

# Wage effects of educational mismatch and job search in Ghana and Kenya

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# **Wage effects of educational mismatch and job search in Ghana and Kenya**

## **Abstract**

Education is key to development strategies in Africa. We use overeducation and undereducation to analyse the effectiveness of education in preparing individuals for employment in Kenya and Ghana, using the Skills Towards Employment and Productivity Survey. Systematic differences in wages between matched, overeducated and undereducated workers hold across attainment levels, even controlling for cognitive skills. Overeducated workers are rewarded above exactly matched workers, partially supporting human capital theory. Undereducated workers are compensated over their education level, following the job competition model. Obtaining a job through social networks is widespread, but associated with lower wages for the overeducated and exactly matched.

Keywords: Education quality; social networks; overeducation; undereducation

## **1. Introduction**

In this article we apply the concepts of overeducation and undereducation to enhance our understanding of how education and skills are valued in labour markets in sub-Saharan Africa (SSA). Through our analysis of the wage premiums and penalties for over and undereducated workers we contribute to on-going debates about whether demand-side factors, that is the educational level required in jobs, or supply side factors, that is the educational level attained, are more important in determining wages. The application of this approach to countries in SSA is in itself relatively new while our analysis extends and builds on previous studies in two ways. First, in order to enhance our understanding of the applicability of human capital theory in Ghana and Kenya, the two countries of our study, we investigate the effect of educational quality rather than simply years of education. Previous studies in Europe have associated being overeducated with having lower skill levels which are actually due to unmeasured ability differences (Chevalier 2003; Sloane 2003), an issue we make efforts to address by controlling for an individual's cognitive skill in contexts where the quality of education is inconsistent. Second, we link how obtaining a job through social networks, which is particularly relevant in developing country contexts (see for example Wahba and Zenou 2005 for Egypt), contributes to wage determination and relates to over and undereducation.

Most of the literature on overeducation and undereducation is based on populations in which a substantial proportion obtain degree-level qualifications (these contexts include the US, UK, the Netherlands, Germany, Portugal, Spain, Greece and Hong Kong). Overeducation implies an individual has more education than is required for their job while undereducation implies having less education than is required, and thus they are relative measures. Overeducation and undereducation can occur across the educational distribution, which explains how they are possible in countries such as Ghana and Kenya, where overall educational attainment is relatively low. Applying these concepts in the sub-Saharan African context of relatively low overall educational attainment contributes to our understanding of education and skills in two ways. The first contribution is to extend and test our existing knowledge about how labour markets function and how context shapes their functioning, particularly in low and middle-income countries in which about 85% of the world's population live (Quinn and Rubb 2006).

A priori, there is good reason to expect substantial differences between the prevalence and consequences of overeducation and undereducation in low- and middle-income countries in Africa and higher-income country contexts, given very different access to education and

overall educational attainment. In Ghana and Kenya, labour market conditions include a large informal sector, as is the case in many developing countries (Fields 2011). There is practically no labour protection and, again as in many developing countries, a substantial pay differential between formal and informal sectors even after controlling for a range of observed differences (Bargain and Kwenda 2014). A further substantial difference is that social safety nets consist of household risk sharing rather than government provided benefits (Herrera and Mercerón 2013). Thus, the fall-back position and ability to wait for the right job in the formal sector are substantially different to western contexts. Across Africa the male female gap in participation and attainment is notable, notwithstanding that in younger cohorts in Kenya, male and female participation in education in urban areas has evened out (Shabaya and Konadu-Agyemang 2004). In sum, applying these concepts in SSA opens up different ways of exploring how labour markets function and validates how far the tools we currently have are applicable in sub-Saharan African countries.

Second, the concepts of overeducation and undereducation may help us to understand better the articulation of education systems and labour markets in SSA. The concepts of overeducation and undereducation can inform whether educational investment has been effective, in excess of what is needed or insufficient to meet demand. Informing policy on education is of high policy relevance as education has been central to development strategies in sub-Saharan African countries. It might be surprising that overeducation is even possible in countries where there is educational rationing, perhaps because of the opportunity cost of participating, – yet precisely this situation is reported, for example in South Africa (Pauw, Oosthuizen, and Westhuizen 2008). In Europe, the poor economic conditions of recession have been found to increase overeducation, as workers pay less attention to being in a matched job than to remaining employed or getting a new job (Borgna, Solga, and Protsch 2019). Quantifying the extent of overemployment and the factors that either mitigate it or explain why it exists provide much needed insight into how the education system prepares participants for employment. In terms of undereducation, the expectation is that it can explain how some workers in Ghana and Kenya are able to compensate for a lack of qualifications and obtain jobs for which they are undereducated, perhaps through the experience and training they have acquired on the job. At the heart of these issues is the need to further our understanding of how skills and experience are valued and required by the available jobs in these labour markets.

Only a few studies have examined overeducation and undereducation in the context of developing countries. Examples of such research include Quinn and Rubb's (2006) and Pearlman and Rubb's (2020) studies of Mexico; Wu and Wang (2018) for China using the World Bank's STEP data, Abbas (2018) for Pakistan, Mehta et al. (2011) for the Philippines, Mexico, Thailand and India, Wye and Ismail (2019) for Malaysia, and within sub-Saharan Africa (Herrera and Merceron 2013; Handel, Valerio, and Puerta 2016; Darko and Abrokwa 2020). The paucity of such studies is in part a result of lack of data, the recognition of which motivated the development of the World Bank's Skills Towards Employment and Productivity Survey (STEP) which a number of the studies referenced above used. STEP is the first initiative to measure skills across urban areas of low and middle-income countries.<sup>1</sup> The data record educational attainment, the individual's report of the educational requirements of their job and the difference between these two measures, the variable we use to measure over and undereducation (as explained further in sections 3 and 5.1). Comparing the STEP data for all countries, Handel, Valerio and Puerta's (2016) study of overeducation and undereducation finds that overeducation is present across many of these countries. For example, in Ghana overeducation is extremely high with 45.1% of those in work classified as overemployed. Undereducation appears to be a serious constraint in Kenya where 40.4% of those in work are undereducated while in Ghana undereducation is less prevalent, affecting 12.8% of those in work. Darko and Abrokwa's (2020) analysis of the nationally representative Ghana Living Standards Measurement Survey (GLSS) for 1998–99, 2005–06 and 2012–13 confirms the existence of both overeducation and undereducation. In sum, these studies suggest that overeducation and undereducation do occur in SSA, notwithstanding the lower overall levels of attainment, and they require further study to fully understand their wage effects.

Using the opportunity provided by the STEP surveys, we seek to further our understanding of undereducation and overeducation in Ghana and Kenya, the two sub-Saharan African countries included in the survey. Although both countries have performed relatively well in economic terms over recent years, their education systems continue to face challenges to deliver on quality not just quantity (Akyeampong 2010; Blunch 2014; Honorati and Silva 2016). Net enrolment rates are high (the World Bank (2020) estimates that 86% and 80% of children

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<sup>1</sup> Two waves of the survey have been completed. Countries included in the two waves are: Armenia, Azerbaijan, Bolivia, Bosnia & Herzegovina, Colombia, Georgia, Ghana, Kenya, Kosovo, Lao PDR, Macedonia, Serbia, Sri Lanka, Ukraine, Vietnam, and the Yunnan Province in China. A third wave has been implemented in Serbia, Kosovo, Libya, and the Philippines.

<sup>2</sup> <https://datatopics.worldbank.org/education/country/kenya>

complete primary school in Ghana and Kenya respectively<sup>2</sup>) but nevertheless educational attainment and the quality of education are low in both countries. For instance, in Ghana two out of five workers have no more than a primary education, and only one in five has more than a basic education (Honorati and de Silva 2016). In addition, only 16 percent and 35 percent of primary six students were proficient in mathematics and English respectively (MoE 2012). Kenya usually outperforms neighbouring countries in eastern and southern Africa in education but even so Piper and Mugenda (2012) report low literacy and maths scores. For example across Class 2 pupils, only 7.2% of children could read English fluently (more read English than Kiswahili) and numeracy outcomes in both conceptual and procedural tasks were lower than Ministry of Education-established performance benchmarks (Piper et al. 2018).

Consistent with findings in higher-income countries, the analysis in this article shows that overeducated urban workers suffer a pay penalty compared with matched workers with the same education. However when the educational requirements of jobs and other factors are taken into account, overeducated workers earn a premium over those exactly matched to the job on educational requirements, whilst undereducated workers are associated with a wage penalty relative to their co-workers whose education is matched to the job. Thus, the findings in Ghana and Kenya seem to be consistent with those of higher-income countries notwithstanding the lower overall educational attainment and provision of schooling. The analysis also finds that obtaining a job through social networks is consistently associated with lower earnings for overeducated and educationally matched workers – but not for undereducated workers. Thus, social networks might facilitate access to jobs rather than providing a route into higher paid jobs, and may facilitate some workers getting a job which requires a higher level of education than they possess. The results further highlight the importance of education and the acquisition of cognitive skills for earnings, particularly for women.

The next section sets out the theoretical background which, in line with the existing literature draws on human capital theory and the job competition model while also considering the role of the type of job search used in wage setting. Previous evidence on the wage effects of overeducation, undereducation and social networks in wage setting is also discussed. Section 3 sets out the alternative measures of over and undereducation. Section 4 describes the data

while the empirical strategy in Section 5 focuses on the effects of overeducation, undereducation and type of job search on wages. Findings and discussion are presented in Sections 6 and 7 respectively. The last section concludes.

## **2. Theoretical background and previous findings**

We follow the literature in the field of overeducation and undereducation which generally starts by setting out the human capital approach, contrasting it with the Thurow (1975) job queue model. Our aim is to gauge the relevance of each in explaining how workers are matched to jobs and how reward systems operate in Ghana and Kenya.

### ***2.1 Human capital theory***

In human capital theory (HCT), overeducation should not impose wage penalties because years of education are rewarded regardless of field of study and institution (Becker, 1975). The existence of overeducation might still be consistent with the HCT model if on-the-job training is taken into account, as Mincer (1974) noted. On the job training is likely to be particularly important in the contexts of Kenya and Ghana given the overall low rates of educational attainment, widespread difficulties in meeting the indirect costs or coping with the opportunity cost of education and questions over its quality, certainly in terms of consistency. In the HCT model, marginal productivity is determined by the components of human capital (education, training, experience, skills) rather than by the characteristics of the job, the sector or industrial context in which jobs are performed and the types of job that are available (Mincer 1974; Becker 1975). If workers do not obtain the type of job that is commensurate with their education level this could be because they do not have the necessary innate ability (which could also be classified as human capital) and this is a further way in which the standard educational outcomes might be modified if ability is included as an explanatory variable. Overeducation could also be consistent with short-term constraints to matching the right workers to jobs.

Human capital theory also provides an explanation for undereducation in predicting that undereducated workers are less productive and therefore paid less than a worker who is matched in education, performing the same job. Green, McIntosh and Vignoles (1999) conclude that undereducated workers earn less than other workers performing the same job at the ‘correct’ education level but more than their peers, with their education level, who are matched to their job. Firms might place someone in a job for which they are undereducated

because there is a shortage of workers with the correct level of education or they may take experience on the job into account, which is also consistent with human capital theory. It is possible that some jobs have become more complex over time, raising the educational requirement, making people with longer tenure seem to be undereducated.

Although in theory HCT has taken a view that is broader than education, in practice studies have relied on years of schooling as the indicator of education and human capital. In western countries with standardized education systems this has arguably caused less distortion than in developing country contexts. However, low literacy rates and differentiation in attainment between those with similar years of education are found in a number of African countries (Majgaard and Mingat 2012). In eleven countries in SSA, Spaul and Taylor (2015) find that learning deficits are considerably larger than access to education deficits. Years of schooling result in very different measured achievement across countries compared with measures of foundational skills in literacy and numeracy (Filmer et al. 2020). Thus, in order to measure learning attainment in SSA, indicators of education need to take into account achievement measures, for example based on literacy attainment, relative to other measures such as years of schooling.

## ***2.2 Job competition model***

In contrast to HCT, Thurow's (1975) job competition model predicts that qualifications in excess of those required by the job would be unrewarded in wages but the value of qualifications is to place workers higher in the queue for getting a job. Wages are determined according to the needs of the job, fixed by production processes which determine wage levels (Duncan and Hoffman, 1981). There is no reason to expect workers who have more education than required for the job to earn more than those with the required education (McGuinness 2006; Slonimczyk 2008). One could expect workers with less education than is required to earn more than their peers who are matched to their jobs by education level. Employers may still want to hire workers with more than the required education, if they are less costly to train on the job or their qualifications are linked to unobserved skills or competencies related to higher productivity (Weiss 1995). One dimension of the interconnectedness of education and employment in Ghana is that people who cannot gain employment often pursue further education (Aryeetey and Baah-Boateng 2007), presumably to increase their chance of gaining employment.



Consistent with the job competition model, numerous authors conclude that overeducated workers suffer a pay penalty in comparison to people with their education level who have a job to which they are matched in education (Chevalier 2003; Groot and Maassen van den Brink 2000 for a meta-analysis; Sicherman 1991; Cohn and Khan 1995; Verdugo and Verdugo 1989). Part of the educational investment of these workers is unproductive; an explanation for this unproductive investment could lie in Thurow's (1975) argument that the requirements of the job drive employees' rewards. Chevalier (2003) estimates a 14% pay penalty for overeducated graduates in the UK, which he states is consistent with previous estimates for UK graduates as reported by Battu, Belfield, and Sloane (1999) and Dolton and Vignoles (2000). At the same time, Leuven and Oosterbeek (2011) summarising the findings of eight studies in the field conclude that overeducated workers still receive a wage premium – consistent with HCT- in relation to their co-workers who have less schooling, so part of their investment is productive.

### ***2.3 Job search***

Herrera and Merceron (2013 p87) state that: 'in a dysfunctional labour market, applicants may be hired based on their social network rather than their abilities'. In such contexts, job-seekers generally use their families and social networks to find work, as has been found in Ghana where access to higher quality jobs is limited (Affum-Osei et al. 2019). However the importance of social networks is not only found in such 'dysfunctional markets', it is in fact common as documented in research on the role of social networks in facilitating employment through an information giving role (see for example Ioannides and Loury 2004). In the 1970s Granovetter's (1973) study of a town in Massachusetts found that over 50% of jobs were found through social contacts. The importance of social contacts in the US has been confirmed in many subsequent studies and the significance of networks may even be intensifying as a result of the move towards internet-based recruitment methods. Information about job vacancies plays an important role in reducing job search friction (Cappellari and Tatsiramos 2015). Hence, what Granovetter (1973) termed weak ties may lead to better employment opportunities because these weak ties extend access to information about job opportunities beyond a person's immediate social circle.

Social contacts have been found to reduce unemployment duration by 1-3 months on average but at the cost of wage discounts of at least 2.5%, based on analysis of US and European data (Bentolila, Michelacci, and Suarez 2010). One reason why lower wages might occur is that

workers' have contacts in occupations that are less productive but they settle for opportunities in those occupations in order to secure a job (Bentolila, Michelacci, and Suarez 2010). On the other hand, it is also possible that contacts are a source of verification of a worker's potential and would therefore result in higher wages (Montgomery 1989; Mortensen and Vishwanath 1999). Notwithstanding the large body of research into social contacts, wages and getting a job, little research to date links social capital and overeducation as Kalfa and Piracha (2018) note in their study of social networks and overeducation in Australia. They found that social capital enhances the prevalence of overeducation particularly for women. Kucel and Byrne (2008) also found, using data from the UK, that personal contacts increase the probability of overeducation. If job-seekers look for jobs through formal and informal channels at the same time then those who fail to secure a job through formal channels would pass on offers through informal channels so that job-seekers with lesser prospects end up, through informal channels, in jobs which pay less (Franzen and Hangartner 2006).

### **3. Data**

The study uses data from World Bank's STEP survey database. The survey was collected through a two-stage random sampling of households and individuals between 2011 and 2017. One urban adult aged 15 to 64 years was randomly selected as the respondent from each household. The survey collected detailed information on education, measures of skills (cognitive, non-cognitive, and job-relevant skills), labour force participation, occupation, family background, and socioeconomic status. The Ghana survey which is part of the first wave of surveys was collected between September 2011 and December 2012 and consists of 2,987 individuals. The Kenya survey is part of the second wave and was collected in 2013 and consists of 3,894 individuals.

The final sample used in this study consists of 2,761 employed individuals aged 25 to 64 in Ghana and Kenya. The lower age limit of 25 years is to ensure that the sample consists mostly of individuals who are available for work and are not also actively involved in other activities including education. In the sample there are more individuals in Kenya (53%) than in Ghana (47%), and more males than females (52% and 48% respectively). The survey was only conducted with urban dwellers whose characteristics diverge from those in rural areas and thus the findings are not nationally representative. In both countries, as in other settings, those living

in urban areas tend to have higher levels of educational attainment and have access to better jobs (Zhang 2006).

#### **4. Method and procedures**

##### ***4.1 Measures of mismatch***

Previous research has operationalised overeducation and undereducation broadly in three ways, the subjective method which we employ, the objective method (or job evaluation) and the realised matches approach. Each method has its own well documented limitations (Sloane 2003; Green, McIntosh, and Vignoles 1999; Chevalier 2003). The subjective/self-assessment method uses a worker's self-assessment of the educational requirement of his or her job which is then compared to the worker's reported level of education. The advantage of this approach is that workers assess the requirements of the actual job they are engaged in at a local level providing insight into how workers themselves feel about their particular job and their preparedness for it. Some workers may overestimate or underestimate the education required for a job (Chevalier 2003) or according to Herrera and Merceron (2013) overestimate the requirements. However, Groot and van den Brink (2000) demonstrate that subjective measures are less likely to provide biased estimates of the incidence of overeducation. The approach has been widely used in previous studies (Belfield 2010; Daly, Büchel, and Duncan 2000; Dolton and Vignoles 2000), as have the alternative methods.

##### ***4.2 Matching, earnings and education quality measures***

This study takes advantage of the availability of the self-assessment measures in STEP to derive measures of undereducation, overeducation and exactly matched education, using the subjective method described in Section 3 to measure mismatches. The individual's actual educational attainment is classified following 7 levels of the UNESCO International Standard Classification of Education's (ISCED) which are pre-primary education (ISCED 0), primary education (ISCED 1), lower secondary education (ISCED 2), upper secondary education (ISCED 3), post-secondary non-tertiary education (ISCED 4), first stage of tertiary education (ISCED 5) and second stage of tertiary education (ISCED 6). There are variations within each level, for example 4a refers to those who have completed a course leading to ISCED 5a which is a theoretically orientated tertiary education while 4b leads to ISCED 5b which is more applied. The education level needed for each individual's job as indicated by the respondent

are also classified on the ISCED scale. The STEP data record the difference between these two measures. An individual is exactly matched if these two measures are equal, that is, if the individual's own educational attainment is the same as the educational attainment required for the job. An individual is overeducated if their educational attainment is higher than the educational attainment required for the job. The opposite is true for undereducated individuals.

The first part of the analysis summarises the relationship between hourly earnings and the three categories of matched, overeducated and undereducated workers. In this analysis the distribution of mismatch over different educational levels, the educational requirements of jobs and occupations is also investigated. To accomplish this, we created two new measures of relative earnings. The first measure takes into account educational attainment by measuring the individual's earnings relative to the average earnings for the level of education they have attained. The second measure, takes into account the educational requirements of the individual's job by measuring the individual's earnings relative to the average earnings for the ISCED category corresponding to the educational requirement of their job. These new variables are used to determine more precisely whether mismatch is associated with wage penalties and premia when educational level and the educational requirements of the job are taken into account.

The analysis also uses a composite measure that is constructed to capture the quality of the individual's education, rather than using a simple measure of years of schooling completed. As we have explained, empirical modelling often relies on years of schooling as the key indicator of educational attainment. However, the persistence of low literacy rates across many African countries forces attention to the quality rather than the quantity of education. We construct a measure of learning attainment by weighting literacy proficiency scores by a person's years of schooling relative to the average for people of that age. The literacy proficiency score is derived from a comprehensive test designed by Educational Testing Services for the World Bank. The test is based on the literacy frameworks developed for the Programme for the International Assessment of Adult Competencies (PIAAC) and aims to measure levels of 'competence at accessing, identifying, integrating, interpreting, and evaluating information' (World Bank 2014:3). Weighting this score by the years of actual education completed divided by attainment of the cohort is a simplified version of the approach taken by Filmer et al. (2020) to capture learning adjusted years of education. Multiplying learning adjusted years of education by literacy test scores gives a better measure of the individual's learning and hence

the quality of education that the individual has received. We also include an interaction term for gender and education quality in order to control for gender differences in the value of education.

### 4.3 Regression analysis

Multiple regression is used to explore these relationships further while taking into account how factors other than educational mismatch impact on earnings. This analysis also considers how these relationships vary for under, over and exactly matched workers. The regressions are estimated using three indicators of earnings. In the first specification the dependent variable is the simple log of hourly earnings in US dollars, *lnwage*. The second measure of earnings is the log of the constructed relative wage measure which takes account of educational attainment, , and the third measure is the log of the second relative wage measure which takes account of the educational requirements of the job (as defined above).

For each of the three dependent variables we estimate OLS regressions of the following form:

$$\ln W_i = \alpha_0 + \beta_u EDunder_i + \beta_o EDover_i + \beta_q EDqual_i + \beta_x X_i + \beta_s S_i + \beta_z Z_i + \varepsilon \quad (1)$$

Where  $W_i$  is the measure of earnings for individual  $i$ , either the natural log of wages, the log of the individual's wage relative to the average wage for the level of education they have attained, or the log of the individual's earnings relative to the average earnings for the ISCED category corresponding to the educational requirement of their job. *EDunder* and *EDover* are dummies for undereducation and overeducation respectively and  $\varepsilon$  is an error term. Exactly matched is the omitted category relative to which the coefficient estimates for *EDunder* and *EDover* are interpreted, analogous to the models in Verdugo & Verdugo (1989), Bauer (2002), Cohn & Khan (1995) and Rubb (2003). These coefficients differ from those in Duncan and Hoffman (1981) as they use continuous variables recording years of over (surplus), under (deficit) and required education. Thus the coefficient values cannot be directly compared. *EDqual* is the composite measure constructed to capture the quality of the individual's education, as described above. We also include an interaction term for gender and education quality in order to control for gender differences in the value of education.

$X$  is a vector of control variables including individual characteristics such as gender, age and measures controlling for features of the individual's employment, specifically tenure (months in current job, months in current job squared) and whether the job is in the formal or informal sector<sup>3</sup>.  $S$  includes dummy variables capturing the type of method used to find the individual's current job. The types of methods recorded are: own search (through the internet/other media, employment agencies or university/school career services) and direct employer contacts (21% of jobs), through social networks with friends, relatives or others (30% of jobs), through training or an apprenticeship with the employer (6% of jobs), or by starting a business (42% of jobs) - the reference category.  $Z$  includes country indicator variables included to account for unobservable country level differences in policies and development. Appendix Table A1 provides definitions and summary statistics for all the variables used in the analysis.

Each specification is estimated initially for the whole sample then separately for the under, over and exactly matched sub-samples. Stratifying the sample in this way allows us to examine whether there are differences between the sub-samples in the relevance to wage determination of aspects such as education quality and different ways of conducting job search.

## 5. Findings

### 5.1 Descriptive findings

Using the constructed measures of mismatch, one-third of adult workers in the sample were overeducated for the job they were doing, whilst 26 percent were undereducated for their jobs. More women were overeducated than men (of the overeducated, 52 per cent were women versus 48 per cent men), whereas a larger proportion of men than women were undereducated. Figure 1 shows the distribution of educational mismatch in Ghana and Kenya and suggests that there is a higher prevalence of educational mismatch in Kenya where undereducation is more evident than overeducation, while in Ghana the opposite is the case.

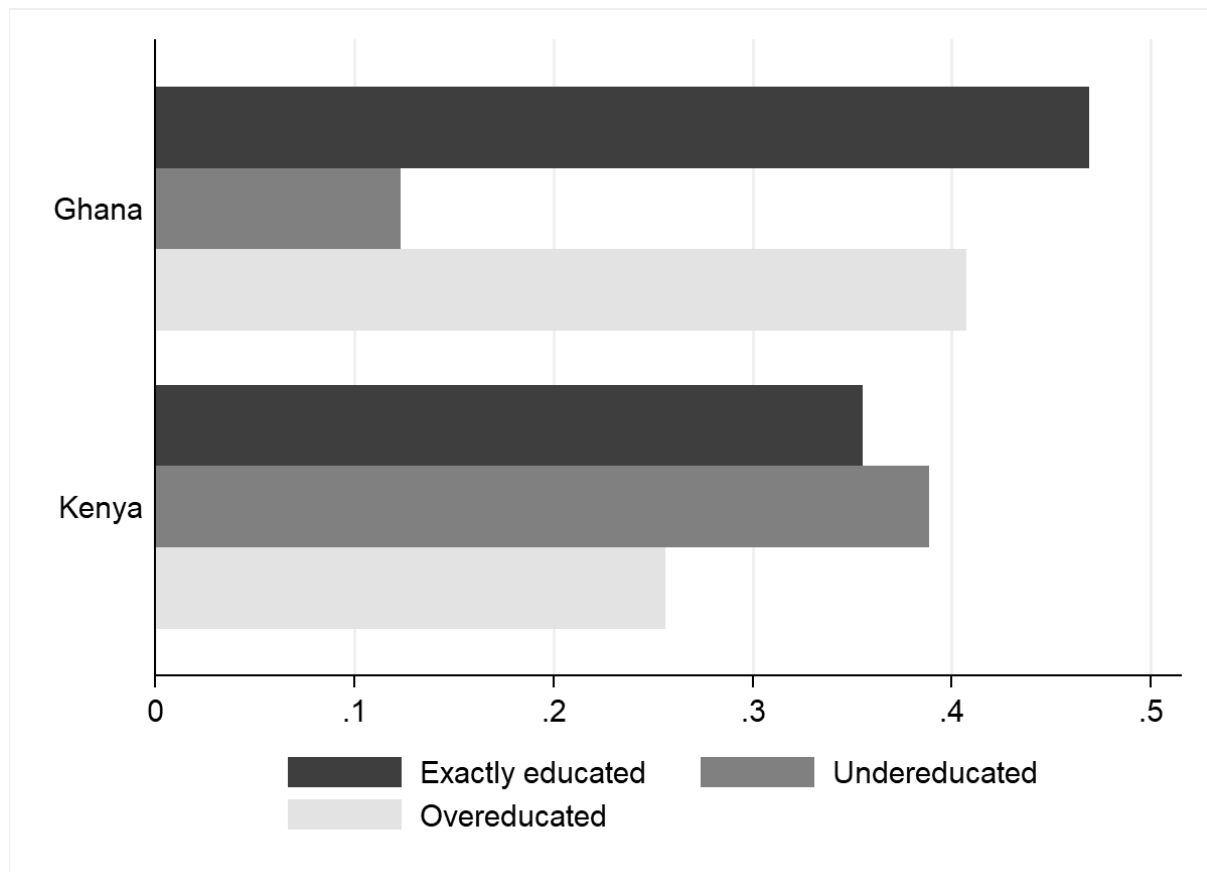
Figure 1 illustrates that the prevalence of mismatch in the urban areas of Ghana and Kenya is high. This imposes costs on workers and firms but also helps to inform how effective educational policy has been and where policy changes are needed. From our data it is not

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<sup>3</sup> We have not included age squared. When included in the estimations it was significant in two but the coefficient was very small (-0.0005) indicating a turning point at over 80 years of age (which suggests no meaningful turning point)

possible to differentiate between short-term mismatches which represent market co-ordination or information disparities between workers and employers and persistent mismatches which represent a more fundamental disparity between aggregate supply and demand (see Sattinger 2012). However, the high prevalence of mismatch suggests that short-term and more persistent mismatches are both present.

*Figure 1: Educational mismatch by country*



Persistent mismatches call into question the effectiveness of educational attainment as an indicator of worker productivity. As such, persistent mismatches could be consistent with HCT if education in Ghana and Kenya is a poor marker of human capital whereas worker quality, literacy skills and work experience are better indicators. Alternatively, and following the Job Competition Model, it may be that the educational requirements of jobs determine the demand for workers at different education levels and education serves as a sorting device rather than a wage setting device (through screening by employers or by workers signalling productivity, as described in Weiss (1995)). The multiple regression analyses explores the relative strength of these potential explanations.

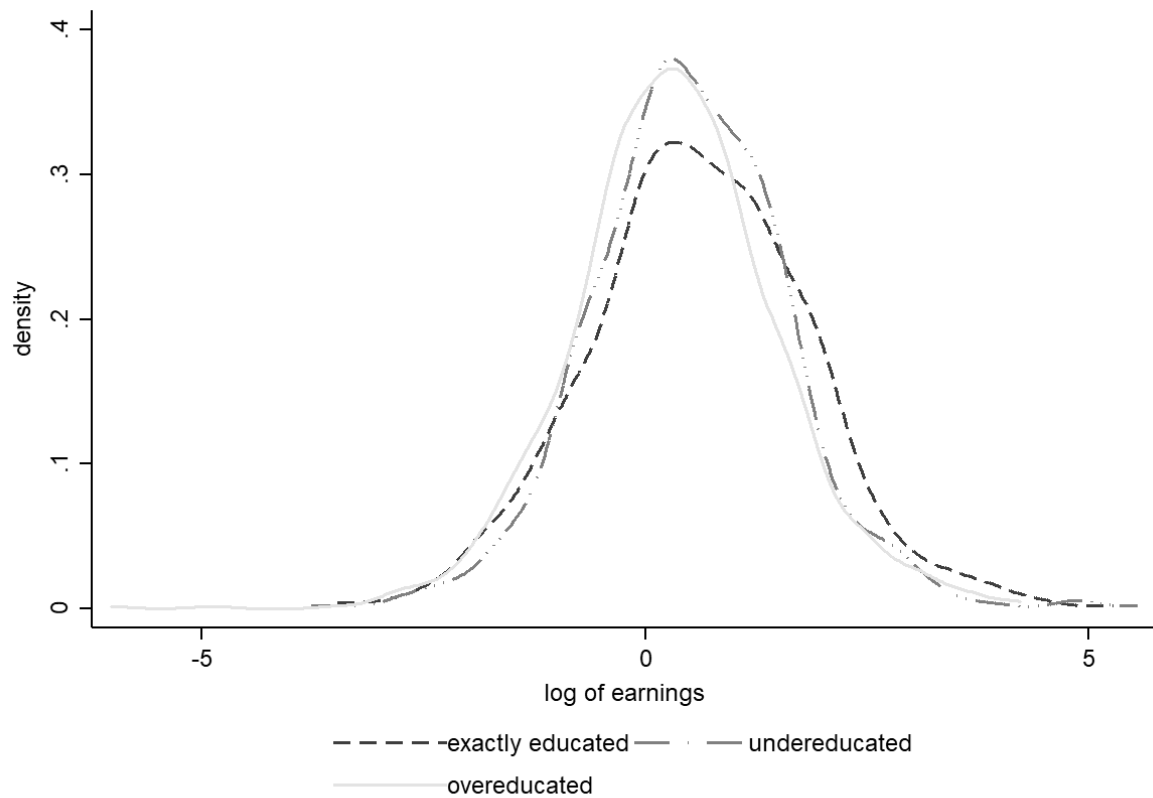
Table 1 shows mean earnings by ISCED level and by the categories of over, under and exactly educated. It is quite striking that the relationships between educational attainment and earnings are in line with HCT, that is higher educational attainment corresponds to higher earnings even across relatively low levels of education, albeit with small differences in wages. Table 1 also shows that on average under and overeducated workers earn lower wages than matched workers with the overeducated earning on average the least. This pattern is mirrored in Figure 2 which plots the distribution of log earnings by mismatch category and additionally shows the normalisation of the logged earnings distributions.

*Table 1: Mean hourly earnings in US\$ by educational attainment and mismatch category*

	Mean	S.D
Exactly educated	4.33	10.33
Undereducated	3.60	12.33
Overeducated	2.54	5.49
None or < ISCED 1	2.41	7.54
ISCED 1	2.55	12.34
ISCED 2	2.73	7.39
ISCED 3 & 4A	2.97	5.12
ISCED 4B	5.02	6.17
ISCED 5 & 6	8.51	15.33

*Figure 2. Educational mismatch and earnings*





The earnings data show that the overeducated earn amongst the lowest wages, which might be explained by the distribution of mismatch over different levels of educational attainment and over jobs requiring different levels of education. Figures 3 and 4 show how mismatch varies by educational levels, the educational requirements of jobs and occupations. The first panel of Figure 3 shows that at the lowest as well as the highest levels of educational attainment, there is a high proportion of matched workers. At lower (higher) levels of attainment, there are higher levels of undereducation (overeducation). This is consistent with the undereducated tending to have lower educational attainment while the overeducated tend to have higher attainment. For example, there are no overeducated workers at ISCED level 1 and no undereducated workers at ISCED levels 5 and 6.

However, in relation to the level of education required for different jobs, the second panel of Figure 3 shows a very different pattern. First, there is a higher proportion of matched workers in jobs requiring higher levels of education where education is likely to be more explicit in hiring criteria. In contrast, there is a higher proportion of overeducated workers than undereducated workers in jobs requiring lower educational attainment and the opposite is true in jobs requiring higher education attainment. For example, there are no undereducated workers

in jobs requiring lower than the ISCED level 1 level of attainment and no overeducated workers in jobs requiring higher than level 4 attainment. Figure 4 shows mismatch by broad occupational group and reflects the pattern in the second panel of Figure 3. Mismatch occurs in all occupational groups, the exactly matched predominate among professionals, while in lower occupational groups there are higher proportions of overeducated workers.

Figure 3. Mismatch by educational attainment and educational attainment needed for job

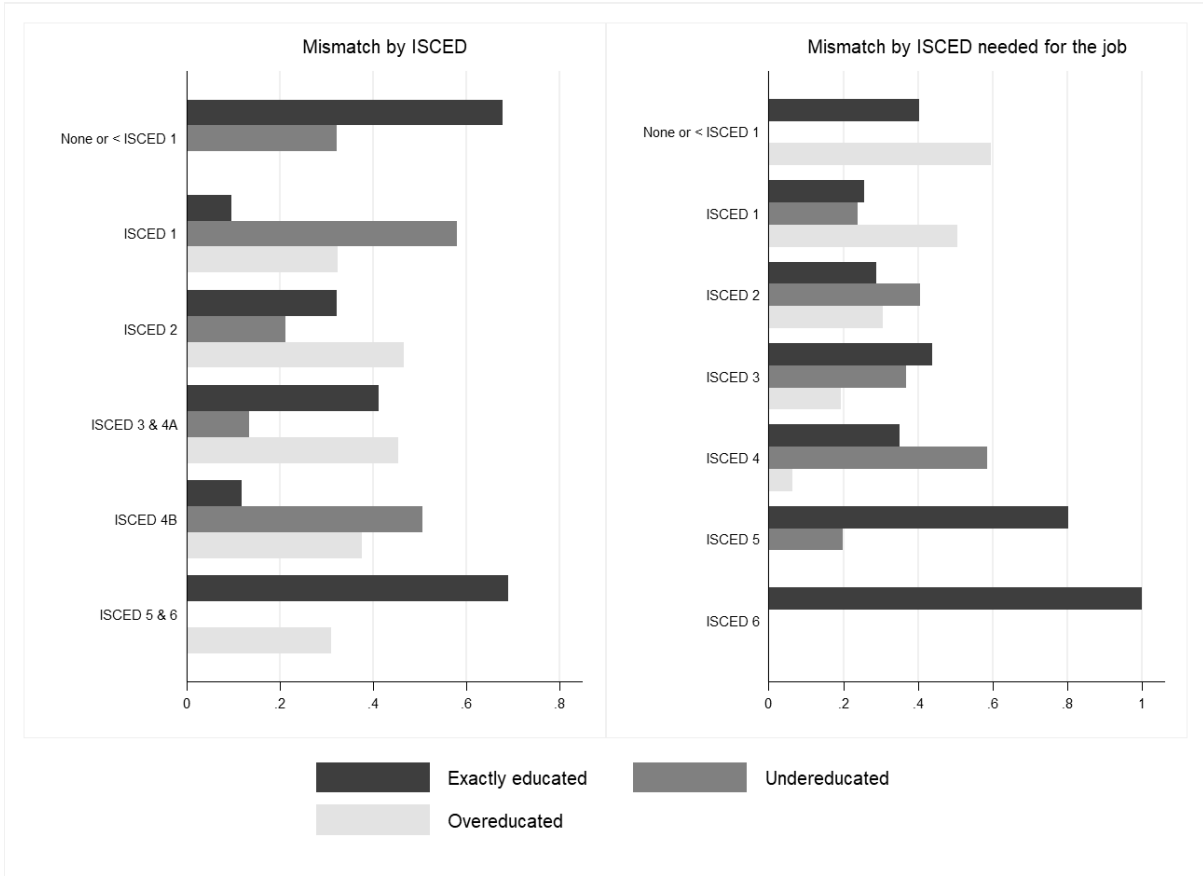
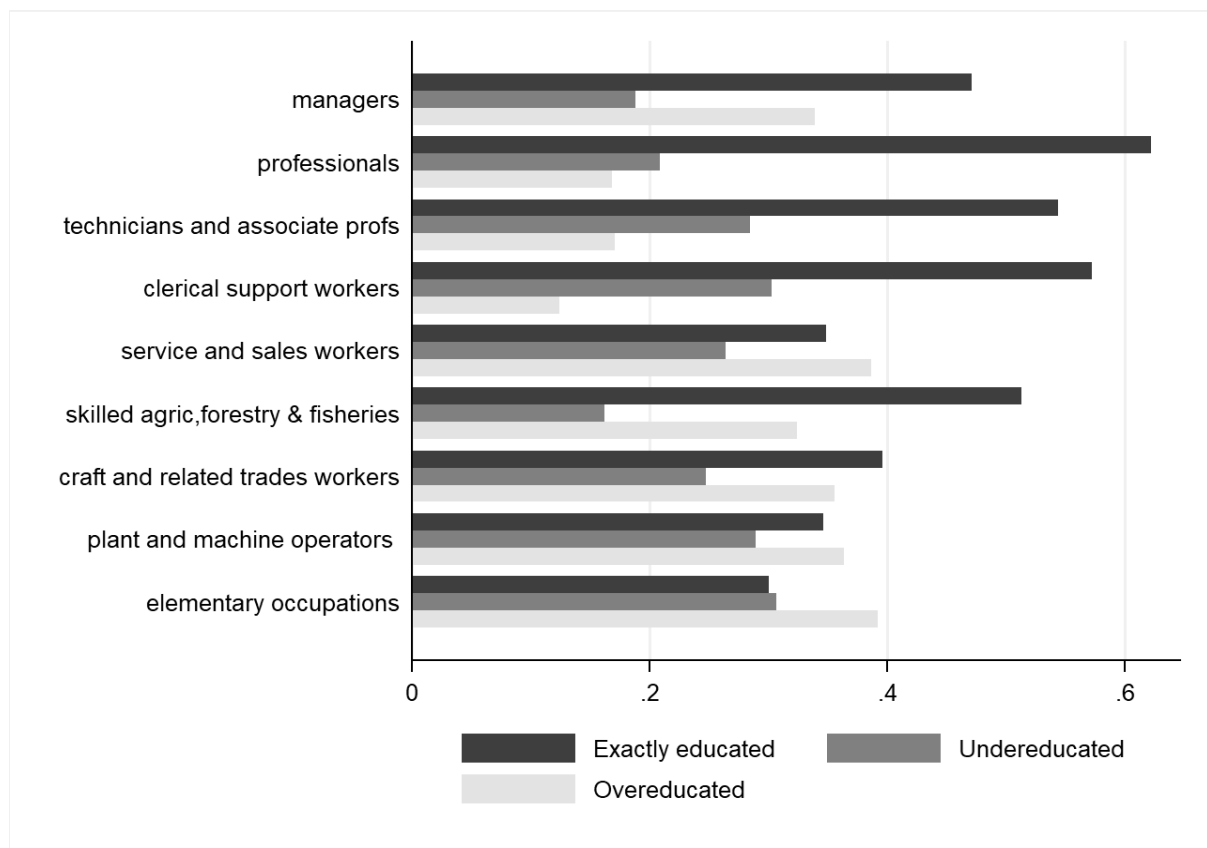


Figure 4. Education mismatch and major occupational group



These differences across the distributions of educational attainment, the educational requirements of jobs, and occupations are underexplored. While to some extent predictable from a statistical perspective they may go some way towards explaining differences in the wage penalties of under and overeducated people. In particular, the lower earnings of overeducated people (Table 1) may in part be explained by their employment in jobs with lower educational requirements and in lower occupational groups (Figures 3 and 4). Furthermore, it may be that within different educational levels of attainment and in different types of jobs, the pattern of financial reward and penalty to mismatch varies, as assignment theory would predict. This may in itself provide some rationale for mismatch, if, for example, overeducated workers in some categories of jobs are compensated for their educational attainment.

To consider whether mismatches are associated with wage penalties or premiums taking into account these distributional issues, Table 2 shows for each mismatch category the mean values of the two constructed measures of relative earnings (described above). The figures in Table 2 indicate that in contrast to the distribution of mean earnings (Table 1) the undereducated earn higher wages relative to the mean for the level of education (ISCED) they have attained. This pattern is expected since the undereducated are by definition in higher skilled jobs than

equivalently educated people who are matched or overeducated. For the undereducated, the wage premium by ISCED and the very minor penalty in relative wages by ISCED needed in the job are in line with the Job Competition Model (1975) in which the education required by the job sets wages: undereducated workers earn a premium in relation to the exactly matched at their education level. In terms of relative wages by ISCED attained, neither the penalty for the overeducated nor the premium for the undereducated are in line with HCT in that people are not rewarded at their education level. However, and again in contrast to mean earnings, the figures for earnings relative to the average for the education level (ISCED) needed in the job in Table 2 show that when educational requirements of jobs are taken into account, wages are higher relative to the average for the overeducated. This evidence suggests that within a given category of job, determined by the education needed for that job, the overeducated, while mismatched, are financially compensated to some extent for their education, which is in line with human capital theory. This could be part of the rationale for them to have accepted a specific job in the first place, in that relative to their colleagues their overeducation is recognised and rewarded. Next, multiple regression analysis examines whether these patterns are maintained when other factors are taken into account.

*Table 2: Means for relative earnings by mismatch category*

	Exactly educated		Undereducated		Overeducated	
	Mean	SD	Mean	SD	Mean	SD
Relative earnings by ISCED attained	1.03	2.25	1.30	5.00	0.80	1.56
Relative earnings by ISCED needed in the job	1.00	2.20	0.95	3.41	1.09	2.05

## **5.2 Regression results**

The results in Table 3 show the earnings estimations for the whole sample with the three different dependent variables. In estimation 1 the dependent variable is the log of the hourly wage, the dependent variable in estimation 2 is the log of the relative wage taking into account educational attainment and the dependent variable in estimation 3 is the log of the relative wage taking into account the educational requirements of the job.

Table 3: Mismatch, earnings and relative earnings

	(1) Hourly Earnings	(2) Relative earnings by ISCED attained	(3) Relative earnings by ISCED needed in the job
Undereducated <sup>a</sup>	0.0053 (0.0520)	0.1532*** (0.0514)	-0.0561 (0.0514)
Overeducated <sup>a</sup>	-0.1724*** (0.0494)	-0.1653*** (0.0488)	0.1590*** (0.0487)
Job search: Social networks	-0.2140*** (0.0514)	-0.1917*** (0.0508)	-0.2081*** (0.0510)
Job search: own search and employer contact	-0.0393 (0.0610)	-0.1028* (0.0607)	-0.1491** (0.0610)
Job search: after training, apprentice	0.1731* (0.0931)	0.0517 (0.0933)	0.0210 (0.0931)
Female	-0.3008*** (0.0644)	-0.3245*** (0.0638)	-0.2988*** (0.0640)
Education quality	0.0714*** (0.0065)	0.0116* (0.0064)	0.0144** (0.0065)
Female*education quality	0.0258*** (0.0088)	0.0298*** (0.0086)	0.0278*** (0.0086)
Age	-0.0023 (0.0026)	0.0006 (0.0026)	0.0011 (0.0026)
Tenure	0.0017*** (0.0007)	0.0023*** (0.0007)	0.0024*** (0.0007)
Tenure squared	-0.0000* (0.0000)	-0.0000** (0.0000)	-0.0000*** (0.0000)
Informal	-0.3709*** (0.0530)	-0.2039*** (0.0521)	-0.1650*** (0.0522)
Kenya	0.0030 (0.0490)	0.1014** (0.0486)	0.0791 (0.0484)
Constant	0.5892*** (0.1237)	-0.5980*** (0.1224)	-0.6831*** (0.1233)
Observations	2,761	2,761	2,761
Adjusted R-squared	0.212	0.068	0.052

Notes

Robust standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \*p<0.10

<sup>a</sup>Reference category is Exactly matched: educational attainment exactly matched to educational requirements of the job

After controlling for other influences, the results for the indicators of mismatch can be seen to vary across the estimations in Table 3 in the pattern similar to that suggested by the summary analysis of Tables 1 and 2. First, with exactly matched the reference category, in estimation

1 where the dependent variable is the log of hourly earnings, overeducated is negatively significant, and the estimated coefficient indicates a wage penalty of just over 17 percent for the overeducated. However, undereducation is not significant in estimation 1 implying that the lower wages of the undereducated compared with the exactly educated in Table 1 are explained by the other factors included in the regression. In estimation 2 where the dependent variable, takes into account level of education attained, the pattern in Table 2 remains. Consistent with many previous studies, the coefficient on undereducated is positive and significant while that on overeducated is negative. Even when other factors are controlled, for people with comparable educational attainment, the earnings of those undereducated for their job are higher than those at the same education level who are matched, while the earnings of those overeducated for their job are lower compared with those who are matched. Specifically, the overeducated suffer a wage penalty of 16.5 percent relative to those with otherwise identical characteristics including the same level of education who are matched. In contrast, the undereducated earn a premium of 15.3 percent compared with the exactly matched. In estimation 3 the dependent variable takes into account the level of education needed in the job and, as we would expect, the pattern is reversed. The coefficient on undereducated is negative (but insignificant) while overeducated is positive and significant. This confirms that even after controlling for other factors and once the educational requirements of a job are taken into account, overeducated workers earn (almost 16 percent) more than the exactly matched and undereducated workers suffer a penalty of 5 percent (although not significantly relative to the matched). In separate regressions by country we find the results for overeducation in equations 1 and 2 are mainly driven by Kenya, whereas once the educational requirements of the job are taken into account (estimation 3), the premium effect of overeducation is stronger in Ghana (See Appendix table A2 for summary results). These findings are consistent with Figure 1 which shows that mismatch is more common in Kenya, although overeducation is more prevalent in Ghana.

These results confirm that the relationship between mismatch and earnings is more nuanced than is suggested by considering only raw earnings data. Specifically, the distribution of mismatch across educational levels and the educational requirements of jobs needs to be taken into account. The raw earnings data in Table 1 and also estimation 1 in Table 3 suggests that the overeducated suffer penalties for not being matched but this is no longer true when the educational requirements of jobs are taken into account (in estimation 3). Instead, in jobs with similar educational requirements, the overeducated earn a premium over matched and

undereducated workers doing the same kind of work. They therefore see a return to their educational investments in relation to their less educated co-workers. In addition, the wage penalty for the undereducated indicated by the raw earnings data is not replicated when earnings are considered relative to the average for different educational levels (in estimation 2). Instead, in comparison with equally educated people, the undereducated earn a premium. Whether this means they are being paid more than their marginal revenue product depends on whether they bring other skills to the job that are not accounted for by their formal educational attainment, literacy attainment or tenure.

The pattern of significance of the indicators for different methods of job search shows that this variable is relevant in understanding how labour markets function in SSA. Relative to the reference group (finding a job by starting a business), finding a job through social networks or own job search and employer contacts is associated with lower paid jobs. The negative effect of social networks ranges from around 19 percent in column (2) to 21.4 percent in column (1). However, the effect of own job search and employer contacts is only significant in estimations 2 and 3 when education and the educational requirements of the job are taken into account – an earnings reduction of 10.1 percent and 14.9 percent respectively. In contrast, finding a job after an apprenticeship or training takes a positive sign but is only significant in estimation 1.

In relation to the other independent variables, female gender is negative and significant in all three estimations. Being female is associated with lower wages of around 30, 32.5, and 29.9 percent in columns (1) - (3) respectively. The indicator for the quality of education takes a positive sign and is significant in all three estimations, although less strongly in estimation 2 where the dependent variable takes account of educational attainment. The marginal effect of an increase in the measure of the quality of education equates to a 7.1% increase in earnings in specification 1 (column (1)) but after taking account of educational attainment and the educational requirements of the job the returns fall to between 1.16% and 1.44% (columns (2)-(3)). However, the interaction between gender and educational quality is positive and significant in all three estimations. This suggests that the quality of education is particularly important for women and works to narrow the gender pay gap. Specifically, the returns to a higher quality of education for females (relative to males) range from 2.6-2.9 percent across the three specifications – columns (1) – (3). In contrast, when we estimated separate regressions (Appendix Table A3) where instead of the constructed indicator of educational quality, years of education and the literacy score were included separately with an interaction term between

the former and gender, years of education was only significant in estimation 1 and the interaction only significant in estimations 2 (strongly) and 3 (weakly). The literacy score was positive and significant in all three estimations. The pattern of significance of the mismatch indicators was not affected. There is therefore some evidence that literacy is more important for earnings than years of schooling.

Age is insignificant but tenure is positively and significantly linked to earnings in all three estimations in line with human capital theory. The negative sign for tenure squared suggests this is a non-linear relationship with the return to tenure diminishing, although the coefficients for tenure squared are small indicating a high value for the turning point. Predictably, working in the informal sector is associated with lower earnings. Earnings are higher in Kenya once educational level or the educational requirements of the job are taken into account.

Because gender is significant we also estimated the regressions separately for men and women (Appendix Table A4). The results show that in all three equations the effects of overeducation are stronger for men. In estimation 2 where educational level is taken into account, undereducated females are paid more than equally educated women who are exactly educated for their job. In estimation 3, only males suffer a penalty for undereducation. The positive effect of educational quality is larger for women (more than double that for men in estimations 2 and 3) in line with the significant interaction effect in Table 2. Other differences are that the positive effect of tenure is only significant for women implying that experience in the job is less important for men. The negative effect of job search through social networks is smaller for women, but still negative.

In order to explore whether different job search methods and the quality of education had differential impacts on earnings for the matched and unmatched sub-samples, estimations 2 and 3 in Table 3 were estimated separately for undereducated, overeducated and exactly matched workers. Table 4 shows the results for the dependent variables measuring relative wages by education (ISCED) attained (estimations 1-3) and education (ISCED) needed in the job (estimations 4-6).



Table 4: Relative earnings by mismatch category

	(1)	(2)	(3)	(4)	(5)	(6)
	Undereducated	Overeducated	Exactly educated	Undereducated	Overeducated	Exactly educated
	Relative earnings by ISCED attained			Relative earnings by ISCED needed in the job		
Job search: Social networks	-0.0946 (0.0932)	-0.1685* (0.0891)	-0.2914*** (0.0827)	-0.1311 (0.0941)	-0.1743* (0.0897)	-0.3004*** (0.0831)
Job search: own search and employer contact	0.0579 (0.1145)	0.0923 (0.1106)	-0.3676*** (0.0915)	-0.0395 (0.1175)	0.0561 (0.1090)	-0.3734*** (0.0922)
Job search: obtained after training, apprentice	0.3666* (0.2076)	0.1830 (0.1636)	-0.2781** (0.1326)	0.2654 (0.2090)	0.1926 (0.1640)	-0.2450* (0.1340)
Female	0.0220 (0.1198)	-0.4701*** (0.1275)	-0.4756*** (0.0940)	0.0735 (0.1209)	-0.4461*** (0.1263)	-0.4268*** (0.0943)
Education quality	0.0298** (0.0125)	-0.0206 (0.0133)	0.0249*** (0.0092)	0.0047 (0.0129)	0.0167 (0.0132)	0.0176* (0.0092)
Female*education quality	0.0018 (0.0171)	0.0338* (0.0172)	0.0464*** (0.0118)	0.0072 (0.0171)	0.0281 (0.0171)	0.0402*** (0.0120)
Age	0.0034 (0.0043)	-0.0017 (0.0050)	0.0012 (0.0040)	0.0005 (0.0044)	-0.0025 (0.0050)	0.0037 (0.0040)
Tenure	0.0013 (0.0013)	0.0023* (0.0012)	0.0030*** (0.0010)	0.0022* (0.0013)	0.0020* (0.0012)	0.0029*** (0.0010)
Tenure squared	-0.0000 (0.0000)	-0.0000 (0.0000)	-0.0000** (0.0000)	-0.0000 (0.0000)	-0.0000 (0.0000)	-0.0000** (0.0000)
Informal	-0.3666*** (0.0917)	-0.0109 (0.1001)	-0.1566** (0.0798)	-0.2486*** (0.0907)	-0.0584 (0.0999)	-0.1843** (0.0811)
Kenya	0.0751 (0.1195)	0.1080 (0.0817)	0.0927 (0.0704)	0.2226* (0.1200)	-0.0516 (0.0811)	0.0850 (0.0701)
Constant	-0.6361** (0.2468)	-0.6459*** (0.2353)	-0.5991*** (0.1850)	-0.9127*** (0.2460)	-0.3868* (0.2325)	-0.6696*** (0.1878)
Observations	709	888	1,164	709	888	1,164
Adjusted R-squared	0.068	0.023	0.103	0.025	0.044	0.079

Robust standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \*p<0.10

Relative to a person starting their own business, job search using social networks appears to result in jobs with lower earnings but only for the overeducated and matched sub-groups, not for the undereducated. For instance, in columns (2) and (3), social networks lower earnings by around 17 and 20 percent respectively. This evidence suggests that relying on social networks to secure employment may be an effective way of securing a job but for matched and

overeducated workers it is not an effective way to find a higher paid job. In addition, for matched workers, relying on their own search and employer contact is likely to result in lower earnings of around 37 percent. However, for undereducated workers, different kinds of job search do not appear to impact on earnings. Table A1 reports that 35% of the undereducated reported that they had found a job through social networks, a higher proportion than the matched (28%) and overeducated (29%). For the undereducated finding a job through social networks is advantageous since they are accessing a job for which they are seemingly underqualified. The most common entry into work is through setting up a business, which illustrates one of the substantial differences of sub-Saharan African and other developing country contexts from higher income contexts.

In these estimations female gender and the interaction term between quality of education and gender are insignificant for the undereducated while remaining negatively and positively significant (respectively) for overeducated and matched workers (as in Table 3). In addition, the quality of education is only consistently and positively significant for matched workers although in estimation 1 it is also positively significant for the undereducated while in estimation 2 the measure is (weakly) negatively significant for the overeducated. This evidence suggests that when educational attainment and the educational requirements of jobs are taken into account, there is no gender wage gap among the undereducated. Furthermore, matched workers appear to reap most of the wage returns to educational quality.

### ***5.3 Sensitivity analysis***

The possibility of sample selection into employment was taken into account in further sensitivity analysis using the Heckman selection approach to estimate employment participation prior to the earnings equations. As noted by Kalfa and Piracha (2018), as educational mismatch is only observed for those in employment, selection bias may occur if this group is non-randomly selected from the population. Selection is also considered to be more important for females given their generally lower participation rates, and gender differences in relation to matching needs to be considered in future research. However, the results of the Heckman procedures indicated that selection was not a cause of bias in the estimations run on this sample (the procedures used number of children, marital status and parents' educational attainment as exclusion terms). One explanation is that the sample participation rates are quite high (83.79% overall; 91.79% for men and 77.14% for women) and therefore selection would not be expected to be a concern. Heckman selection methods are

though limited by sensitivity to the choice of exclusion terms which might qualify these conclusions.

## **6. Discussion**

We found systematic differences in earnings among undereducated, overeducated and exactly educated workers in country contexts where educational attainment is much lower overall than in the high-income contexts where most of the previous research has taken place and has focused on graduates (see Chevalier, 2003). When we control for the education level at which mismatch occurs, overeducated workers earn a premium over those that are exactly matched for the same job, whilst undereducated workers are associated with a wage penalty. Our evidence shows the importance of controlling for the distribution of mismatch across jobs with different educational requirements. Without controlling for this variation, the data can reflect a statistical artefact in that, for example, undereducated workers are by definition working in jobs that have higher educational requirements than those with the same education who are matched and therefore the former are likely to be higher paid.

The penalties and premiums to mismatch that we find are an indication that people are not entirely rewarded according to human capital theory, that is in line with their education and training. Instead, job requirements also have a role in determining earnings, as Thurow (1975) argues. The extent of these penalties and premiums suggest that they are not simply a result of short-term matching problems in the labour market. These results could also suggest the possibility that part of the educational investment of overeducated workers, in particular, is unproductive. Education might help workers to get a job, that is, to move higher up the job queue (Spence, 1973), but we are unable to test this. There is some evidence in support of HCT in the premium received by the overeducated after the educational requirements of the job are taken into account. To employers, hiring overeducated workers would be justified if these workers are less costly to train once on the job. Following search models (Weiss, 1995), having more than the required level of education for the job could reflect unobserved skills that make these workers more productive than those that have the required level. As for undereducation, this could be reflective of the nature of developing country labour markets which are often characterised by lack of skilled workers. Firms may therefore react to the lack of skilled workers with the correct level of education by hiring workers with lower educational attainment.

The results for the role of methods of job search in wage determination deepen our understanding of the effectiveness of the labour market in allocating people into jobs. In particular, finding a job through social networks or own search and employer contacts is associated with lower earnings, as also found for social networks in the US and Europe (Bentolila, Michelacci, and Suarez 2010). However, further analysis of the differential effects of job search on earnings among undereducated, overeducated and exactly educated workers indicated that finding a job through social networks was consistently associated with lower earnings only for the overeducated and exactly educated, not for the undereducated. Previous studies have found that finding a job through social networks exacerbated the prevalence of overeducation (Kalfa and Piracha 2018). Although social networks are important in the labour market for securing a job, they do not necessarily lead to a higher paid job. In fact the opposite seems to be the case for those who are overeducated and exactly educated. These findings are also consistent with labour market dysfunctionality (Herrera and Mercerón 2013) in that some well-used job search methods appear to result in lower paid jobs. This is also likely to be part of the reason for the inability of developing labour markets to absorb the increasing number of highly educated workers (Aryeetey and Baah-Boateng 2015).

Finally, the results also show the importance of education quality for earnings, particularly for women. It is hard to explore further this finding with the data that we have and it is certainly an important topic for further study. It could be, as has been found in many other contexts, that women are assessed more rigorously on ability than men. Blunch (2014) identifies the need to focus on school quality in Ghana, particularly at post-primary level in order to deliver on higher standards in relation to literacy and numeracy. Overall, these results highlight the importance of job search and education investment, particularly for women, in developing labour markets.

Of course our study has its limitations. The sampling of the STEP survey focuses solely on urban dwellers, limiting the generalisability of the study to the national level. Rural workers make up the majority of the population in both countries and have lesser educational attainment and a larger gender gap in participation and attainment than urban dwellers (Shabaya and Konadu-Agyemang 2004). In future research, consideration of rural dwellers would provide a different perspective on the incidence of mismatch and its implications for the labour market.

## **7. Conclusion**

The analysis in this paper contributes new evidence on the relationship between overeducation, undereducation and earnings in two sub-Saharan African countries, Ghana and Kenya. Previous research on educational mismatches has tended to focus on higher income countries and mostly on graduate overemployment. This analysis encompassed the educational distribution, taking into account the distributional effects of mismatch by controlling for level of education. In parallel, the analysis examines the effect on earnings of different methods of job search and educational quality.

Similar to previous studies, the results on the effects of education mismatch are found to lie somewhere between those predicted by HCT and the job competition model. These results highlight the complexity of the choices with respect to investments in education. Education helps workers find employment but does not help them as much as would be predicted by HCT to find a job commensurate with their education level. There are clearly limits to the willingness of employers to offer financial rewards for educational attainment in Kenya and Ghana. In order to secure employment individuals need to make decisions about their educational investments in relation to these labour market realities. As such, this requires early knowledge of the entry requirements and rewards of different occupations in order to enable investment in the appropriate level and type of education. Our results point to the need to improve the effectiveness of job search. As it stands, many individuals obtain jobs for which they are overqualified through the use of contacts: it maybe that contacts enable individuals to get a job rather than to get a job that is matched to their attainment. Hiring through networks seems to encourage overeducation, in line with job search theories. Not matching has far reaching consequences to individuals, organisations and society. For example, in higher income countries, overeducation has been found to impact workers mental health and wellbeing: overeducated workers report lower job satisfaction (Battu, Belfield, and Sloane 1999; Tsang, Rumberger, and Levin, 1991) and have higher job turnover (Sloane, Battu, and Seaman 1999; Alba Ramirez 1993).

Lastly, that educational mismatches are evident to a high degree in Ghana and Kenya raises concerns about the nature of jobs available to individuals and the quality of the education systems. As in many developing labour markets, most jobs are low-skilled and there are not enough high skilled jobs to meet the growing supply of educated workers. One of the greatest challenges for governments is to invest in or stimulate job creation which can take advantage

of and absorb this increasing supply of labour. Similarly, the education system should focus more on quality rather than quantity and needs to work with industry to ensure that the skills required by employers are acquired by the expanding labour force.

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## Appendix

Table A1. Summary statistics and variable definitions

Variable	Full sample		Undereducated		Overeducated		Exactly educated	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Log of hourly earnings (USD)	0.48	1.19	0.50	1.07	0.32	1.16	0.58	1.27
Log of hourly relative earnings by ISCED attained (USD)	-0.69	1.08	-0.50	1.01	-0.87	1.10	-0.67	1.09
Log of hourly relative earnings by ISCED needed in the job (USD)	-0.68	1.07	-0.76	0.99	-0.57	1.11	-0.72	1.08
Exactly matched (1 if level of educational attainment equals that required for the job; 0 otherwise)	0.42	0.49						
Undereducated (1 if level of educational attainment is below that required for the job; 0 otherwise)	0.26	0.44						
Overeducated (1 if level of educational attainment is above that required for the job; 0 otherwise)	0.32	0.47						
Job search: Social networks (1 if individual found current job via social networks; 0 otherwise)	0.30	0.46	0.35	0.48	0.29	0.45	0.28	0.45
Job search: Own search employer contact (1 if individual found current job via own search or direct contact by the employer; 0 otherwise)	0.22	0.41	0.25	0.43	0.14	0.35	0.26	0.44
Job search: Started own business (1 if individual started own business; 0 otherwise)	0.42	0.49	0.34	0.48	0.53	0.50	0.40	0.49
Job search: After training, apprentice (1 if individual found current job after apprenticeship or training; 0 otherwise)	0.06	0.23	0.06	0.24	0.04	0.20	0.07	0.25
Education quality; literacy test scores multiplied by learning adjusted years of education	5.23	4.95	4.56	4.28	5.28	4.70	5.60	5.46
Male (1 if male, 0 if female)	0.52	0.50	0.56	0.50	0.48	0.50	0.52	0.50
Female (1 if female, 0 if male)	0.48	0.50	0.44	0.50	0.52	0.50	0.48	0.50
Age (in years)	36.16	9.63	36.61	9.55	36.10	9.39	35.94	9.85
Tenure (in months)	79.96	86.04	76.25	79.41	79.85	83.35	82.30	91.74
Formal (1 if employed in formal sector, 0 if informal sector)	0.24	0.43	0.27	0.44	0.14	0.35	0.30	0.46
Informal (1 if employed in informal sector; 0 if formal sector)	0.76	0.43	0.73	0.44	0.86	0.35	0.70	0.46
Ghana (1 if individual is located in Ghana; 0 if Kenya)	0.47	0.50	0.23	0.42	0.57	0.50	0.55	0.50
Kenya (1 if individual is located in Kenya; 0 if Ghana)	0.53	0.50	0.77	0.42	0.43	0.50	0.45	0.50
<i>N</i>	2,761		709		888		1,164	

Table A2. *Mismatch, earnings and relative earnings by country (summary results)*

	(1)	(2)	(3)	(4)	(5)	(6)
	Ghana	Kenya	Ghana	Kenya	Ghana	Kenya
	Hourly earnings	Hourly earnings	Relative earnings by ISCED attained	Relative earnings by ISCED attained	Relative earnings by ISCED needed in the job	Relative earnings by ISCED needed in the job
Undereducated	0.0428 (0.1074)	-0.0481 (0.0599)	0.1404 (0.1079)	0.1497** (0.0585)	-0.1451 (0.1070)	-0.0290 (0.0584)
Overeducated	-0.0699 (0.0711)	-0.3076*** (0.0661)	-0.1090 (0.0712)	-0.2301*** (0.0638)	0.1876*** (0.0708)	0.1218* (0.0645)
Constant	0.6870*** (0.1799)	0.4177** (0.1639)	-0.3755** (0.1821)	-0.8172*** (0.1578)	-0.4785*** (0.1817)	-0.9065*** (0.1603)
Observations	1,308	1,453	1,308	1,453	1,308	1,453
Adjusted R-squared	0.142	0.268	0.041	0.092	0.046	0.069

Robust standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \*p<0.10  
Other included variables as in Table 3

Table A3. *Mismatch, earnings and relative earnings using years of education and literacy scores*

	(1)	(2)	(3)
	Hourly earnings	Relative earnings by ISCED attained	Relative earnings by ISCED needed in the job
Undereducated	-0.0393 (0.0520)	0.1368*** (0.0514)	-0.0797 (0.0515)
Overeducated	-0.3341*** (0.0508)	-0.2062*** (0.0501)	0.1335*** (0.0500)
Job search: Social networks	-0.2167*** (0.0511)	-0.1906*** (0.0506)	-0.2077*** (0.0508)
Job search: own search and employer contact	-0.0508 (0.0618)	-0.1019* (0.0610)	-0.1405** (0.0614)
Job search: after training, apprentice	0.1513 (0.0925)	0.0593 (0.0940)	0.0376 (0.0939)
Female	-0.2203** (0.0955)	-0.3467*** (0.0931)	-0.2972*** (0.0941)
Years of education actually completed	0.0696*** (0.0078)	0.0050 (0.0076)	0.0026 (0.0077)
Female*years of education completed	0.0074 (0.0088)	0.0193** (0.0086)	0.0149* (0.0087)
Literacy score	0.0283*** (0.0089)	0.0202** (0.0088)	0.0215** (0.0088)
Age	0.0031 (0.0026)	0.0019 (0.0026)	0.0022 (0.0026)
Tenure	0.0020*** (0.0007)	0.0024*** (0.0007)	0.0025*** (0.0007)
Tenure squared	-0.0000** (0.0000)	-0.0000*** (0.0000)	-0.0000*** (0.0000)
Informal	-0.3402*** (0.0545)	-0.2020*** (0.0535)	-0.1864*** (0.0538)
Kenya	0.0420 (0.0493)	0.1057** (0.0491)	0.0991** (0.0491)
Constant	-0.0118 (0.1467)	-0.7132*** (0.1437)	-0.7523*** (0.1449)
Observations	2,761	2,761	2,761
Adjusted R-squared	0.212	0.066	0.046

Robust standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \*p<0.10

Table A4. *Mismatch, earnings and relative earnings by gender*

	(1)	(2)	(3)	(4)	(5)	(6)
	Males	Females	Males	Females	Males	Females
	Hourly earnings	Hourly earnings	Relative earnings by ISCED attained	Relative earnings by ISCED attained	Relative earnings by ISCED needed in the job	Relative earnings by ISCED needed in the job
Undereducated	-0.0963 (0.0691)	0.1022 (0.0781)	0.0652 (0.0682)	0.2361*** (0.0777)	-0.1812*** (0.0679)	0.0778 (0.0778)
Overeducated	-0.2065*** (0.0678)	-0.1359* (0.0719)	-0.1747*** (0.0670)	-0.1573** (0.0712)	0.2075*** (0.0667)	0.1110 (0.0712)
Job search: Social networks	-0.2754*** (0.0722)	-0.1542** (0.0733)	-0.2328*** (0.0714)	-0.1464** (0.0724)	-0.2556*** (0.0714)	-0.1708** (0.0728)
Job search: own search and employer contact	-0.1041 (0.0849)	0.0071 (0.0867)	-0.1182 (0.0840)	-0.1180 (0.0872)	-0.1985** (0.0843)	-0.1171 (0.0874)
Job search: after training, apprentice	0.2978** (0.1272)	-0.0599 (0.1303)	0.1785 (0.1295)	-0.1639 (0.1272)	0.1181 (0.1290)	-0.1572 (0.1298)
Education quality	0.0740*** (0.0069)	0.0888*** (0.0086)	0.0131* (0.0068)	0.0351*** (0.0082)	0.0147** (0.0069)	0.0371*** (0.0080)
Age	-0.0044 (0.0034)	0.0014 (0.0040)	-0.0009 (0.0034)	0.0033 (0.0040)	-0.0001 (0.0034)	0.0039 (0.0039)
Tenure	-0.0004 (0.0009)	0.0043*** (0.0010)	0.0004 (0.0009)	0.0047*** (0.0010)	0.0005 (0.0009)	0.0046*** (0.0010)
Tenure squared	0.0000 (0.0000)	-0.0000*** (0.0000)	0.0000 (0.0000)	-0.0000*** (0.0000)	0.0000 (0.0000)	-0.0000*** (0.0000)
Informal	-0.2903*** (0.0658)	-0.5598*** (0.0892)	-0.1543** (0.0643)	-0.3221*** (0.0881)	-0.1417** (0.0649)	-0.2370*** (0.0867)
Kenya	-0.0345 (0.0647)	0.0443 (0.0748)	0.0418 (0.0645)	0.1755** (0.0739)	0.0278 (0.0646)	0.1386* (0.0730)
Constant	0.7812*** (0.1602)	0.1871 (0.1802)	-0.4357*** (0.1591)	-1.0353*** (0.1783)	-0.5023*** (0.1599)	-1.1307*** (0.1760)
Observations	1,430	1,331	1,430	1,331	1,430	1,331
Adjusted R-squared	0.176	0.214	0.029	0.090	0.041	0.063

Robust standard errors in parentheses. \*\*\* p&lt;0.01, \*\* p&lt;0.05, \*p&lt;0.10