

Determinants of Urban Worker Earnings in Ghana: The Role of Education

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Abstract

The paper examines the role of education in earnings determination by using all three rounds of the Urban Worker Survey of Ghana for 2004-2006 conducted by CSAE. The analysis is begun by investigating and comparing heterogeneity in earnings determinants amongst self-employed (informal sector), private sector workers and public sector workers with particular focus on education. An examination of the role education, individual and household characteristics play in facilitating entry into employment sectors is further undertaken in a multinomial logit model of occupational attainment in addition to analyzing the pattern of returns to education along the earnings distribution. After addressing biases associated with estimating earnings equations, it is observed that education plays an important role in promoting access to lucrative formal sector jobs, especially employment in the public sector but has no direct impact on earnings within the sector.

Keywords

Education, Earnings, Labour Markets

1. Introduction

The importance of education in modern labour market outcomes cannot be over-emphasized. The theoretical underpinnings have been provided by Schultz [1], Becker [2] [3] and Mincer [4]. Recent studies by Psacharopoulos [5], Schultz [6] and Psacharopoulos [7] endorse positive returns to education especially at the primary level and have partly been the justification for the prominent feature of policy in Sub-Saharan Africa (SSA) towards primary education [8].

The evidence on returns to education in Sub-Saharan Africa is inconclusive although generally biased towards convexity. The indication of convexity in recent studies by Söderbom and Teal [9], Kingdom and Söderbom [10], Rankin *et al.* [11] is a signal of skill shortage at high levels of education. The overall expansion and focus

on primary education as a policy prescription is therefore questionable if returns to education are the highest at higher levels. Consequently, the need for further research returns to education particularly at high levels.

Labour markets in most developing countries are segmented into broadly defined formal and informal sectors [12] in a dualistic labour market. The formal sector is regulated by law and most decent jobs and is found in this protected sector whereas the informal sector is unregulated and unprotected especially in area of job security and earnings. The informal sector as a result absorbs many job seekers who are unable to secure employment in the formal sector. Recent empirical evidence, on the other hand, suggests the possibility of viewing the informal sector as an efficient outcome of the labour market that utilizes technology intensively in unskilled labour that coexists with the formal sector with comparatively skilled labour at much higher wages [8].

In Ghana, self-employment is the fastest growing segment of the labour force across rural and urban areas constituting about 65% of total employment [13], this trend is typical of most developing nations especially in Africa. Among the enormous challenges that faces the government as a result, is the need to identify development strategies that can generate new employment and income opportunities to reduce unemployment and under-employment. An investigation of the earnings determination process in the informal sector is as a consequence vital to understanding the labour market and income determination/distribution.

This paper aims to fill gaps in the earnings determination literature by investigating and comparing heterogeneity in earnings determinants across occupations (public and private formal sectors and the informal (self-employment) sector) with particular attention on schooling. First is an examination of the role of education in the labour market in terms of earnings by occupation as a baseline model. This is followed by an examination of how education, individual and household characteristics facilitate entry into employment sectors in a multinomial logit model of occupational attainment and subsequently address selectivity bias in the earnings equation following Heckman [14] and Lee [15]. This is necessitated by the important role education plays in labour market success by not only increasing earnings but by the indirect promotion of entry into well paid occupations. Lastly, quantile regression technique is applied to analyze earnings determinants across quantiles of the conditional earnings distribution. This sheds light on whether premiums to education and other earnings determinants for urban workers in Ghana are identical for low and high earners in addition to whether education ameliorates or worsens existing inequalities.

2. Methodology

Analysis of the demand for education has been driven by the concept of the human capital pioneered by Schultz [1], Becker [3] and Mincer [4]. Mincer's [4] model is adopted in this paper based on the fundamental assumption that an individual's earnings reflect his/her labour productivity and that investment in human capital in the form of foregone earnings in the past pays off in higher wages in the future [16]. This led to the development of a theoretical model from which the following wage equation is derived for this study

$$\ln w_i = \alpha_i + \beta_i X_i + u_i \quad (1)$$

where w_i is the monthly earnings of individual i , X_i is a vector of worker characteristics and u_i is the residual. According to Card [16], the choice of time over which to measure earnings is mostly dictated by data availability. The explanatory variables include the log of hours of work, education (highest educational level completed), tenure (the duration on the job as a proxy for experience) and gender dummy to control for disparities in earnings by sex as well as occupational and firm level variables. Labour market tenure is included in linear and quadratic form: to identify the shape of tenure earnings relationship. Beneath the assumption of no other cost of education rather than foregone earnings, the estimated coefficient of education (schooling) variable directly measures the returns to one additional year of education in terms of earnings. The use of years of schooling implicitly suggests that one additional year of schooling, regardless of the current level of education, yields the same return. This may not be the case if, for example, completed degrees rather than years of schooling itself are valued in the labour market. As a result education is allowed to affect earnings in a non-linear way by the inclusion of dummy variables for the highest completed educational level in the earnings function. Corresponding coefficients in this regard, represent the wage premium associated with the different education levels compared to the reference group (no education). Other explanatory variables used include sex, firm size and sector of employment, these are not exhaustive in the Mincerian model but dictated by data availability. Empirical analysis is subsequently carried out based on three labour market sub-sectors: public sector, private sector, self-employ-

ment in addition to a pooled model. Where public and private are formal sector jobs and self-employment is in the informal sector.

Two main sources of bias in OLS estimates of effects of education on earnings are endogeneity (omitted variable) bias and sample selectivity bias. The former relates to the concern in earnings literature that education may be positively correlated with unobserved ability which will lead to an upward bias of estimates of the returns to education.¹ Therefore, to be sure our findings are not due to the failure to allow for such endogeneity, instrumental variables are used to control for endogenous education.

Endogeneity is caused by a correlation between explanatory variables and the disturbance term. This means

$$Cov(x, u) \neq 0 \tag{2}$$

This results in biased and inconsistent estimates; which is corrected by an identification of variable(s) that are not correlated with the residual but correlated with the endogenous variable. Subsequently, parent’s education (mother and father’s education) are used as instruments for education in an instrumental variable estimation.

In Ghana as in most developing countries (particularly in Africa), having a job in the formal wage sector is typical of outcomes in the labour market (selection into different sectors of employment are correlated with the potential determinants of earnings). In addition, observations with no earnings information are excluded, if exclusion of such observations is not random (lower earners are less likely to work), such sample selection bias may bias OLS estimates. Estimation of equations over an endogenously selected population requires the implementation of selection correction methods following Heckman [14]. When selection is presumed to be over a large number of exclusive choices, the multinomial logit specification is applied as by Lee [15] and Durbin and McFadden [17].

I therefore model occupational outcomes by focusing on the way in which education and other individual and household characteristics influence people’s decisions to participate in the formal public or private sectors and self-employment relative to unemployment for consistent estimates of the earning function. Following Heckman [14] and Lee [15], the earnings equation is corrected for selectivity by including the inverse of Mills ratio² (selection correction term) as an additional explanatory variable in the earnings equation.

$$\ln w_{ij} = \alpha_{ij} + \beta_{ij} X_{ij} + \rho_{ij} \lambda_{ij} + u_{ij}; u_{ij} \sim N(0, \sigma^2) \tag{3}$$

where w_{ij} is the monthly earnings of individual i in sector j , X_{ij} represent explanatory variables, β_{ij} are estimated parameters, λ_{ij} is the selectivity correction term and ρ_{ij} measures the effect and direction of non-random selection into employment sectors, the null hypothesis of ‘no bias’ is subsequently rejected if this is statistically significant.

Quantile Regression

It is possible that earnings determinants, particularly education may be different for individuals at different points in the earnings distribution. Standard OLS techniques concentrate on estimating the mean of the dependent variable subject to values of the independent variables where variables are included as uncentred regressors. As an alternative to OLS, quantile regression is based on the entire sample available and allows us to estimate the return to education within different quantiles of the earnings distribution [5]. This makes it possible to focus on quantile treatment effects of education and other covariates on earnings rather than on the average treatment effect and as such add value to estimation results. Following Bushnisky [5], the quantile regression model of the earnings function is specified as follows;

$$\ln w_i = x_i' \beta + u_{\theta_i} \tag{4}$$

$$Quant_{\theta}(\ln w_i | x_i) = x_i' \beta_{\theta}; Quant_{\theta}(u_{\theta_i} | x_i) = 0 \tag{5}$$

¹Belzil and Hansen (2002) find a strong and positive correlation between unobserved ability and unobserved taste for schooling which leads to a substantial upward bias of OLS estimates of returns to schooling. However, recent findings in empirical literature indicate that estimated returns rise as a result of treating education as an endogenous variable, Card (2001).

²The inverse Mill’s ratio is defined as $\lambda_{ij} = \frac{\phi(H_{ij})}{\Phi(H_{ij})}$, where $H_{ij} = \Phi^{-1}(P_{ij})$, $\phi(\cdot)$ is the standard normal density function, $\Phi(\cdot)$ the normal distribution function, and P_{ij} is the estimated probability that the i^{th} worker chooses the j^{th} occupation.

3. Data and Results

3.1. Data Source and Description

The urban household worker surveys for Ghana were conducted by the Centre for the Study of African Economies (CSAE)³ in collaboration with the Ghana Statistical Office (GSO) based on a stratified random sample of urban households from the 2000 census. Urban areas covered include Accra (and neighboring Tema), Kumasi, Takoradi and Cape Coast. The surveys have been conducted for 2004, 2005 and 2006 and collect information on incomes, education and labour market experience (tenure) household characteristics and numerous other modules for labour market participants in urban areas. The study uses all three rounds of the UHWS in pooled sample estimations. Although it has been a while since the data was collected, the UHWS is the only known labour market survey in Ghana which tried to track individuals overtime, although the high attrition rate made it impossible to conduct any meaningful analysis using the data as panel. For this reason, it is deemed necessary to research into the labour market using this data set.

Summary of the sample are provided in **Table 1** and **Table 2**. The sample distribution by sector and gender in **Table 1** shows the private sector is the largest sector in terms of employment (47%) followed by self-employment (25.7%), unemployment (20%) and public sector (7.2%) respectively. This pattern is similar to the male distribution though unemployed men outnumber men in self-employment. Among females, self-employment is the largest category, followed by private sector, unemployment and public sector respectively. Average years of schooling are high for the two formal sectors (public and private) with self-employment as the least in terms of education. We find a clear hierarchy in occupations with respect to education with public sector at the top, followed by the private sector, unemployment and self-employment.

The unemployed in Ghana possess mean education that are close to those in formal sector (private sector), an indication that in Ghana the unemployed seem to queue for suitable job opportunities in the formal sector. Average years of tenure on the job are highest for self-employment followed by public sector and the least is the private sector. The overall low tenure on the job suggests a high labour turnover in Ghana particularly in the private sector. Average monthly earnings by employment sector and gender presented in **Table 2** show earnings differences exist between sectors in Ghana.

Table 1. Labour market distribution by sex, education and tenure.

Employment Status	All (%)	Female (%)	Male (%)	Education (years)	Tenure (years)
Public	7.2	4.7	9.3	10.6	6.7
Private	46.9	30.8	60.6	9.1	2.6
Self-employment	25.7	42.1	11.7	6.6	8.8
Unemployment	20.1	22.3	18.4	8.6	-
Total	2,107	970	1,125	8.16	5.70

Source: Calculations from Ghana UHWS 2004, 2005 and 2006 [18]-[20].

Table 2. Average monthly earnings by employment sector and gender.

Employment Sector	All (\$)		Female (\$)		Male (\$)	
	Mean	Std. Dev	Mean	Std. dev	Mean	Std. dev
Public	111.18	100.18	120.85	122.86	107.16	89.56
Private	87.63	124.44	61.42	63.25	97.79	139.96
Self-employment	74.19	180.20	55.87	55.49	131.38	346.60
Total	84.60	145.10	60.71	64.83	104.43	184.84

Source: Calculations from Ghana UHWS 2004, 2005 and 2006 [18]-[20].

³University of Oxford.

Table 2 indicates average earnings in the public sector are about 26% and 49% more than private sector and self-employment earnings respectively as depicted in **Figure 1**. Disaggregation of earnings by gender point out that, with the exception of the public sector, average earnings for men are more than women in all sectors. A summary of all other variables used are presented in **Table A1** in the **Appendix**.

3.2. Empirical Results

Baseline OLS results of the earnings equation are presented in **Table 3** with years of schooling, results with levels of schooling are presented in **Table 4**. Earnings function is specified for the total sample without occupational variables (pooled 1) and with occupational controls (pooled 2). Control variables include tenure and tenure square, educational level variables and gender⁴ dummy. To evaluate the impact of enterprise characteristics on earnings, firm size (number of workers) and dummies⁵ for sector of employment are introduced in the pooled (2) model. Location dummy is additionally used to control for differences in earning opportunities due to area of residence. The term returns to education is commonly used in the Mincerian earnings literature but the coefficients are not returns in its strictest sense but the gross earnings premium from an extra year or level of education and not ‘return’ to education as it does not take into consideration the cost of education. Results are consequently interpreted with this caveat in mind.

Table 3 shows the average marginal returns (premium) to education is 7.9% in Ghana, this drops to 6.2% once we introduce occupational level variables and highlights the general tendency to underestimate returns to education in earnings function that includes occupational level variables. Knight and Sabot (1990) confirm this by noting that education can influence wages by influencing the choice of occupation, sector or firm size a worker enters. Appleton and Balihuta [21] also note this in a study on education and agricultural productivity on Uganda. Results from specification (2) with levels of education in **Table 4** also reiterate this fact as coefficient of all schooling levels relative to no education which captures the premium to education at that particular level are higher in pooled (1) than those in pooled (2) with occupational level variables.

The average premium to an additional year of education in Ghana is highest in the private sector 8.7%, followed by the public sector (8.4%) and self-employment (2.3%). The low returns to education in self-employment in Ghana are worrying since self-employment is the fastest growing occupation in the country. The implication here is that education may not be an effective means by which incomes can be increased and poverty levels reduced among the working population that is growing the fastest.

Results in **Table 4** indicate, premiums are associated with the different levels of education compared to no education particularly in the private sector where there exist a clear convex earning-education relationship. Within the private sector, we find that individuals who work in large firms (that is firms that employ more than twenty employees) enjoy earnings premium of about 60.7% whilst no evidence of penalties or premiums are

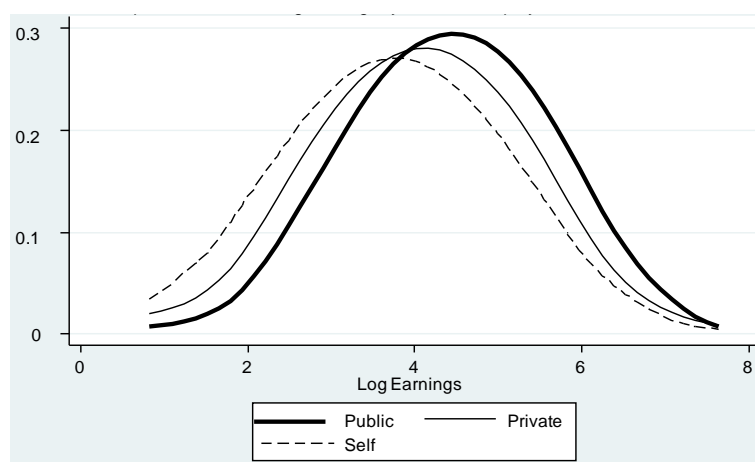


Figure 1. Sample distribution of log earnings by sector of employment Ghana.

⁴Sexdummy equal 1 if respondent is a male and zero otherwise

⁵Private and self-dummies are in reference to the public sector

Table 3. Earnings equation estimates with years of schooling.

	Self	Private	Public	Pooled (1)	Pooled (2)
Education (years)	0.023 [*] (0.013)	0.087 ^{***} (0.011)	0.084 ^{***} (0.022)	0.079 ^{***} (0.008)	0.062 ^{***} (0.008)
Log of hours	-0.006 (0.199)	0.142 (0.089)	0.248 (0.205)	-0.009 (0.085)	0.064 (0.083)
Tenure	0.106 ^{***} (0.033)	0.042 [*] (0.025)	0.003 (0.017)	0.060 ^{***} (0.020)	0.070 ^{**} (0.021)
Tenure ²	-0.004 ^{***} (0.001)	-0.000 (0.001)	0.000 (0.000)	-0.002 [*] (0.001)	-0.002 ^{**} (0.001)
Sex	0.361 (0.249)	0.201 ^{***} (0.078)	0.058 (0.110)	0.319 ^{***} (0.073)	0.198 ^{**} (0.081)
Firm size		0.608 ^{***} (0.072)			0.679 ^{***} (0.070)
Private					-0.108 (0.076)
Self					-0.023 (0.127)
Accra	-0.250 (0.231)	0.021 (0.069)	0.139 (0.125)	0.041 (0.062)	-0.001 (0.062)
Constant	2.988 ^{***} (1.043)	1.906 ^{***} (0.481)	1.924 [*] (1.087)	3.007 ^{***} (0.446)	2.566 ^{***} (0.438)
R-squared	0.095	0.278	0.294	0.159	0.216
Observations	387	736	130	1253	1253

Notes: Dependent variable is the log of monthly earnings. Robust standard errors in parenthesis; *** p < 0.01, ** p < 0.05, * p < 0.1. OLS estimation method.

found to be associated with working in the private sector or in self-employment relative to the public sector, an indication of non-existence of compensating earnings differential in the Ghanaian labour market. In addition, men in private sector enjoy earnings premium of 22% more than women but no such evidence is found for public and self-employment.

OLS estimates of the Mincerian equation potentially suffer from sample selection bias and endogeneity bias. First, we address endogeneity of education by estimating the earnings function in instrumental variables estimation. Mother and father's (parents) education are used as instruments for education due to the high positive correlation between individual's education and that of their parents. Weak endogeneity test, test of over-identifying restrictions and Hausman test of endogeneity prove that indeed education is endogenous in the sample. Results are not presented for brevity. It is observed that correcting for endogeneity bias changes returns to education estimates as IV estimates are appreciably higher. The average premium to an additional year of schooling in Ghana increases to 10.9% and within occupations returns to education in private sector increases to 11.7% but no evidence is found in self-employment and public sector similar to Rankin, Sandefur and Teal [11] who found no evidence of returns to education within the public sector in both Ghana and Tanzania. All other variables in the IV model drop marginally. To address sample selectivity bias, we first of all model selection into labour market status in a four way multinomial logit model of public sector, private sector, self-employment with

Table 4. Earnings function estimates with levels of schooling.

	Self	Private	Public	Pooled (1)	Pooled (2)
Log of hours	0.027 (0.191)	0.135 (0.091)	0.243 (0.222)	0.023 (0.083)	0.082 (0.082)
Tenure	0.109 ^{***} (0.033)	0.048 [*] (0.025)	-0.004 (0.017)	0.063 ^{***} (0.020)	0.071 ^{***} (0.021)
Tenure ²	-0.004 ^{***} (0.001)	-0.000 (0.001)	0.001 (0.000)	-0.002 ^{**} (0.001)	-0.002 ^{**} (0.001)
Primary	-0.015 (0.132)	0.325 ^{**} (0.156)	-0.000 (0.345)	0.234 ^{**} (0.095)	0.158 (0.098)
Secondary	0.406 ^{**} (0.186)	0.733 ^{***} (0.154)	0.498 (0.354)	0.742 ^{***} (0.097)	0.568 ^{***} (0.104)
Tertiary	1.244 (1.090)	1.302 ^{***} (0.171)	0.664 [*] (0.379)	1.356 ^{***} (0.120)	1.071 ^{***} (0.126)
Sex	0.354 (0.245)	0.215 ^{***} (0.079)	0.109 (0.121)	0.367 ^{***} (0.072)	0.255 ^{***} (0.082)
Firm size		0.607 ^{***} (0.073)			0.644 ^{***} (0.071)
Private					-0.042 (0.077)
Self					0.062 (0.130)
Accra	-0.206 (0.232)	0.004 (0.071)	0.122 (0.124)	0.020 (0.062)	-0.010 (0.062)
Year dummies	Yes	Yes	Yes	Yes	Yes
Constant	2.872 ^{***} (0.997)	2.231 ^{***} (0.505)	2.524 ^{**} (1.211)	3.058 ^{***} (0.439)	2.600 ^{***} (0.436)
R ²	0.107	0.295	0.307	0.191	0.237
Sample size	386	737	130	1253	1253

Notes: Dependent variable is the logarithm of monthly earnings. Robust standard errors in parenthesis; *** p < 0.01, ** p < 0.05, * p < 0.1.

unemployment as the based for normalisation, results are presented in [Table A2](#), average partial effects from the multinomial logit estimates are presented in [Table 5](#).

Results highlight the strict preference for formal sector employment by the educated in Ghana, as all levels of education are found to reduce the likelihood of being in self-employment and increase the probability of formal sector employment particularly in the public sector. In addition, individuals with secondary education prefer to wait in unemployment for formal sector jobs rather than enter into self-employment as secondary education is found to increase the likelihood of unemployment. Being a man increases probability of formal sector employment and reduces probability of self-employment.

Marriage reduces the probability of unemployment and increases the probability of self-employment whereas access to non-labour income increases the likelihood of self-employment. This is a reflection of the phenomenon

Table 5. Average partial effects from multinomial logit estimation.

	Unemployment	Self-employment	Private	Public
Age	-0.008 ^{***} (0.001)	0.005 ^{***} (0.001)	0.001 (0.002)	0.002 ^{***} (0.001)
Primary	-0.015 (0.022)	-0.086 ^{***} (0.021)	0.048 (0.031)	0.053 ^{**} (0.024)
Secondary	0.077 ^{***} (0.026)	-0.192 ^{***} (0.028)	0.044 (0.036)	0.072 ^{***} (0.026)
Tertiary	0.050 (0.035)	-0.314 ^{***} (0.048)	0.122 ^{**} (0.048)	0.143 ^{***} (0.027)
Sex	0.022 (0.016)	-0.224 ^{***} (0.018)	0.178 ^{***} (0.021)	0.024 [*] (0.013)
Married	-0.111 ^{***} (0.022)	0.088 ^{***} (0.022)	0.025 (0.030)	-0.002 (0.017)
Children	0.050 [*] (0.026)	-0.002 (0.027)	-0.069 ^{**} (0.034)	0.021 (0.020)
Household head	-0.043 ^{**} (0.022)	0.028 (0.021)	0.025 (0.026)	-0.010 (0.014)
Non-Labour income	-0.005 (0.020)	0.046 ^{**} (0.021)	-0.031 (0.024)	-0.009 (0.013)
Father's education	0.004 (0.003)	-0.001 (0.004)	0.009 [*] (0.005)	0.005 [*] (0.003)
Mother's education	-0.002 (0.003)	-0.005 (0.004)	0.011 ^{**} (0.005)	-0.003 (0.003)
Accra	-0.418 ^{***} (0.043)	0.057 ^{***} (0.022)	0.326 ^{***} (0.029)	0.034 ^{***} (0.011)
Observations	2030	2030	2030	2030

Note: These results are based on multinomial logit estimates reported in [Appendix A2](#). Levels of significance are; * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$.

particularly among low educated women in Ghana who otherwise would have remained unemployed, are set up in trading by their husbands after marriage. Having children increases unemployment probability by about 5% and reduces the probability of private sector employment by about 7%. In a similar manner, being a household head reduces the tendency of unemployment by about 4% due mainly to the economic burden on such individuals in Ghana. Also in Ghana, the probability of unemployment is largely reduced (about 42%) by residing in Accra relative to other urban areas. Finally, young people are more prone to unemployment than the old as age is found to reduce unemployment.

Results with selectivity correction based on the multinomial logit model are reported in [Table 6](#). Weighted least squares are applied in the second stage regression to account for heteroskedasticity present in the model due to selectivity and standard errors are bootstrap to account for the two stage nature of the procedure. Generally, results with sample selection correction are fairly similar to OLS estimates with a convex earning education relation found in the private sector. The selection correction term is however positive and significant in the public sector but insignificant in private and self-employment. The implication here is that, earnings of a worker

Table 6. Selection corrected earnings estimates.

	Self	Private	Public
Log of hours	0.053 (0.204)	0.091 (0.098)	0.295 (0.478)
Tenure	0.103*** (0.038)	0.045 (0.035)	-0.026 (0.025)
Tenure ²	-0.004** (0.001)	0.000 (0.001)	0.001 (0.001)
Primary	-0.008 (0.147)	0.416** (0.173)	-0.534 (0.418)
Secondary	0.472** (0.227)	0.900*** (0.181)	0.000 (0.379)
Tertiary	1.413 (1.125)	1.487*** (0.208)	-0.211 (0.450)
Sex	0.488 (0.319)	0.307** (0.152)	-0.029 (0.231)
Firm size		0.004* (0.002)	
Accra	-0.224 (0.230)	0.042 (0.162)	-0.050 (0.223)
Selection correction term	0.182 (0.210)	-0.072 (0.385)	0.890* (0.536)
Year dummies	Yes	Yes	Yes
Constant	2.918*** (1.042)	2.451*** (0.899)	4.545* (2.530)

Notes: Dependent variable is the log of monthly earnings. Bootstrap standard errors in parenthesis *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Regressions include two year dummies to control for any time specific effects but not included for brevity. Result obtained via Stata Selmlog command.

with average characteristics are higher than that of any worker who would be drawn randomly into the public sector. Conversely, earnings of a worker with average characteristics in either private or self-employment do not significantly differ from those of a worker who would otherwise be randomly drawn into the sector.

Quantile regression estimates to determine earnings heterogeneity are presented in [Table 7](#). Hours of work, tenure, sex and residence in Accra increase earnings along the earnings distribution though not always significantly so at all quantiles of the conditional earnings distribution. Firm size premium is highest at the bottom quantile but the premium declines along the conditional earnings distribution. All educational levels compared to no education, are associated with earnings premiums across quantiles in the Ghanaian labour market (though not always significantly) with larger premiums to high levels of education evident of a convex relationship between earnings and education. Results from F -tests statistics confirm the differential earnings premiums across quantiles. What emerges from these results is that, in the Ghanaian labour market, high ability individuals (in the top quartile of the earnings distribution) have more premiums with all levels of education (primary, secondary and tertiary) compared to low ability ones. The implication here therefore is that, contrary to expectations, education may not be inequality reducing in urban Ghana.

Table 7. Quantile regression results.

	OLS	25%	50%	75%
Log of hours	0.082 (0.082)	0.110 (0.104)	0.117** (0.060)	0.038 (0.097)
Tenure	0.071*** (0.021)	0.027** (0.014)	0.038*** (0.014)	0.026* (0.015)
Tenure ²	-0.002** (0.001)	-0.000 (0.000)	-0.001 (0.001)	-0.000 (0.001)
Primary	0.158 (0.098)	0.143 (0.131)	0.096* (0.053)	0.182*** (0.067)
Secondary	0.568*** (0.104)	0.483*** (0.115)	0.456*** (0.071)	0.587*** (0.055)
Tertiary	1.071*** (0.126)	0.730*** (0.131)	0.975*** (0.075)	1.205*** (0.125)
Sex	0.255*** (0.082)	0.257*** (0.071)	0.374*** (0.058)	0.399*** (0.044)
Firm size	0.644*** (0.071)	0.660*** (0.082)	0.488*** (0.049)	0.478*** (0.069)
Private	-0.042 (0.077)	-0.066 (0.088)	-0.033 (0.066)	0.069 (0.068)
Self	0.062 (0.130)	-0.099 (0.192)	0.039 (0.117)	0.277** (0.117)
Accra	-0.010 (0.062)	0.115* (0.066)	0.045 (0.036)	0.025 (0.051)
Constant	2.725*** (0.438)	2.357*** (0.570)	2.767*** (0.354)	3.418*** (0.532)
R-squared	0.237	0.151	0.160	0.184
Observations	1253	1253	1253	1253

Notes: Dependent variable is the logarithm of monthly earnings. Bootstrap standard errors in parenthesis *** p < 0.01, ** p < 0.05, * p < 0.1. Regressions include year dummies to control for time specific effects but not included for brevity.

4. Summary and Conclusions

In addressing the objectives of the study, ordinary least squares and quantile regression techniques are applied in addition to addressing the two main endogeneity issues in the earnings equations which were omitted variable bias and sample selection bias by the use of instrumental variables and sample selection correction technique by Heckman [14] and Lee [15].

Findings indicate that education plays an important role in promoting access to lucrative formal sector jobs especially in the public sector but has no direct impact on earnings within the sector. Results show a strong convex education-earnings relationship, consistent with Quinn and Teal [22] and Rankin *et al.* [11], especially in the private sector as individuals with higher levels of education have higher earnings premiums than those with lower levels of education. Sample selection appears a very important aspect of the Ghanaian labour market con-

sistent with labour market segmentation as hypothesised by Harris and Todaro [23] based on the positive self-selection within the public sector. Estimated earnings determinants along the earnings distribution point to a convex education earnings relationship particularly at the top quartile of the earnings distribution as found in the OLS, this further indicates education is not inequality-reducing among urban workers in Ghana, as high ability individuals have higher premiums with all levels of education than low ability ones.

Although educational attainment is a primary factor in determining labour market participation and earnings, it negatively determines participation and weakly explains earnings in the low-earning and the fastest growing informal sector amidst stagnant employment growth in the formal sector. As a result, even though the informal sector is characterised as low earnings sector, many job seekers find jobs in the informal sector. Educational investment therefore, needs to be augmented with improvements in employment opportunities in quality alternative occupations similar to those found in the public and private sectors.

It is, however, important to note that predictions of the findings are limited due to the cross sectional nature of the data used for which reason results are not necessarily causative. The high attrition rate in the data is the main limitation which made it impossible to conduct a meaningful panel analysis. In addition, although quantile regression is informative in terms of the differential effects of education on earnings, it is not able to indicate the rationale for the differences, further research is therefore needed to decompose the differential impact education has on earnings.

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Appendix

Table A1. Sample means by labour market status (sample standard deviation of variables other than dummies in parenthesis).

	Unemployment	Self Employment	Private Sector	Public Sector
Age (in years)	26.75 (9.78)	36.17 (9.52)	34.43 (11.55)	38.58 (11.40)
Education (yrs)	8.61 (4.39)	6.60 (4.78)	9.09 (4.10)	10.62 (3.68)
Education level:				
None	0.17	0.32	0.13	0.06
Primary	0.50	0.56	0.54	0.42
Secondary	0.26	0.10	0.22	0.23
Tertiary	0.07	0.02	0.11	0.29
Married	0.23	0.70	0.54	0.66
Children	0.34	0.78	0.56	0.72
Non-labour income	0.27	0.30	0.37	0.36
Household head	0.16	0.31	0.42	0.48
Accra	0.02	0.26	0.49	0.44
Number of Observations	424	542	989	152

Computations from UHWS for 2004, 2005 and 2006 for Ghana [18]-[20].

Table A2. Multinomial logit results (omitted category: unemployment).

	Self-employment	Private	Public
Age	0.442*** (0.056)	0.119** (0.047)	0.183** (0.075)
Age ²	-0.005*** (0.001)	-0.001* (0.001)	-0.002* (0.001)
Primary	-0.383* (0.211)	0.277 (0.209)	0.951** (0.424)
Secondary	-1.612*** (0.275)	-0.362 (0.245)	0.608 (0.457)
Tertiary	-2.111*** (0.445)	0.099 (0.320)	1.952*** (0.497)
Sex	-1.403*** (0.189)	0.374** (0.154)	0.357 (0.248)
Married	1.268*** (0.224)	0.843*** (0.216)	0.749** (0.319)
Children	-0.365 (0.263)	-0.534** (0.245)	-0.073 (0.381)
Household head	0.462** (0.223)	0.368* (0.201)	0.162 (0.276)
Non-Labour income	0.290 (0.207)	-0.061 (0.178)	-0.132 (0.255)
Father's education	-0.035 (0.037)	0.051 (0.031)	0.042 (0.049)
Mother's education	-0.014 (0.038)	0.043 (0.031)	-0.031 (0.050)
Accra	3.240*** (0.406)	3.877*** (0.393)	3.676*** (0.429)
Constant	-7.628*** (0.943)	-2.334*** (0.778)	-7.015*** (1.360)
Wald χ^2 (D.F)	1277 (45)		
Log-likelihood	-1838.91		
Pseudo-R2	0.26		
Observations	2,030	2,030	2,030

Standard errors in parenthesis *** Significant at 1% level, ** Significant at 5% level, * Significant at 10% level: Reference categories are; no education, female for sex and Kumasi, Cape Coast, Tema and Takoradi for location of residence.