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Firm Productivity and Matching Frictions in th Labor Markets: Is This an Unending Curse to Employers?

David Katuta Ndolo
Tufts University, USA
Victor Kidake Senelwa
World Bank

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Abstract

The productivity behavior of firms is significantly influenced by labor market frictions in both emerging and established economies. Kenya persistently advocates for enhanced strategies to bolster productivity. The precise impact of labor market friction remains ambiguous. This paper focuses on assessing the influence of qualification and skills mismatch on firm productivity within the context of Kenya. The study utilized secondary cross-sectional data obtained from the World Bank database, specifically from the 2016-2017 Skills Toward Employment Productivity (STEP) Household Survey conducted in Kenya. The full specification of the maximum likelihood model under the endogenous switching regression (ESR) was estimated. The results of the study indicate that insufficient education and a mismatch between skills and job requirements have a significantly negative impact on firm productivity. The impact of excessive education on firm production was found to be minimal. The essential finding regarding the marginal treatment effect, which holds significant implications for policymaking, indicates a strong positive association between over-education and firm productivity. A negative association is observed between education and skills mismatch and firm productivity. The policy implications underscore the necessity of aligning graduates with employment opportunities that correspond to their educational background and level of expertise.

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Keywords: Firm productivity, labor market, friction, over-education, under-education, mismatch

Introduction

The discrepancy in cross-country labor productivity can be attributed to the allocation of skills, which accounts for a substantial portion of this difference. In addition, it has been found that the allocation of skills explains approximately 30-40 percent of the variation in aggregate labor productivity across countries, as reported by the OECD in 2013. Haltiwanger, Hyatt, and McEntarfer (2017) posit that individuals with higher levels of education exhibit a greater propensity to engage in employment with firms that demonstrate higher levels of productivity. Nevertheless, it is worth noting that individuals with higher levels of education are less inclined to be matched with firms characterized by low productivity. However, it is improbable for these individuals to disassociate themselves from such firms. Organizations employing workforce with lower levels of education exhibited a higher propensity to experience employee turnover during periods of expansion. There is also a greater likelihood of encountering challenges in maintaining upward mobility within the organizational hierarchy. According to Braconier et al. (2014), the presence of a higher percentage of employees with advanced education levels has a substantial positive impact on labor productivity. However, it is anticipated that the rate of growth in the accumulation of human capital will decrease. Braconier et al. (2014) asserts that the increasing economic significance of knowledge will lead to higher rewards for individuals with advanced skills. Consequently, this will result to a rise in income disparities within nations in the forthcoming years.

While examining the impact of skill and qualification mismatch on productivity, Allen and Van der Velden (2001) proposed that qualification and skill mismatch leads to low productivity and lack of efficiency in resource allocation. The more qualifications and skills are efficiently matched, the higher the increased productivity. Also, over-education is associated with the incentive to move to a job that better reflects one's education and skills. Subsequently, this reduces job satisfaction and job effort, thus leading to lower productivity (Green & Zhu, 2010). According to Quintini (2011), over-qualification diminishes satisfaction relative to those who are well-matched workers with the same level of qualification. However, he found that the effect is insignificantly relative to the perfectly matched workers in their jobs.

Educational attainment has a higher premium in the formal sector. This was revealed by Kenya's workforce, which exhibited a consistent pattern in the levels of technical skills among individuals with post-secondary training, both in formal and informal sectors. 51 percent of the formal employees and 40 percent of the informal employees had either a diploma or a certificate as

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the highest level in training professionally. The earnings mismatch in the formal and informal sector are high. 74 percent of entry working in the formal sector earned between USD 100 to 500 per month, while 81 percent in the informal sector earn a monthly income between USD 50 to 250.

Consequently, employees in the informal sector, relative to their counterparts in the formal sector, are not only deprived of the right to earn a competitive wage, they are also subjected to employment insecurity, work insecurity, and social insecurity.

Studies carried out in the United Kingdom (Dolton & Sllies, 2003) reveals that the existence of educational mismatch in over-education and over-educated workers have lower wage relative to the matched ones with the same educational attainment. In the views of Ra, Chin, and Liu (2015), wages are normally considered as an indirect measure of productivity and the value addition of human capital to the respective firms since an increase in wages implies higher productivity. Relatively, small wages imply that the supplied skills are of no economic value. This may be as a result of skills mismatch or the skills requirement fall short in the labor market. According to Hartog (2000), Werfhorst, and Mijs (2010), the return of education for the over-educated was approximately half to two-thirds compared to those who were well-matched.

Over-skilling and under-skilling are examples of skill mismatch (CEDEFOP, 2010). Over-skilled employees tend to usually incur a pay penalty in comparison to those who are well-matched in their employment (Quintini, 2011; Mavromaras et al., 2009). This implies that skill mismatch has a significant influence on income inequality. This is because there is a gap between the range of abilities needed and those that are financially rewarded. Workers that are under-qualified receive a greater salary and must draw on a wider range of their abilities to meet the demands of their jobs (Perry et al., 2014).

Labor Market Situation in Kenya

There has been a steady rise in the number of university graduates entering the Kenyan labor market. The overall labor force participation rate was 66.7%, which is an interesting number. At 90.6%, individuals between the ages of 40 and 44 had the greatest percentage, while those between the ages of 15 and 19 had the lowest rate (KNBS, 2019). Labor underutilization is defined in the study as gaps between labor supply and demand, thus indicating an unfulfilled demand for workers. The labor underutilization rate was 53.70 percent among young people aged 15 to 29 (Figure 1) and this represents a sizable fraction of the population. The overall unemployment and underemployment rate was 11.9%.

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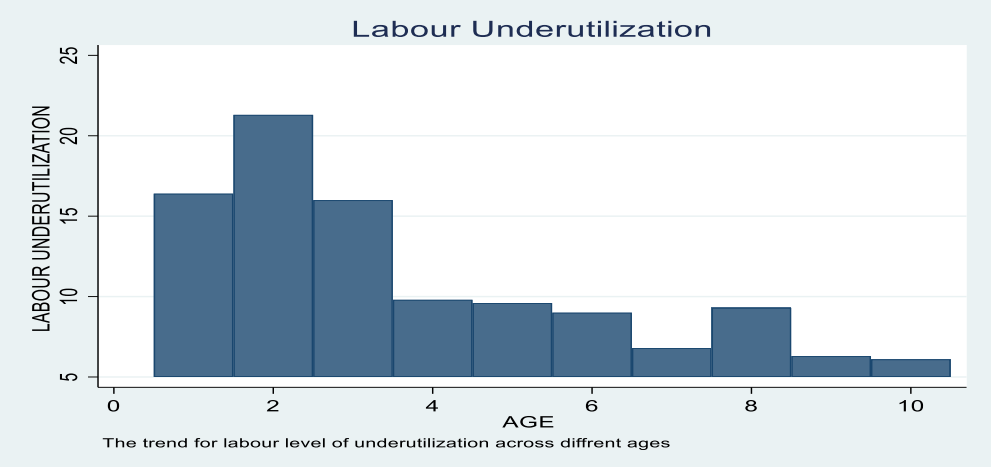

Figure 1. *Unemployment Time - Related Under Employment and Labor Underutilization by Age Cohorts*
Source: KNBS (2019)

According to the OECD (2013), between 30 and 40 percent of the variance in aggregate labor productivity may be attributed to differences in the distribution of skills between countries. In addition, research by Haltiwanger, Hyatt, and McEntarfer (2017) demonstrates that employees with higher levels of education tend to be hired by more successful businesses. Assessing the effective allocation of funds in education, as well as determining whether the investment has been excessive or insufficient, can be accomplished by examining the prevalence of over-education and under-education. Education has been at the center of development plans in Sub-Saharan African countries. Therefore, it is imperative for policymakers to have accurate information to make informed decisions. Surprisingly, over-education has been recorded in nations with educational rationing, such as South Africa (Pauw, Oosthuizen, & Van der Westhuizen, 2008), due to the opportunity cost of participation. For example, cross-country research (Erosa et al. 2010) shows a sizable income disparity in aggregate labor productivity levels between nations on opposing extremes of the wealth spectrum.

According to the human capital theory developed by Becker (1995) and Mincer (1974), earnings are directly proportional to an individual's level of education and work experience. On the other hand, Thurow's (1976) job rivalry model places greater emphasis on the demand side of the labor market. This suggests that productivity is attributable to the work itself, as opposed to individuals who possess more productive personal attributes. It is uncertain how transferable the findings from the literature on the correlation between mismatch and productivity are to other nations, especially to African setting which has its own set of economic challenges.

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It is worth noting that a significant portion of research on skill mismatch has predominantly concentrated on developed nations. Furthermore, there is a relative scarcity of studies examining skill mismatch in developing countries, particularly in the African context. This study investigates the correlation between labor market mismatch frictions and firm productivity in the context of Kenya. Specifically, the focus is to identify the impact of qualification frictions in the workplace and how it affects firm productivity. Furthermore, this study examines the influence of the discrepancy between qualifications and skills on the productivity of firms.

Literature review

Human Capital Theory (HCT) posits that in a perfectly competitive market, wages serve as a reflection of the marginal productivity of workers. The skill mismatch is quantified by analyzing its impact on wages, as demonstrated in studies by Mavromaras and McGuinness (2012) and Levels et al. (2014). According to Romer (1989), the accumulation of human capital is identified as the fundamental driver of sustained economic growth. Allen and Van der Velden (2001) assert that the optimal allocation in the labor market occurs when there is a match between the skills and capabilities of workers and the skills desired by jobs. The demand for employees with high educational levels is increasing due to the need for general skills and multi-tasking capabilities (Robinson & Vecchi, 2008). In contrast to the findings of Sicherman and Galor (1990), Becker (1964) argued that wages are influenced by a worker's investment in education. Sicherman and Galor concluded that individuals voluntarily allocate a portion of their working career to firms. Although the direct return on schooling may be lower, the probability of promotion is higher. Additionally, Sicherman and Galor (1990) observed that promotion involves over-education, which is indirectly considered as the initial investment in human capital.

Duncan and Hoffman (1981) conducted research on the effects of over-education and concluded that, for a given employment, greater levels of education lead to better productivity and fixed salaries, especially for persons with over-skilled producing and earning similarly to those with less schooling in the particular field. Therefore, mismatches include over-education. Freeman (1976) argues that labor market theories have examined salary and skill mismatches, as well as the pattern of projected returns to schooling. Rather than being a function of the nature of the work itself, marginal productivity is determined by factors such as education, training, experience, and abilities (Mincer, 1974; Becker, 1975). Workers' inability to land jobs commensurate with their education levels is often attributable to a lack of human capital. However, including ability as an explanatory variable in education research has the potential to alter the typical results.

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According to human capital theory, workers with lower levels of education tend to be less productive and consequently receive lower wages compared to workers with similar education levels in the same job. This, in turn, has an impact on the overall productivity of the firm. Green, McIntosh, and Vignoles (1999) found that workers with lower levels of education tend to earn less than their counterparts with similar job roles but higher levels of education. However, these under-educated workers still earn more than their peers who have similar education levels but are not matched to their job. Firms may assign individuals to positions for which they have insufficient education due to a scarcity of labor with the appropriate level of education.

According to Thurow (1975), the job competition model (JCM) suggests that being over-qualified for a job may not result in higher wages. However, having more qualifications can increase the chances of being selected for a job. In addition, it is important to note that wages are influenced by the specific requirements of a job and are determined by the production processes in place. This relationship between production processes and wage levels has been discussed by Duncan and Hoffman in their 1981 study. According to Thurow's (1975) perspective, educational investment by workers is seen as unproductive. Thurow argues that employees are primarily motivated by job requirements, which they perceive as rewarding. According to Mavromaras and McGuinness (2012), workers who possess higher levels of education than what is necessary for a particular job tend to receive higher compensation than what is typically expected for that job. In this scenario, over-education can be seen as a situation where there is a mismatch between an individual's level of education and the requirements of their job or occupation. From a different perspective, companies might choose to employ workers who are over-qualified if the cost of training is low and they demonstrate higher levels of productivity (Weiss, 1995).

Similarly, over-educated workers are paid less than their employed peers with similar levels of education, which can have a negative impact on a company's productivity (Chevalier, 2003). According to research by Chevalier (2003), over-educated graduates in the United Kingdom face a 14 percent salary penalty. Similarly, Leuven and Oosterbeek (2011) draw the conclusion that highly educated workers obtain a salary premium compatible with human capital theory in comparison to their less educated coworkers. This indicates that some of their investment in education is worthwhile.

McGowan and Andrews (2015) used two methods to investigate the connection between labor market mismatch and labor productivity. The first method examined qualification and skill mismatches separately by identifying the factors that contribute to each, and considering the overlap between the types of mismatches. Accordingly, under-qualification and under-skilling cause lower productivity within the affected firms due to the allocative

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inefficiency associated with skills mismatch in the labor market. Although a higher level of qualification and skill mismatch can lead to lower labor productivity, this varies across the different types of mismatches. Given the greater potential for reducing mismatches in sectors with higher reallocation, this article fails to evaluate its direct influence on productivity.

Based on the dynamic system-GMM estimator developed by Blundell and Bond (1998), an empirical study of the role of skills mismatch was conducted by Mahy, Rycx, and Vermeylen (2015). It was found that over-education affects firm productivity positively, while under-education was associated negatively. This was contrary to their theory that highly educated people are less productive because they are dissatisfied with their jobs. Over-education had a favorable and substantial influence on productivity in any business context. However, the effect was bigger in companies that employed a higher proportion of highly qualified workers.

Fanti, Guarascio, and Tubiana (2021) found that the capacity to immediately match skills requirements was crucial to improving company efficiency in Spain by analyzing data from Turkish household surveys, which was conducted between 2004 and 2015. Skills matching was one element that contributed to Italian companies' productivity. Nonetheless, age, size, innovation, internationalization, and recruiting tactics were also important.

Turrell, Speigner, Djumalieva, Copple, and Thurgood (2018) conducted a study to examine the effects of mismatch on productivity and production in the UK. Their findings indicate that, despite operating in an output-optimizing counterfactual scenario with a negligible unemployment rate, the influence of mismatch on productivity and production is minimal and does not account for the observed productivity disparities. Hence, the observed trend may be attributed to the diversity present in the labor market. In the context of the United Kingdom, it has been observed that the phenomenon of mismatch is affected by factors such as regional or occupational productivity variations, market tightness, and matching efficiency.

Using firm and individual level data from Statistics Sweden from 1990-2013, Halvarsson and Tingvall (2017) found that over-education led to productivity improvements in firms that employed mismatched people in terms of productivity, earnings, and output. Reduced productivity can be directly linked to lack of knowledge. However, the potential dynamic impacts of educational mismatches were not investigated in this study. According to Reynolds et al. (2016), with GMM and a sample size of 23,052 establishment-year observations, the percentage of over-educated workers in a given establishment is 6.1%, while the percentage of under-educated workers is 10.0%. The study also found that the GMMs approach had a negative effect on the productivity of establishments with educationally mismatched employees, particularly those with many under-educated workers.

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Using the Household, Income, and Labour Dynamics in Australia (HILDA) dataset, Mavromaras, McGuinness, O'Leary, Sloane, and Wei (2013) found that mismatch had no appreciable impact on occupational mobility. In addition, there was a significant pay penalty for those who were over-skilled and over-educated. Certainly, focusing on the negative impact on male workers' well-being and the elimination of this issue may have benefits for both businesses and employees. Sandulli, Baker, and López-Sánchez (2014) found that in a sample of Spanish companies with at least one employee and fewer than 250 employees working in services industries in IT firms, efficiency and productivity increased when employees had similar levels of education.

According to Andrews and Cingano (2014), there is evidence in the literature suggesting that skills mismatches have a significant impact on firm productivity. According to Wolbers (2003), the impact of labor market mismatch is influenced by various factors, including gender, educational level, and age. Job tenure in Europe has a negative impact on the likelihood of a job mismatch. Several studies have been conducted on the education mismatch and productivity in different regions such as Europe and the USA. However, there is limited research available on this topic, specifically in the African context (Yanikkaya et al., 2022; Mahy, Rycx, & Vermeylen, 2015). Given the dearth of research in developing countries, which has previously made it difficult to draw general conclusions due to the distinct economic dynamics between developed and developing nations, this study will serve as the basis for developing a policy framework and conducting further research in this field.

Methodology

The human capital theory proposes that different forms of input (Capital and Labor) may be combined to produce the same output (Y). The theoretical approach is grounded in Mueller's (1972) life cycle theory and the human capital theory. Both theories view education and skill set as inputs to the production process. During the early phases of growth, when labor market frictions are at their greatest, companies start with no employees and gradually begin employing both the jobless and the employed. The companies' goal during the recruiting process is to increase productivity. Researchers are inquisitive to identify how search and matching frictions affect business output. A basic open-economy model is presented in this research to test the hypothesis that the time and money spent on employing new employees reduces a company's production. The underlying question for researchers examines how search and matching frictions impact the firm’s productivity. This paper presents a simple open-economy model, which hypothesizes that

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firms incur costs in the hiring process. Nevertheless, delayed hiring process affects productivity.

The model starts by assuming that time is continuous and there is no aggregate improbability (Bilal et al., 2022). Labor markets follows a Poisson process where people learn of available jobs through searching. Employed persons contact firms at Poisson rates defined as γ_e. On the other hand, it is defined as γ_u for the unemployed person. Job matches outcomes is dependent on the effectiveness of the workers and the searching process of the firms, and the entire process exhibits constant returns to scale function. $\bar{s}$ is defined as the exertion by the firms to get employees, and M is the measure of the firms. The rate at which employed and unemployed workers contact potential employers is defined as:

$$\gamma_i = \tilde{\gamma}_i \left(\frac{\bar{s}M}{\tilde{\gamma}_u \mu + \tilde{\gamma}_e (1-\mu)}\right) \quad for\ i = u, e \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 1$$

Where $\tilde{\gamma}_u$ and $\tilde{\gamma}_e$ are the matching efficiencies of unemployed and employed. Higher values of $\tilde{\gamma}_u$ and $\tilde{\gamma}_e$ implies reduced unemployment rates or high rates of job-to-job transitions. Hence, a preferred stiff labor market is defined by reduced values of these parameters. The revenues of a firm in such a rigid labor market is defined as:

$$y = [(1-\mu)y]^{1/\sigma} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 2$$

Where y is the income produced per employed worker. Generally, matching efficiencies increases firm productivity by increasing the income generated per worker.

Empirical Model

The objective of this study was to assess the influence of qualification and skills mismatch on firm productivity within the context of Kenya. Specifically, the study focused on investigating the impact of over-education, under-education, and education and skills mismatches on firm productivity. The following model was estimated:

$$Prod_i = \alpha_i + \beta_i Mismatch_{i,k} + \beta_i \delta + \varepsilon_i \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 3$$

Where Prod represents firm productivity and is expressed as the value added to the firm per worker. Mismatch refers to the measures of qualification, including skill mismatch and their components, such as under-education, education, and skills mismatches. The δ represents other factors included in the model such as years of work experience, matched qualifications, and industrial sector.

The baseline regression relies on the OLS estimator, which is prone to heteroscedasticity and serial correlation issues that could lead to spurious

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results (Aubert & Crépon, 2003). One further issue associated with the estimation of ordinary least squares (OLS) is the potential presence of endogeneity problems. According to Gautier et al. (2002), the phenomenon of endogeneity can arise when employers take advantage of cyclical downturns to enhance the skill level of their workforce. This assertion aligns with empirical research conducted by Cockx and Dejemeppe (2002) and Dolado et al. (2000), which indicate that the average duration of over-education within organizations may increase as a result of diminished labor productivity.

Arellano and Bover (1995) and Blundell and Bond (1998) proposed the utilization of Generalized Method of Moments (GMM) model estimates as a means to address various issues in research, including the study conducted by Dudek et al. (2016). In order to facilitate the process of model identification, the GMM estimators utilize instrumental variables. Nevertheless, Gaussian Mixture Models (GMM) exhibit a fundamental limitation in their ability to ascertain the most appropriate instruments for endogenous regressors (Chevalier, 2003).

In this context, the endogenous switching regression (ESR) approach was employed using a fully specified maximum likelihood model. This methodology effectively addresses the issues of endogeneity and sample selection bias, as discussed by Kirimi and Olunga (2013) and Shiferaw et al. (2014). In this particular model, the estimation process involves the assessment of two distinct selection equations. These equations pertain to firms that encounter frictions or mismatches, as well as firms that do not encounter such frictions or mismatches.

$$Establishment\ 1 : (Prod_1|R_i = 1) = \alpha_1\delta_i' + E(\varepsilon_1|\mu_i) > -\gamma y \text{.....} 4$$

$$Estabishment\ 2 : (Prod_0|R_i = 0) = \alpha_0\delta_i' + E(\varepsilon_0|\mu_i) \leq -\gamma y \text{.....} 5$$

$Prod_1$ and $Prod_0$ are the firm's productivity, which varies depending on whether there are education and skills mismatches or not. δ_i' is a vector of explanatory variables that explain the firm's productivity. γ,α_1, and α_0 are parameters to be estimated for the selection outcome with and without mismatches respectively. Three random errors are generated from the estimation method, namely: $\varepsilon_0, \varepsilon_1$ and μ_i.

Instrumental variables were generated for all the mismatches (education and skills) in order for the model to be identified. The variables generated are highly correlated with mismatches, but it is unlikely to influence the outcome variable directly with the unobserved errors. Based on this, the conditional expectation of the outcome variable is defined as:

$$E(Prod_1|Y_i'R_i = 1) = \alpha_1\delta_i' + \delta_{1u}\vartheta_1 \text{ .....} 6$$

$$E(Prod_0|Y_i'R_i = 0) = \alpha_0\delta_i' + \delta_{0u}\vartheta_0 \text{.....} 7$$

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Where $\vartheta_1 and \vartheta_0$ are the Inverse Millis Ratio generated from the outcome equations. The mean outcome variable resulting from the impact mismatches is estimated as:

$$E(Prod_1|Y_i'R_i = 1) - E(Prod_0|Y_i'R_i = 0) = Y_i'(\alpha_1 - \alpha_0) + \delta_{1u}\vartheta_1 - \delta_{0u}\vartheta_0 \quad \ldots\ldots 8$$

The second term on the left-hand side of Eq. (8) is the expected value of impact on the firm's productivity if the firm had not experienced mismatches.

Through the full specification, it was possible to assess the impact of mismatches, specifically for the treated and untreated populations. Accordingly, the treatment effect is estimated. This study adopted the methodology employed by Brave and Walstrum (2014) to calculate the marginal treatment effects (MTEs) of mismatches on productivity. A comparable methodology was employed by Carneiro, Heckman, and Carneiro et al. (2011) to assess the varying benefits of education for individuals who exhibited an increased propensity to pursue higher education. Through the MTE (Marginal Treatment Effect) approach, it is possible to quantify the extent to which an individual's productivity is affected by a slight variation in the propensity score. This is in conjunction with an additional alteration in mismatch. The study examines the impact of mismatch on productivity as the outcome variable, specifically for over-education, under-education, and education-skills mismatch.

The research utilized secondary data from Skills toward Employment Productivity (STEP) Household Survey (2016-2017) in Kenya, which was obtained from the World Bank database. The data used in this study was cross-sectional in nature. The measurement of mismatch is conducted by utilizing the International Standard Classification of Education (ISCED) to define qualification mismatch. This involves establishing a benchmark of qualifications that are deemed "appropriate" for a given job. Individuals who possess a qualification level that surpasses (falls short of) the benchmark corresponding to their highest qualification are categorized as over-qualified (under-qualified).

Table 1. Definition and Measurement of Variables

Variable	Definition and Measurement
Firm Productivity	This is defined as the ratio of sales in the latest fiscal year to the number of permanent full-time employees.
Over- Education	A binary variable defined as 1 if a person has a qualification level corresponding to their highest qualification (ISCED) above the benchmark and 0 otherwise.

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Under -Education	A binary variable defined as 1 if a person has a qualification level corresponding to their highest qualification (ISCED) below the benchmark and 0 otherwise.
Education & Skills Mismatch	A binary variable defined as 1 if a person has a qualification level corresponding to their highest qualification (ISCED) in addition to having skills and vocational training above or below the benchmark and 0 otherwise.
Firm Size	This is a binary variable defined as 1 if the firm is large and 0 if the firm is small. A firm is considered large if it has more than 5 permanently employed workers and zero otherwise
Working Experience	This is a binary measurement. Individuals with over 3 years of experience are considered proficient, while others are less experienced.

Empirical findings and discussions

The dataset presented encompasses comprehensive information pertaining to both the demand and supply dynamics within the labor market. The demand side of the analysis places emphasis on factors such as firm productivity and firm size. However, the supply side takes into account labor market frictions such as over-education, under-education, and the mismatch between education and skills. The analysis incorporates working experience as a control variable. Only a small proportion, specifically 3 percent, of the graduating cohort met the criteria for being classified as experienced, which required having a minimum of 3 years professional work experience. The findings indicate that 54.8 percent of the employees surveyed possessed educational qualifications that exceeded the minimum requirements for their current positions. Conversely, 25.1 percent of the employees were found to have educational qualifications that fell below the minimum requirements. Furthermore, it was found that 11.9 percent of the employees exhibited a disparity between their educational qualifications and the skill set demanded by their respective positions as indicated in Table 2. In aggregate, the interviewed firms exhibited a productivity rate of 11 percent. The skewness shows the distribution of the data in relation to the normal distribution, with -1 and +1 showing extreme levels of distribution. Kurtosis measures how tailed the distribution of a variable is in relation to the normal distribution with a kurtosis of 3. The rule of thumb indicates that any distribution with kurtosis value greater than +2 is considered to be more tailed.

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Table 2. Descriptive Statistics

Variable	Mean	SD	Skewness	Kurtosis
Firm Productivity	11.3799	1.4070	-0.9671	2.9203
Firm Size	0.1644	0.3706	1.8114	4.2811
Working Experience	0.0336	0.1803	5.1730	27.7600
Over-Education	0.5488	0.4977	-0.1961	1.0385
Under-Education	0.2509	0.4336	1.1492	2.3206
Education & Skills Mismatch	0.1186	0.3234	2.3586	6.5632

Source: Author computation (2023)

Semi-Parametric ESR Model Results- Treatment Effect of Mismatches on Productivity

To mitigate the concerns related to endogeneity, the endogenous switching regression model was employed to estimate the impact of mismatches on productivity across various measures. Subsequently, the treatment effects were computed. Heckman and Vytlacil (2005) introduced the notion of policy-relevant treatment effects, which refers to the average effect on the outcome of interest due to a transition from the baseline policy to an alternative policy.

Specifically, Table 3 displays the estimations of the Local Average Treatment effects by examining the variations in these effects across various levels of firm productivity. Based on the findings, the marginal policy-relevant treatment effect for over-education exhibited a positive trend. On the other hand, a negative trend was identified for under-education, education, and skills mismatches,. These findings suggest that an excessive level of education among employees led to a significant increase in firm productivity, thereby amounting to 33.2 percent. Conversely, lack of education and skills, as well as mismatches between education and skills, resulted in decrease in firm productivity, with reductions of 0.9 percent and 19.3 percent, respectively. The findings align with the conclusions made by Vandeplas and Thum-Thysen (2019), who reported a rising trend in skills shortages and over-qualification within the European Union. They also highlighted the negative correlation between job mismatches and productivity in labor markets, as well as the positive relationship between skills supply and productivity. According to Mahy, Rycx, and Vermeylen (2015), there is a notable and positive correlation between the level of education required for a job and firm productivity. Specifically, an increase in the level of over-education, where employees possess qualifications exceeding the requirements of their positions, enhances firm productivity. Conversely, a decrease in the level of education, resulting in under-education among employees, diminishes firm productivity.

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Table 3. Semi-Parametric ESR Model Results- Treatment Effect

	Over-Education	**Under-Education**	**Education & Skills Mismatch**
	Firm Productivity	**Firm Productivity**	**Firm Productivity**
Average Treatment Effect	-12.25***	5.772***	40.82***
	(5.090)	(0.892)	(4.745)
Treatment on the Treated	-26.33	-7.375***	-40.11***
	(28.48)	(0.502)	(3.609)
Treatment on the Untreated	84.85**	10.17***	51.73***
	(27.91)	(1.317)	(5.836)
Local Average Treatment Effect/ IV	38.26***	-3.910***	-8.680***
	(6.109)	(0.140)	(0.857)
Marginal Policy-Relevant Treatment Effect	33.22***	-0.894**	-19.32***
	(4.322)	(0.328)	(1.625)
Observations	3894	3894	3894

Figures 2, 3, and 4 present the estimated Marginal Treatment Effects (MTEs) of over-education, under-education, as well as education and skills mismatches, respectively. These figures illustrate a declining trend in the estimated MTEs.

Figure 2. Estimated MTE for Over- Education

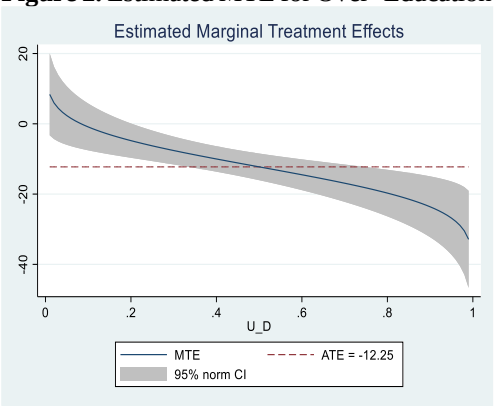
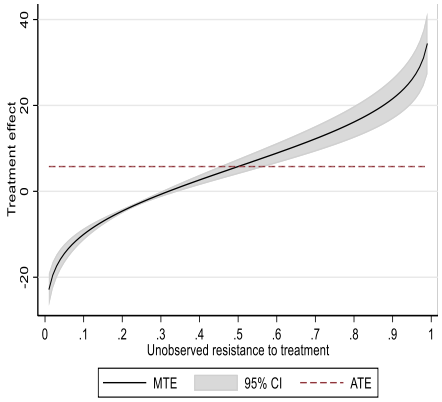


Figure 3. Estimated MTE for Under-Education



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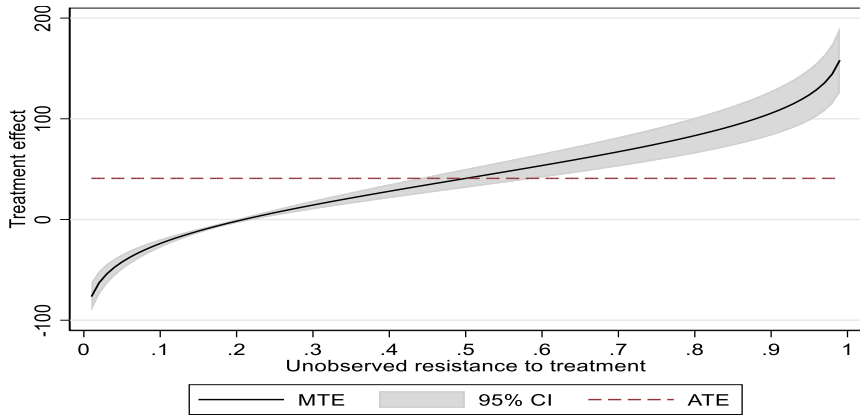

Figure 4. Estimated MTE for Education & Skills Mismatch

Figure 2 implies that people are more likely to boost production through greater marginal productivity when their degrees of over-education increases. Figure 3 shows that marginal productivity and the propensity to boost productivity declines as people's levels of education fall below the norm. Figure 4 demonstrates that the marginal production associated with education and skills mismatch fall as the mismatch grows. As a result, people are less likely to make efforts to boost productivity under these conditions. The findings from the endogenous switching regression model indicate that there is a significant positive relationship between over-education among employees and firm productivity. The estimate of the marginal policy-relevant treatment effects indicates a significant positive correlation between over-education and firm productivity, with a notable increase of 33.2 percent. On the other hand, it was discovered that under-education and mismatches between educational attainment and skill requirements had an adverse effect on firm productivity, leading to a reduction of 0.9 percent and 19.3 percent, respectively. The adverse consequences arising from insufficient education and the mismatch between education/skills underscore the need to address disparities in education and employment, which ultimately lead to decreased productivity.

Conclusion, gap, and polocy implication

This study uniquely showed how skills mismatches affect firm productivity using STEP Skill data from 2016-2017. This data set was used to show that labor market frictions due to under-education, over-education, and skill-mismatch significantly impact firm productivity. In Table 2, the treatment provides significant evidence that over-education positively increases firm productivity in Kenya. Consequently, it is evident that as Kenyans climb their academic ladder, they become more knowledgeable. This

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implies improved productivity and higher pay as indicated by the treatment effect of 33.22, which is significant at 5 percent. Halvarsson and Tingwall (2017) assert that over-education led to productivity improvements in firms that employed mismatched people in the dimensions of productivity, earnings, and output.

Under-education, relative to the job requirement, significantly reduces the firm's productivity in Kenyan labor market, with a treatment effect of 0.894 at 5 percent significant level. According to McGowan and Andrews (2015), under-qualification and under-skilling causes lower productivity within the affected firms due to the allocative inefficiency associated with skills mismatch in the labor market. Subsequently, a higher level of qualification and skill mismatch leads to lower labor productivity. However, this varies across the different types of mismatches. Given the greater potential for reducing mismatches in sectors with higher reallocation, this article fails to evaluate its direct influence on productivity.

Skills mismatch, which allowed workers to engage in jobs without relevant skills, created labor market disequilibrium. This resulted to a significant decline in the firm productivity by 19.32 at 5 percent. When workers are not paired with jobs that match their skills, they are less productive in those jobs. This could be due to the level of incompetence. Fanti et al. (2021) establishes that skills matching contributed to Italian companies' productivity as well as other factors such as age, size, innovation, internationalization, and recruiting tactics. On the contrary, Turrell et al. (2018) established that mismatch was affected in the UK by factors such as regional or occupational productivity variations, market tightness, and matching efficiency.

As earlier mentioned in the review section, studies and conclusions in developed economies cannot be generalized in developing economies such as Kenya. Thus, like an incurable curse in the labor market, employers' endeavor to match employees with the right jobs so as to optimize their productivity and achieve their profit maximization goal. Therefore, it is important to empirically investigate labor market frictions in Kenya's labor market. This study, however, provided insights about Kenya's labor market frictions.

The results of the analysis indicate that policy interventions, which enhance the congruity between employment opportunities and individuals' skills and education, has the capacity to augment firm productivity and tackle labor market difficulties in developing nations. These challenges arise due to substantial barriers to efficient labor matching in such contexts. It is imperative to acknowledge that this study has limitations in terms of comprehensiveness. In other words, there are additional variables that exert influence on fluctuations in firm productivity such as financial frictions and socio-economic factors.

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