ vocational	17.23*	17.94**	6.18	17.35***	69
O-level Secondary	55.27***	53.7***	29.56***	18.53**	46
O-level Secondary + vocational	28.66**	28.4***	24.39***	5.42**	20
A-level Secondary	105.4***	106.27***	46.23***	4.5**	4
Professional	171.8***	174.6	107.5	61.6	2
Higher Education	175.7***	176.2***	105.4***	69.9**	10
Sub-total observations					**542**
Returns to Education for Workers who Completed School Between 1969-1985					
None	-37.8*	-37.3*	-33.83*	-30.51	7
Primary School	PR	PR	PR	PR	1,003
Middle School	38.82***	39.1***	22.02***	21.87**	12
Primary/middle+ vocational	23.12**	23.49**	12.75***	11.63**	220
O-level Secondary	43.33**	41.91**	25.73***	14.57**	238

O-level secondary+ Vocational	116.4***	111.7***	77.36***	37.58**	147
A-level Secondary	161.17***	157.1***	95.42***	46.43**	37
Professional	218.9***	209.6***	121.7***	74.19***	40
Higher Education	307.2***	295.9***	163.8***	57.46**	76
Sub-total observations					**1,780**
Returns to Education for Workers who Completed School After 1985					
None	-12.98*	-13.58*	-11.57	-10.6	110
Primary School	PR	PR	PR	PR	723
Primary/middle+ vocational	22.02*	21.05*	11.63	4.08**	117
O-level Secondary	33.6**	32.3**	25.5**	11.6**	210
O-level secondary+ vocational	47.99**	49.18**	30.08***	32.18**	162
A-level Secondary	140.4***	139.6***	107.5**	39.15**	30
Professional	172.4***	166.5***	92.7***	43.33***	40
Higher Education	363.7***	364.6***	203.4**	81.12***	52
Sub-total observations					**1,444**
Current on Job-training		0.04	0.05	-0.09**	
Past on Job-training		0.08**	0.07**	0.01	
Control Variables					
Job-training	NO	YES	YES	YES	
Occupations	NO	NO	YES	YES	
Firm fixed Effects	NO	NO	NO	YES	

Notes: Significance at the 1%, 5% and 10% level is indicated by *** , ** and * respectively. PR is the point of reference

The middle school graduates also enjoyed an increase in the premium. In particular, their returns relative to primary school graduates increased from 15.9% to 38.8% between 1969–1985. Further, the average returns to education of workers with ordinary level of education relative to primary school graduates fell from 55.2% in the 1960s to 43.3% in 1969–1985, and 33.6% recently. The average returns to education for workers with advanced level of secondary education increased significantly between 1968–1985 (from 105%–161%), and then declined during the period of 1986–2000. The changes in returns to schooling are observed even when we control for job-training, occupations, and firm fixed effects in columns 2–4, although the size and significance of the estimated coefficients are reduced.

The main finding in Table 1 is that there are evidences of the earnings differences for workers with the same level of education obtained from different types of education systems reflected in the three periods identified earlier. However, there is no systematic pattern of change in returns to schooling induced by the time period when education was completed for many of the education levels. It is only the higher education and middle school graduates that appear to have experienced increasing returns to education over the three periods. The systematic rise in returns to schooling of higher education

graduates is consistent with increasing convexity of the returns to education in our sample. But before we interpret these results we first address our main question in this section using results that estimate the returns to schooling using years of education as a measure of education in Table 2 and Figure 1.

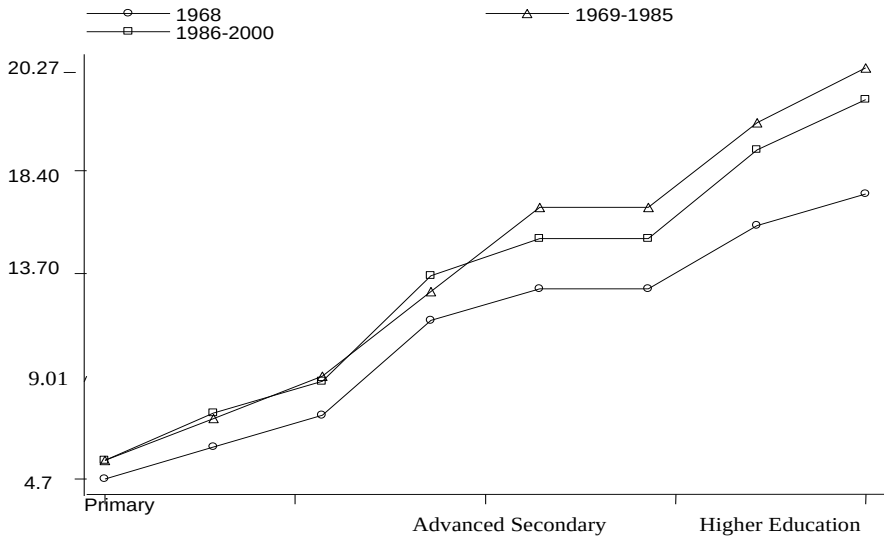

Figure 1: Estimated Returns to a Year of Education for workers who completed school over the period of 1960-2000

Similarly, we ask whether the returns to years of education for workers differ by the period when school was completed. Again, the answer to our question is, yes. As Figure 1 and Table 2 reveal, there are differences in returns to education for workers who completed education at different periods. The results in Table 2 show that the returns to each level of education increased over the period 1960–1985, but most substantially for higher education graduates. For example, the returns to primary school education between 1969–1985 increased by about 14%, while the returns to higher education increased by over 30% during the same period. Furthermore, the results indicate that the returns to school for workers who completed school after 1986 were slightly less than returns for workers who completed school between 1969–1985. However, when we control for firm fixed effects, the coefficients on schooling interacted with the time of school completed, and are not statistically significant.

The results in Figure 1 also indicate that the returns to schooling for workers who completed school after 1969 were higher than the returns for those who completed school before 1969. Furthermore, the results indicate that the returns to post-secondary school for workers who completed school after 1986 were less than the returns for those who completed school between 1969–1985.

Table 2: Returns to Schooling and Job-training in Tanzanian Manufacturing (1960-2000) Based on Years of Education

Variable Name	1	2	3	4	Number of Observations
Returns to Education for Workers who Completed School Before 1969					
Primary School	4.7[a]	4.7[a]	3.2[b]	2.12[c]	274
Middle School	5.9	5.9	3.92	2.78	113
Primary/Middle + vocational	7.1	7.1	4.66	3.44	69
O-level Secondary	10.7	9.5	6.88	5.42	46
O-level secondary +vocational	11.9	11.9	7.62	6.08	20
A-level Secondary	11.9	11.9	7.62	6.08	4
Professional	14.3	14.3	9.10	7.40	2
Higher Education	15.5	15.5	9.80	8.06	10
Sub-total observations					**542**
Returns to Education for Workers who Completed School Between 1969-1985					
Primary School	4.7[a]	4.7[a]	3.2[b]	2.12[c]	274
Middle School	5.9	5.9	3.92	2.78	113
Primary/Middle + vocational	7.1	7.1	4.66	3.44	69
O-level Secondary	10.7	9.5	6.88	5.42	46
O-level secondary +vocational	11.9	11.9	7.62	6.08	20
A-level Secondary	11.9	11.9	7.62	6.08	4
Professional	14.3	14.3	9.10	7.40	2
Higher Education	15.5	15.5	9.80	8.06	10
Primary School	4.7[a]	4.7[a]	3.2[b]	2.12[c]	274
Sub-total observations					**1,780**
Returns to Education for Workers who Completed School After 1985					
Primary School	4.7[a]	4.7[a]	3.2[b]	2.12[c]	274
Middle School	5.9	5.9	3.92	2.78	113
Primary/Middle + vocational	7.1	7.1	4.66	3.44	69
O-level Secondary	10.7	9.5	6.88	5.42	46
O-level secondary +vocational	11.9	11.9	7.62	6.08	20
A-level Secondary	11.9	11.9	7.62	6.08	4
Professional	14.3	14.3	9.10	7.40	2
Higher Education	15.5	15.5	9.80	8.06	10
Sub-total observations					**1,444**
Control Variables					
Job-training	NO	YES	YES	YES	
Occupations	NO	NO	YES	YES	
Firm fixed Effects	NO	NO	NO	YES	

Notes:

[a] All coefficients in the column are significant at 1%.

[b]The coefficient estimate of the quadratic term of education is significant at 1% whereas the coefficient estimate of the linear term of schooling is significant at 10%.

[c]The coefficient estimate of the quadratic term of education is significant at 1% whereas the coefficient estimate of the linear term of schooling is significant at 5%.

[d] The coefficient estimate of the interaction between linear term of schooling and the second period of school completion (1969-1985) is significant at 10% level while the coefficient estimate of the interaction between quadratic term of schooling and the second period of school completion is significant at 5%.

[e] The coefficient estimate of the interaction between linear term of schooling and the second period of school completion (1969-1985) is not significant while the coefficient estimate of the interaction between quadratic term of schooling and the second period of school completion is significant at 5%.

Thus, the results based on the level of education strongly support our findings that returns to education have changed over time. The results based on years of schooling also support this finding, but when we control for firm fixed effects, they lose their statistical significance. But we believe the findings that returns to education have changed for a number of reasons. First, as argued before, an estimate of schooling based on years of schooling is based on an implicit assumption that the returns to a year of education are the same at every level of education. This assumption tends to mask the important information in terms of the changes that may affect only a specific type of education, and the way labour markets influence returns to different levels of education.

This observation is consistent with the increasing convexity of returns to schooling in our data. To confirm this result, we investigate the trends in returns to schooling in our data by describing the shapes of earnings functions over the period 1993–2000. Specifically, we use data for the five waves of surveys over the period 1993–2000 to estimate the cross–sectional earnings functions, and then use the coefficients on schooling and the years of schooling required to complete each level of education to estimate the returns to different levels of education across the five waves.

Figure 2 presents the results. To examine the changes in convexity of the returns to education over time in our data, we ask whether the slope of earnings function has shifted across the five waves of the period 1990s–2000. The answer to our question is, yes. As Figure 2 reveals—except for the second wave—there is a systematic pattern of upward shift of the earnings function over the period 1993–2000.

The other finding revealed in Figure 2 is that there are differences between the rates of return to years of education across levels of education. For instance, it is indicated that in all the five waves of surveys, the returns to post-secondary education are higher than those for primary and secondary education. This observation further confirms our observation of a considerable convexity in the relationship between the wage rate and years of completed schooling, especially at the higher education level.

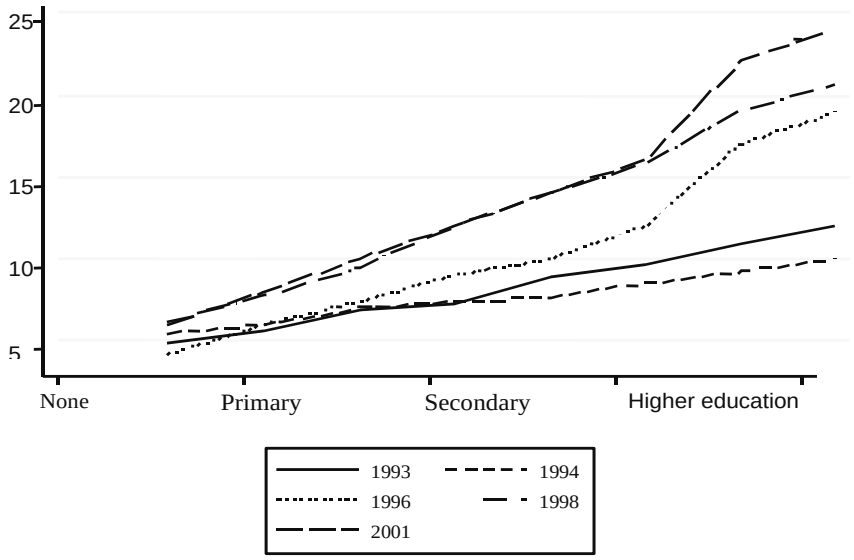

Figure 2: Trends in Returns to Schooling Over the Period (1993-2001)

The important questions that arise here are: What explains the increase in convexity of the earnings function in our data? Why have the returns to schooling shifted over time in our data? To address these questions, we look at the factors that have influenced the supply and demand for graduates over time in Tanzania, along with changes in labour market conditions that might have influenced earnings.

We saw earlier that whereas higher education had the highest growth rate, (from a total enrolment of 203 in 1960 to 13,442 in 2000) in absolute terms pre-higher education contributed the largest share of the educated labour supply by far. Therefore, we anticipate that the relation between changes in relative supply and earnings of higher education graduates will be positive as long as the demand for workers with higher education tends to increase more than supply over time.

In the case of less educated workers, if the demand for such workers in the labour market remained constant over time, earnings might have been pulled downward by changes in supply. This is certainly compatible with stable demand over time, i.e., the observed pattern of wage changes could in principle be explained by changes in supply alone, in the form of a negative relation between changes in labour supply. This pattern is in strong contrast to the situation explained in Knight and Sabot (1992), where the effect of expansion in education in Tanzania accounted for a fall in returns to ordinary level of secondary education between 1970–1980.

The other explanation of our results is that recent economic reforms—particularly the emergence of the private sector as the alternative employer, introduction of competitive product market, and the liberalization of the labour market—might have helped stimulate changes in the demand for skilled and/or more educated labour and the level of earnings.

In addition, several models (e.g., *training or human capital* models, *signalling* and/or *sheepskin* hypothesis*)* and others predict that earnings will increase with years of education. According to the *training* or *human-capital model,* schooling increases one's skills that are valuable to firms. The *signaling model* predicts that workers with more education receive higher pay because schooling signals a worker's ability. Related to the signaling model is the *sheepskin hypothesis,* whereby firms observe the signal whether people get a diploma (sheepskin) for graduating. This section concludes that the returns to education in our data are non-linear, changing over time, and become more convex.

4. **Conclusions and Recommendation**

This paper aimed at analysing the effect of education policy on returns to schooling by making use of existing rich data set from surveys of Tanzania's manufacturing firms that ask individual workers the time they completed school. This information was combined with various questions that probed the type, level, and highest education and training attained by individual workers. There were also other questions that made it possible to set up a Cobb Douglas production function, and an earnings function of the Mincerian type.

This paper has had the advantage of making use of a panel data, and directly estimating the effect of education policy on earnings while controlling for schooling. The analysis began by considering changes in Tanzania's education since the 1960s. Such an assessment revealed that since independence the education system of Tanzania has gone through distinct policies, partly influenced by political and economic structures. Before independence and until 1967 the country's education policy was designed to serve the colonial rule, which was basically the British education system. After independence Tanzania changed its education policy to serve the newly independent country. In 1967, Tanzania adopted the Arusha Declaration. This was followed by comprehensive education policy changes through the Musoma Resolution of 1974, and the economic reforms of the 1990s. Hence, there are Tanzanians who attended English primary school, primary education with 4 plus 4 systems (middle school), primary education that uses Kiswahili as a medium of instruction, and cost–sharing versus free education mix. Thus, the results based on the level of education strongly support that the returns to education have changed over time.

The results based on years of schooling also support this finding, but when we control for firm fixed effects, they lose their statistical significance. The results further show that over the period 1968–2000, returns to higher education

relative to primary school more than doubled as it increased from 176% during the period before 1969 to 364 over the period of 1986–2000. The average returns to education for workers with advanced level of secondary education increased significantly between 1968–1985 (from 105%–161%), and then declined during the period of 1986–2000. The changes in returns to schooling are observed even when we control for job-training, occupations, and firm fixed effects, although the size and significance of the estimated coefficients are reduced. Therefore, the returns to schooling are influenced by the education policy captured by the period one went to school.

References

Acemoglu, D. & S. Pishke. 1999. The Structure of Wages and Investment in General Training. *Journal of Political Economy*, 107: 539–572.

Angrist, J. D. & A. B. Krueger. 1991. Does Compulsory School Attendance Affect Schooling and Earnings. *Quarterly Journal of Economics*, 106: 979–1014.

Ashenfelter, O. & D. Zimmerman. 1997. Estimating of Return to Schooling from Sibling Data: Fathers, Sons and Brothers. *Review of Economics and Statistics*, 79: 1–9.

Barron, J.M., D.A. Black & M.A. Loewenstein. 1989. Job Matching and On-the–Job-training. *Journal of Labour Economics,* 7(1): 1–19.

Bartel, A. P. 1995. Training, Wage Growth, and Job Performance: Evidence from a Company Database. *Journal of Labour Economics*, 13(3): 401–425.

Becker, G.S. & B.R. Chiswick. 1966. Education and the Distribution of Earnings. *American Economic Review,* 56: 358369.

Becker, G.S. 1964. *Human Capital: A Theoretical and Empirical Analysis*. New York: National Bureau of Economic Research.

Ben-Porath, Y. 1967. The Production of Human Capital and the Life Cycle of Earnings. *Journal of Political Economy*, 75: 352–365.

Bishop, J. H. & S. Kang. 1996. Do Some Employers Share the Costs and Benefits of General Training? Centre for Advanced Human Resource Studies, Working Paper 96–19, Cornell University.

Booth, A.L. 1991. Job-related Formal Training: Who Receives it and What is it Worth? *Oxford Bulletin of Economics and Statistics,* 53(3): 281–294.

Butcher, K. F. & A. Case. 1994. The Effects of Sibling Composition on Women's Education and Earnings. *Quarterly Journal of Economics*, 109: 443–450.

Card, D. 1995. Using Geographic Variation in College Proximity to Estimate the Return to Schooling. In: Louis N. Christofides, E. Kenneth Grant and Robert Swidinsky (eds.), *Aspects of Labour Market Behavior: Essays in Honor of John Vanderkamp.* University of Toronto, Canada, pp. 201–222.

Card, D. & B. K. A. 1996. School Resources and Student Outcomes: An Overview of the Literature and New Evidence from North and South Carolina. *Journal of Economic Perspectives*, 10(4): 31–50.

Chowdhury, G. & S. J. Nickell. 1985. Hourly Earnings in the United States: Another Look at Unionisation, Schooling, Sickness, and Unemployment Using PSID. *Journal of Labour Economics*, 3(1): Part I, 38–69.

Galabawa, J. 2000. Access and Equity on Education: The Nyerere Legacy. Chapter presented at the National Economic Policy Workshop on The Nyerere Legacy and Economic Policy Environment in Tanzania; Year 2000 and Beyond. Dar es Salaam, Tanzania.

Griliches, Zvi. 1977. Estimating the Returns to Schooling: Some Econometric Problems. *Econometrica*, 45: 1–22.

Gritz, M. R. 1993. The Impact of Training on the Frequency and Duration of Employment. *Journal of Econometrics,* 57: 21–51.

Harmon, C. & I. Walker. 1995. Estimates of the Economic Return to Schooling for the United Kingdom. *American Economic Review,* 85(5): 1278–86.

Katz, E. & A. Ziderman. 1990. Investment in General Training: The Role of Information and Labour Mobility. *The Economic Journal,* 100: 1147–1158, December.

Knight, J.B. & R.H. Sabot. 1990. Education, Productivity and Inequality: The East African Natural Experiment, Oxford University Press.

Krueger, A. & C. Rouse. 1998. The Effect of Workplace Education on Earnings, Turnover, and Job Performance. *Journal of Labour Economics,* 16: 61–94.

Loewenstein, M. A. & J. R. Spletzer. 1997. Dividing the Costs and Returns to General Training. *Journal of Labour Economics* 16: 142–71.

Lynch, L. M. 1991. The Role of Off-the-Job vs. On-the-job training for the Mobility of Women Workers. AEA Chapters and Proceedings, May: 151–156.

—. 1992. Private-Sector Training and the Earnings of Young Workers. *The American Economic Review*, 82(1): 439–480.

Malyamkono, T. & M. S. D. Bagachwa. 1990. *The Second Economy in Tanzania*. London: James Currey.

Mincer, J. 1988. Job-training, Wage Growth, and Labour Turnover. NBER Working Chapter No. 2690.

—. 1974. *Schooling, Experience, and Earnings*. New York: National Bureau of Economic Research.

—. 1994. The Production of Human Capital and the Lifecycle of Earnings: Variations on a Theme. NBER Working paper no. 4838, Cambridge.

Psacharopoulos, G. & W. Loxley. 1985. *Diversified Secondary Education and Development: The Case of Colombia and Tanzania.* Baltimore: Johns Hopkins University Press.

Salop, J. & S. Salop. 1976. Self-selection and Turnover in the Labour market. *Quarterly Journal of Economics,* November, 617–627.

Spence, M. 1973. Informational Aspects of Market Structure: An Introduction. *Quarterly Journal of Economics,* November, 591–597.

Stevens. M. 1994. Public Expenditure and Civil Service Reform in Tanzania. In: Lundauer & Barbara(eds.). *Pay and Employment Reform in Africa.* The World Bank, 1818 H Street, N.W., Washington, DC.

Schultz, T.P. 2004. Evidence of Returns to Schooling in Africa from Household Surveys: Monitoring and Restructuring the Market for Education. *Journal of African Economies*, 13(02).

United Republic of Tanzania (URT). 1964. *Five Year Plan for Economic and Social Development.* Dar-es-Salaam: Government Printer.

—. 1968. *National Education Assessment.* Ministry of Education. Dar-es-Salaam: Government Printer.