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Covariance and Correlation between Education Mismatch and Skills Mismatch in Tanzanian Formal Sector

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Covariance and Correlation between Education Mismatch and Skills Mismatch in Tanzanian Formal Sector

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Abstract - This study examined the correlation and covariance between education mismatch and skills mismatch in the Tanzanian Formal sector taking Dar es Salaam and Dodoma regions as case studies. The study employed cross sectional and Worker Self Assessment (WSA) techniques with 319 workers from public and private sectors selected by multistage cluster sampling. Office interviews were conducted to collect qualitative data using structured questionnaire. The SPSS-16 statistical package was used for data analysis. Using Chi square at 5% level of significance, the results reported an existence of relationship between education mismatch and skills mismatch (χ^2=39.57; p=0.00). Using bivariate correlation, results portrayed a weak positive correlation between education mismatch and skills mismatch ($Cor_{em,sm}$=0.241). Also, using bivariate covariance, the results showed a positive co-vary behavior between education mismatch and skills mismatch ($Cov_{em,sm}$ = 0.112). This study therefore concludes that education mismatch and skills mismatch are not perfect substitute. It is thus recommended that the government should not take the existence of National Employment Policy of 2008 and its labour regulatory frameworks as a guarantee of success. Thus, deliberate efforts should be adopted to force both private and public employers to use the same standards, measures and regulations in recruitment to minimize incidence of mismatch. Also, the government and other labour market actors should avoid using education mismatch as a proxy for skills mismatch, since the two have no a one to one relation.

Keywords : skills mismatch, education mismatch, policy, formal sector, correlation, covariance.

I. Introduction

The correlation and covariance between education mismatch (EM) as well as skills mismatch(SM) have not been studied systematically in many formal labour markets (Arrow and Capron, 1959; Dieptro and Urwin, 2006; Asian Development Bank(ADB), 2005). More importantly, mismatch problem has been a crucial policy issue not only for policy makers, but also for social partners including employers associations and trade unions (CEDEFOP, 2010a).

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The education mismatch is a phenomenon prevailing when actual level of education possessed by the worker does not match with the requirement for the worker to be able to perform a particular job. This can further be expressed when the worker is either over educated (i.e. the worker has more level of education than what is required to do a particular job) or under educated (i.e. the worker has lower level of education that what is required to do particular job) (CEDEFOP, 2010a; Sugiyarto, 2007; Linsley, 2005).

Several studies (Linsely, 2005; Desjardins *et al*, 2011) have analysed the prevalence of education mismatch as well as skills mismatch in different periods of time. These have further found that education mismatch and skills mismatch are mutually exclusive problems. On the other hand, some scholars have treated education mismatch as equivalent to skills mismatch (Linsley, 2005). Despite these different thinking of researching on mismatch problem, yet few scholars still concur that education mismatch is significantly related to skills mismatch.

Linsley (2005) is an example of the study which treated higher level of education as a signal of more productivity of workers. In the same analysis, he contended that education signals skills and knowledge that are embodied in human being. However, treating EM as a mirror image of SM may not hold true in some situations as follows:- First, education mismatch is all about the deviation in terms of levels of education that workers possess and the demand for such levels. Second, a worker can have more level of education (i.e. over educated) on one hand, yet being under skilled on the other hand. In addition, the worker can have low level of education (under educated) yet he or she is over skilled on the other hand. Nevertheless, it is possible to find some workers who are both over educated and over skilled and others being under educated and under skilled on the other hand.

Moreover, there are notable studies on how education mismatch is correlated to skills mismatch (Lisley 2005, CEDEFOP, 2010b). However, studies on covariance between education mismatch and skills mismatch are scarce. In addition, methodologically, most studies have been reporting the relationship between education mismatch and skills mismatch using descriptive statistics such as percentages. For instance,

Urwin and Di Pietro (2006) did a study in the Italian labour market and found a positive relationship between education mismatch and skills mismatch. They therefore reported that 72.77 percent of the graduates who considered their level of education to be adequate for the job, reported to have used "quite a lot" or "a lot" of knowledge and skills learnt at university. Likewise, 80.32 percent of graduates working in jobs for which they felt having a university degree were excessively claimed using "none" or "a little" of the skills and knowledge acquired at university. Allen and Van Der Velden (2001) as well as Green and McIntosh (2002) had the same observations. The CEDEFOP (2010a, b) analysis of mismatch across European countries found that 40 percent of workers were matched in all aspects. Through the use of cross tabulation, it was further found that first, over-skilling was clearly the predominant form of mismatch with an EU weighted average of 28.75 percent, with a range across countries of 18.50 percent in the Czech Republic, to 39.84 percent in Romania. On the other hand, over education ranged from 1.28 percent in Lithuania to 13.83 percent in the Czech Republic (ibid). Evidence on EM and SM in Africa is limited, with few studies in Nigeria (Adedeji *et al*, 2012).

The Tanzanian labour market is characterised with both informal and formal sectors. Also the labour market is made up of 20.6 million people who are currently in the labour force (URT, 2006). In addition, an average of 700,000 new entrants and re-entrants join the labour force every year including those in the formal sector (ibid). Therefore, more than 18.3 million people in Tanzania are estimated to be employed in a number of sectors including the formal sector (URT, 2006; Danish Federation of Trade Unions and the Danish Confederation of Salaried Employees and Civil Servants, 2003). The formal labour market is thus a legal, structured and organised institution. It is also characterised with both private and public sectors. In the same vein, the number of workers in the formal sector is as follows: - about 344,839 persons are in central, local and regional governments; 78,270 are in the parastatal enterprises and 682,118 are in private sector (URT, 2006).

There are notable efforts made by the government of Tanzania and other stakeholders in improving the labour market. The efforts have been successful through reforms such as Investment Reform and Privatisation (1980s), Public Sector Reforms Program-PSRP (1990s) and Civil Service Reforms Program-CSRP-(1993) (Danish Trade Union of Tanzania, 2003), adoption of the national employment policy of 2008 (URT, 2008) and enactment of the Tanzania Employment Law and Labour Relations Act of 2004 (URT, 2004). However, there is no clear evidence to affirm the effectiveness of such policy, reforms and acts in dealing with skills mismatch and education mismatch. In addition, there is no locally owned empirical evidence to show how EM can be treated as a mirror image of SM.

Therefore, the current study uses Pearson Chi square and Bivariate Analysis to answer the following key questions. First, is there any correlation between education mismatch and skills mismatch in the formal sector of Tanzania? Second, is there any covariance between education mismatch and skills mismatch in the formal sector of Tanzania? How about any relationship between education mismatch and skills mismatch?

II. Theoretical Framework

Human Capital Theory (HCT)

This study has adopted the Human Capital Theory (HCT) as a rudiment for understanding the relationship between education mismatch and skills mismatch in Tanzanian labour market. The HCT contends that a worker with more level of education is likely to have more skills and hence if employed he/she is likely to be more productive. As Borjas (2006) stated that human capital entails a bundle of skills based on the level of education that a person possesses, yet a person who has more level of education as determined by years of schooling is likely to have more return to schooling.

On the other hand, Linsley (2005) in his study on over education in the Australian labour market argues that, the level of education can predict the extent of skills that a worker possesses. However, Nordin et al (2008) opposed this by pinpointing that the level of education cannot predict the skills that workers posses, and thus we cannot use education mismatch as a proxy of skills mismatch. Similarly, Thurrow (1975) reported that even though the HCT can show the relationship between over education and under education with over skill and under skill respectively, yet there is no a causal effect relationship between the two problems. In the same vein, Nordin et al (opcit) argues further that over educated and under educated workers are likely to experience income penalty and income premium respectively and this cannot be the case of skills mismatch. The authors argue further that both over education and under education are just proxies of over skill and under skill.

The HCT is faced with paralysis. This is because the expectations of the schooling graduate may not obey the HCT due to the following grounds. The graduate may complete his/her Bsc in agriculture and thus expects to be employed in the post that he /she will potentially use the skills and the level of education. Things might be different in the labour market that is having stiff competition to get jobs and few job openings with high unemployment rate. Nevertheless, the opportunity cost of doing the job that matches the skills on one hand and the education level on the other hand is low than of not doing. Thus the graduate may

decide to take in any posts so long he /she gets salary. Consequently, the workers might be over educated or under educated on one hand, and over skilled or under skilled on the other aspect. This is an area where HCT is violated. In this case, the human capital theory is disputed in the sense that a worker may end up getting low wage and becomes demoralized as he/she has no power of bargaining for the increment in wage due to the mismatch status that he /she possesses. Thus, the education mismatch is not a perfect substitute of skills mismatch and vice versa.

III. Research Methodology

a) Study Area

The study was carried out in Dodoma and Dar es Salaam regions due to their big number of formal sector workers where for Dodoma was 3.0% and for Dar es salaam was 19.03%(URT, 2006). On the other hand, the choice of Dodoma was thanks to higher government priority list since it was promoted to a capital city; this has led many government offices shifting to Dodoma (ibid).

b) Research Design

This study involved cross sectional and case study design as proposed by Sincich et *al.*, (2005) and Kothari (2007).This was due to their ability to study the problem of mismatch once and in one specific areas and in detail respectively. In addition, the study employed Workers Self Assessment(WSA) approach to study the EM and SM and to get data from workers while assessing themselves their matching or mismatch status with focus on education- job mismatch and skills-job mismatch (Duncan and Hoffman ,1991). This approach has been widely used as it is up-to-date and focuses on how an individual perceives the jobs in the labour market (Alba-Ramirez, 1993 Linsley, 2005). However, workers can give wrong information about their skills and education levels as observed by Hartog (2000).

c) Data Collection Methods and Tools

This study employed workers interview method to collect primary data on education mismatch and skills mismatch. The data were collected using structured questionnaires with open and closed ended questions. This method was administered to formal private and public workers. Also, this study pre-tested the survey instruments before comprehensive data collection. This ensured that the data were consistent over time and could be replicated in different settings, that is, they were reliable (Kothari, 2007; Baradyana and Ame, 2007).

d) Sampling Techniques and Sample Size

This study sampled purposively all districts from Dar es Salaam namely Ilala, Temeke and Kinondoni, to ncrease validity of results. For Dodoma region, Dodoma municipal, Bahi, Chamwino and Kondoa districts were sampled randomly. The sample size per district was as follows: - Dodoma municipal (72), Kondoa (3), Bahi (31), Temeke (6), Kinondoni (152), Ilala(38) and Chamwino (17). The choice of offices based on the merit of being public or private. Thus, this study sampled 177 workers from private sector and 142 from public sector. On the basis of sex, there were 201 male workers and 118 female workers. This sampling ensured that when the first was male then the second selection was female. This was possible in offices where representation of females was good. Thus, the study employed Multistage Cluster Sampling (MCS) method to get 123 workers from Dodoma region and 196 workers from Dar es Salaam region. Thus, Dar es Salaam region had the majority of the respondents since the region has many office workers. Therefore, the sample size for this study was 319 workers.

e) Model Estimation

Part I : *Bivariate Correlation Analysis*

This study employed Bivariate Correlation analysis to compare the association between education mismatch (over education and under education) on one hand, and skills mismatch (over skill, under skill) on the other hand (see equation 1)

$$\text{Correlation} = (\text{Cor}_{em,sm}) = \frac{Covem, sm}{\sigma em, \sigma sm} \quad (1)$$

Where

$\text{Cov}_{em,sm}$ -Covariance of chance of worker to have EM and/or SM

σ_{sm} -standard deviation of SM

σ_{em} -standard deviation of EM

Part II : *Chi Square Approach*

The relationship of classes of EM (i.e. over education and under education) and those of SM (i.e. over skill and under skill) was studied by using the contingency classification tables. In this approach, the aim was to establish the relationship between EM and SM, of which could provide findings to justify whether EM is a proxy for SM. The approach generates the chi square statistic at 5% level of significance.

Thus, equation 2 below was used to capture the relationship between EM and SM.

$$\chi^2 = \sum \frac{(Oi - Ei)^2}{Ei} \quad (2)$$

Where: χ^2 is the calculated Chi Square statistics, O_i is the observed value for person i; E_i is the expected value for person i

Part III : *Bivariate Covariance Analysis*

This study also calculated the covariance coefficient between education mismatch (over education and under education) on one hand and skills mismatch (over skill and under skill) on the other hand. The covariance measured the co- movement between education mismatch and skills mismatch (equation 3)

$$Cov_{em,sm} = \sum_{i=1}^{n} [Lem - E(Lem)][Lsm - E(Lsm)]Pi \quad (3)$$

Where

$Cov_{em,sm}$	-Covariance of EM,SM
L_{em}	-Incidence of EM
L_{sm}	-Incidence of SM
$E(L_{em})$	-Expected incidence of EM
$E(L_{sm})$	-Expected incidence of SM
P_i	-Probability of mismatch

f) Hypothesis Testing

The testing of hypothesis used 5% level of significance (α) and applied the normal distribution tables since the sample size was large. The computed probability (p) value was also compared with the alpha (∝). In addition, chi square statistic was computed and compared with the tabulated chi square value as a measure of relationship. In addition, the covariance and bivariate correlation coefficient were used to compare if there was a convergence in terms of the inference made by the chi square. Therefore, this study tested the following hypothesis-

Hypothesis

Ho: The education mismatch is not a mirror image of skills mismatch
Ho: EM =SM (two tailed test)

Ha: The education mismatch is a mirror image of skills mismatch
Ho: EM ≠SM (two tailed test)

Decision Rule: Reject Ho: when p value (p) < α or chi square computed at 5% is greater than the chi square tabulated.

IV. Results and Discussion

a) Relationship between Education Mismatch and Skills Mismatch

The results in Table 1 show that by comparing the tabulated Pearson Chi square (9.49) at 5 % level of significance and computed Pearson Chi square (39.57); it was learnt that, the computed value of Chi square was greater than the tabulated one. Using the p value of 0.00, the study infers the same observation as those of chi square. In addition, the p-value (0.00) was less than alpha (∝). Therefore, this study learnt that there was a strong evidence to reject the null hypothesis and statistically inferred the presence of significant relationship between education mismatch and skills mismatch. This further implies that education mismatch can be used as a substitute of skills mismatch. These results were similar to the analyses carried out by Allen and Van Der Velden (2001) on Dutch graduates, Green and McIntosh (2002) on the UK graduates and by Pietro and Urwin (2007) on the Italian graduate labour market. In the same analysis, these findings support merely the Human Capital Theory which postulates that education is a proxy for skill. However, education mismatch did not provide sufficient evidence on the extent to which it could be the best representative of skills mismatch. This based on the fact that, during the reference months of data collection, about 33.1 percent of the Tanzanian formal labour market workers had skills mismatch and only 42.1 had education mismatch. Thus, even though there was a statistical relationship between the two, yet the relationship was not of one to one.

Table 1 shows further that 41.9 percent of the graduates who considered themselves as over educated, also reported to be over using their skills. Similarly, 8 percent of the graduates reported that they were over educated, yet they were under skilled. On the other hand, 16.1 percent of workers who reported to be under educated, yet they were over skilled, and 42.7 percent of the workers who reported to be under educated, yet they were under skilled. Thus, basing on the above analysis and results presented, it was understood that though there was an existence of strong equivalence between educational mismatch and skill mismatches, yet it did not have the direct causal effect relationship. Statistically, the EM could neither necessary nor be a sufficient predictor of the SM. The implication of the mirror image of both skills mismatch and education mismatch is centered on the fact that the number of workers with both over skill and over education is more or less the same and the same for under education and under skill. More importantly, over skilling could also imply having that a worker has more level of education in the current job. Thus, using education mismatch in policy making process as a response to skills mismatch is a fallacy.

Table 1 : Skills Mismatch vs. Education Mismatch

Items / SM	Parameters	Oe	EM Ue	Pme	TOTAL
Os	Sample size(n)	13	5	13	31
	% within Status of Skills Mismatch	41.9	16.1	41.9	100
	% within Status of Education Mismatch	34.2	5.7	6.7	9.7
	% of Total	4.1	1.6	4.1	9.7
Us	Sample size(n)	6	32	37	75
	% within Status of Skills Mismatch	8.0	42.7	49.3	100
	% within Status of Education Mismatch	15.8	36.4	19.2	23.5
	% of Total	1.9	10.0	11.6	23.5
Pms	Sample size(n)	19	51	143	213
	% within Status of Skills Mismatch	8.9	23.9	67.1	100
	% within Status of Education Mismatch	50	58.0	74.1	66.8
	% of Total	6	16.0	44.8	66.8
Total	Sample size(n)	38	88	193	319
	% within Status of Skills Mismatch	11.9	27.6	60.5	100
	% within Status of Education Mismatch	100	100	100	100
	% of Total	11.9	27.6	60.5	100

Other Parameters
Pearson Chi Square = 39.567
Observation(n) = 319
Tabulated X^2 = 9.49; p value=0.00

Key : Oe-Over education, Ue- Under education, Pme-Perfect Match in education
Os-Overskill, Us-Underskill, Pms-Perfect Match in skills

b) Correlation Between EM and SM: Bivariate Analysis

Results in Table 2 show that, the correlation between EM and SM was statistically significant at 1% level of significance, with p value of 0.00 and Pearson correlation coefficient of 0.241.This implied that EM could be used as a mirror image of SM; and thus there was a significant association between EM and SM. This meant that, an increase in the number of workers with over skill necessitated the increase in the number of workers with over education and vice versa.

c) Covariance Between EM and SM: Bivariate Analysis

Using covariance analysis, results in Table 2 show that, the covariance coefficient between EM and SM was at 0.112. This implied that the EM and SM had a positive co-vary behavior, though it was weak. More specifically, this inferred that both EM and SM were moving in the same direction, of which was positive. Similarly, an increase in the number of workers who were under skilled necessitated the increase in the number of workers who were under educated and vice versa. Thus, having a weak covariance, implied that EM cannot have strong predictive power on the SM and thus it could be wrong to use EM to address SM. Thus, these findings were consistent with those from Chi square approach as well as from Allen and Van Der Velden (2001) on their study on Dutch graduates, Green and McIntosh (2002) on their study on UK graduates and of Pietro and Urwin (2007) on their study on Italian graduate labour market. Also, these findings support the assumptions of Human Capital Theory which portrayed that education could stand as a proxy for skills.

Table 2 : Correlation and Covariance Analysis

Status	Measures	EM	SM
EM	**Pearson Correlation**	1	.241(**)
	Sig. (2-tailed)	.	.000
	Sum of Squares and Cross-products	155.687	35.567
	Covariance	.490	.112
	Sample size(n)	319	319
SM	**Pearson Correlation**	.241(**)	1
	Sig. (2-tailed)	.000	.
	Sum of Squares and Cross-products	35.567	140.163
	Covariance	.112	.441
	Sample size(n)	319	319

*** Correlation is significant at the 0.01 level (2-tailed).*

V. Conclusion and Recommendations

a) Conclusion

The aim of this study was to test for any existence of mirror image between EM and SM; and also if we can use EM when we need to design labour policy to address SM. The study employed three approaches namely bivariate correlation, bivariate covariance and chi square approach. The study has discovered that there is a significant statistical relationship between EM and SM. Thus, EM can be used as a mirror image of SM. More specifically, the EM and SM are not perfect substitutes. In the same analysis, it is learnt that there is a clear positive

association or correlation between EM and SM though it is weak. This hampers the predictive power of EM on SM as proposed by the human capital theory. On the other hand, the study has found out that EM and SM move in the same positive direction, in the sense that workers with under education are likely to be under skilled. In the same vein, workers who are over educated are likely to be over skilled. However, the way EM and SM co-vary is tending to be weak.

b) Recommendations

Based on the conclusion above, this study recommends that, first, the government and other stakeholders of labour market should not rely on EM to respond to SM, since this can provide wrong policy outcome. Second, there is a need for the government to enhance priority of retraining staff who are either over educated, under educated or over skilled and under skilled. This will ensure that they potentially use their skills and education levels in service delivery. The government and other labour market stakeholders should adopt a standardised and harmonised system of recruitment and career development. This shall ensure that incidences of mismatch are reduced. Last, there should be a deliberate need for the government and other labour market stakeholders to expand investment in areas which have high propensity to absorb skilled labour force. This would assist in turn to reduce unemployment rate as well as reduce the chance of workers or job seekers to be attacked with EM and SM.

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