Rethinking Public Investment in Education in Africa: The Labor Market Response of Public Investment in Education in Ethiopia

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Bringing Rigour and Evidence to Economic Policy Making in Africa

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Abstract

This study investigates the impact of education investments on economic outcomes in Ethiopia, grounded in human capital theory and the Mincerian earnings function. While substantial public expenditure on education has resulted in a significant increase in university graduates over the past two decades, a paradox persists: high unemployment rates among graduates coexist with a notable shortage of skilled labor in firms. This research employs longitudinal data from Ethiopia's national labor force survey to explore the complexities of education returns through an over-required-under-education model, which categorizes workers based on their educational qualifications relative to job requirements. The findings indicate that government investment has successfully mitigated under-qualification but has concurrently contributed to rising over-qualification, with approximately 13% of workers classified as over-qualified in 2021. Productivity analysis reveals that workers with the required educational qualifications outperform both over-qualified and under-qualified peers. Notably, while under-qualified workers see positive returns from additional schooling, over-qualified workers experience negative returns, suggesting diminishing benefits of excess education. These insights highlight the critical need for policymakers to link education investments with effective human capital utilization strategies to prevent counterproductive outcomes, ultimately fostering a more productive labor market in Ethiopia.

1. Introduction

Human capital plays a crucial role in economic growth. The concept of human capital was first recognized by Adam Smith and Alfred Marshall. However, it was Schultz (1961) who set the stage for the present-day interest in human capital theory. Becker (1964) developed the fundamental conceptual framework of analysis for virtually all subsequent work in this area. He argued schooling (formal education) was a leading example of human capital formation by general training. Adam Smith had understood the essence of the notion of human capital investment as the formation of human capital through costly education, the necessity for higher earnings to compensate those who had made the investment in human capital, and the accrual of these earnings over a lifetime. Investment in human capital does not cease with the start of work, however, since on-the job training now begins. Mincer (1958) recognized that workers could also choose at each point to invest in formal on-the-job- training as a substitute for years of schooling and that would eventually be compensated for higher earnings. Becker (1964) suggested that individuals invest in human capital formation up to the point at which the discounted costs of formal education and on-the-job training equal the discounted future earnings over the individual's lifetime.

Human capital theory puts forward the concept that investments in education increase future productivity. From the point of view of economic development, education is the acquisition of knowledge and skills that increase productivity broadly defined. The proximate determinants of education are the experiences or inputs into the production function that determines knowledge and skills that increase productivity. Based on the theory of human capital, returns to investment in education have been estimated for decades. The estimated return may be private rate of return and/or social rate of return1. See Psacharopoulos and Patrinos (2021) for the recent review work on return to investment in education. Generally, the evidence indicates that there is a positive relationship between individuals' level of schooling and earnings, and the relationship is often estimated with a

[1]The private rate of return, which accrues to the individual, is calculated from the out-of-pocket (direct) costs of schooling and the indirect costs of earnings forgone during the investment period. The social rate of return considers the return to society via income taxes and the total cost of providing schooling. Empirical estimates ofthe two rates of return produce the result that the private rate typically exceeds the social rate, if only because thesocial cost of schooling exceeds its private cost

Mincer earnings function or regression. This evidence is attributed to most of the growth in public expenditures on education or that helps to account for the expansion of national educational systems since it led to adoption of a development strategy with a principle that 'expanding education promotes economic growth' for the last few decades. As a result, there has been a rapid expansion in schooling in Sub-Saharan Africa (SSA) over the last decades (Pritchett, 2024). However, the evidence on whether the rapid expansion of schooling in sub-Saharan African countries increased growth is mixed. In this regard, it is worth citing the findings of Pritchett (2001).

Using cross–national data, the author did not obtain an association between increases in human capital attributable to the rising educational attainment of the labor force and the rate of growth of output per worker'. He did not also obtain strong evidence of the growth-promoting externalities to education. The estimated growth impact of education is consistently less than would be expected from the individual impacts. Even if the evidence shows a gap between the micro – mincer and macro-mincer and falls short of expectations, Temple (1999) indicated that the development impact of education varied widely across countries. Rosen (1977) indicated that the Mincerian relationship can have many interpretations since it depends on the context in which the function operates or the factors that generate the relationship. A given set of facts is rarely compatible with a single theoretical interpretation of those facts.

The importance of human capital development for economic growth is well recognized by the government of Ethiopia. It has formulated education policy and strategy and, subsequently, sector development programs since 1993 (MoE, 1993). The main objectives of the education sector policy and the strategy, among others, are to improve the problem-solving capacity of individuals and satisfy the skill needs of the economy. It also aims at improving access, narrowing down gender and regional disparity as well as providing quality education. To realize the objectives, successive five years sector development programs have been prepared and implemented since 1994. In addition to expanding access to higher education, as part of its effort to address the skill requirements of the growing economy, the government has also given due attention to expand Technical and Vocational Education and Training (TVET).

Consequently, Ethiopia has managed to expand access to primary education at an extraordinary rate. Nearly four out of five primary school-aged children were not in school in 1992, but today this has fallen to under one in five. The rapid rise in primary enrolment and a (slower) subsequent improvement in primary completion rates are helping to fuel an increase in secondary

enrolment. In keeping with the greater numbers leaving Grade 10 and Grade 12, technical–vocational education and training (TVET) and university education systems in Ethiopia have expanded rapidly. On the other hand, the pace of structural transformation is even much slower when it comes to employment as indicated by the 1999, 2005, and 2013 national labor force and the 2018 Ethiopian Urban Employment - Unemployment surveys conducted by the Central Statistical Agency (Tsegay and Alebel, 2019; Alebel, 2016). The agriculture sector employs about 73% of 42.4 million employed people aged 10 and above in 2013. This shows a decline of 8 percentage points when compared to 2005 whereby agriculture employment accounted for about 80% of total employed persons in the country. The employment share of the service and industrial sector respectively accounted for 20% and 7%. Manufacturing alone accounts for 4.5% of employment. In urban areas, unemployment is particularly severe among the most highly educated (and especially the youth).

Despite high unemployment, especially in urban areas (about 19% and even more in bigger towns) and high underemployment (about half of those employed) and expansion of higher education and TVET centers, the manufacturing sector suffers from shortage of labor and high labor turnover (EDRI, 2017). A recent study by Blattman and Dercon (2018) that compares manufacturing jobs with informal self-employment shows the workers found manufacturing jobs to be more hazardous to health, poorly paid, and difficult resulting in a higher turnover. The coexistence of high unemployment especially of youth and women, high labor turnover and a shortage of labor in the manufacturing sector, and expansion of TVET in the country is a sign of a fundamental problem in the public investment in education that raises question on the lack of synergy between the country's effort in improving human capital formation and its utilization. In this regard, a major line of research is concerned with the effect of skills mismatch on wages (Groeneveld and Hartog, 2004; Hartog, 2000; Rubb, 2003a); variation in return for different age groups (Söderbom et al. 2006); across segments of employment such as between sectors, self vs. wage employment, formal vs. informal employment (Cling et al., 2007; Vijverberg, 1995; Bennell (1996)) as well as labor market segments (Sparreboom and Nübler, 2013).

The country context and the literature on human capital development show that there are two facts that are contradictory in the labor market of the Ethiopian economy. On the one hand, there is high unemployment and underemployment among the educated (university and TVET graduates). On the other hand, productive sectors such as the manufacturing sector suffer from shortage of labor and high labor turnover (EDRI, 2017). The implication

is that human capital formation in Ethiopia requires a systematic investigation to understand whether "investment in human capital" should go beyond the standard simplistic "spend on schools" or not. That is, it raises an important policy question that 'has the huge public investment in education grappled with its utilization or has it been linked with its productive use?'.

The study investigates this policy question in the context of Ethiopia. It aims to analyze the labor market response of investment in education in Ethiopia using a nationally representative labor force survey conducted by the Central Statistical Agency (CSA). The data contains detailed information on the size, distribution and socio- economic and demographic characteristics of employed and unemployed population. In addition, data on economic activities of children were also collected to measure child labor in both urban and rural areas. So far, CSA has collected the data for three waves: in 2005, 2013 & 2021. The study will contribute to the existing knowledge and policy gap in improving human capital development in Africa using a 'human capital investment' approach that links human capital formation with its utilization.

2. Country context

Ethiopia achieved a remarkable economic growth rate of 11% per annum in the last 12 years. However, there has been limited structural transformation. The agricultural sector and the service sector, with both comparable shares, account for 80% of GDP while the industrial sector accounts for only 20% of GDP, which in turn is dominated by the construction sector. There have been huge improvements in primary enrolment in the past 20 years, and these have been evenly distributed, both spatially and in terms of gender. Numbers in secondary education have also boomed in absolute terms, but enrolment rates have not matched government targets, partly because of a lack of secondary schools in rural areas and a high dropout rate at primary completion stages. Enrolment in tertiary education has also increased rapidly, with a high proportion of vocational and technical courses. Quality at all levels has, however, not improved and has fallen by some measures.

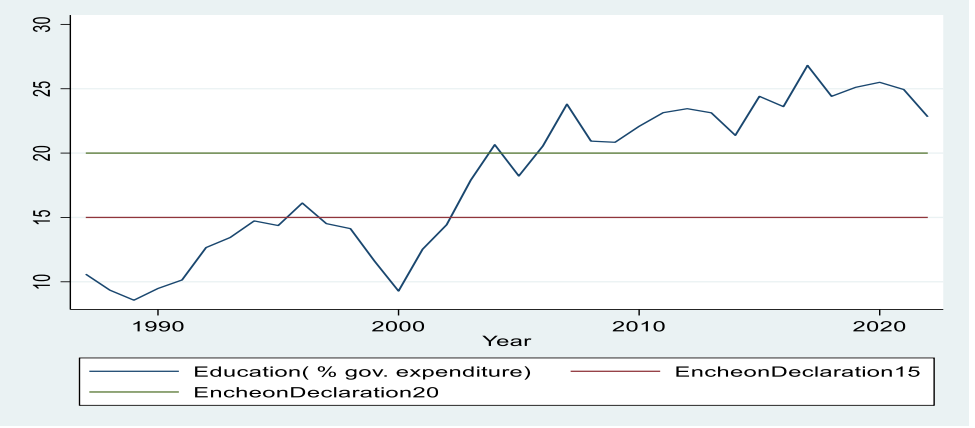
With one of the lowest enrolment rates in the world in the 1980s and early 1990s, Ethiopia has managed to expand access to primary education at an extraordinary rate. Nearly four out of five primary school-aged children were not in school in 1992, but today this has fallen to under one in five. The rapid rise in primary enrolment and a (slower) subsequent improvement in primary completion rates are helping to fuel an increase in secondary enrolment. Secondary education has been slower to develop, however, and in 2012/13

the GER for secondary education (Grades 9 and 10) was still just 38.4%. At Grades 11 and 12, seen as preparation for higher education, the urban share is almost 95%.

In keeping with the greater numbers leaving Grade 10 and Grade 12, technical–vocational education and training (TVET) and university education systems in Ethiopia have expanded rapidly. In 2012/13, over 700,000 students were enrolled in university undergraduate programs, though enrolment was highest among men (70%), and there were over 300,000 TVET students in the country, with enrolment largely equal between men and women (EFME, 2013). Enrolled TVET students include those who have failed to pass Grade 10 or Grade 12 graduation exams and are therefore unable to secure, or even compete for, a university place. Ethiopia has a far higher number of TVET students, as a percentage of enrolments in upper secondary education, than most comparable low and middle-income countries (Joshi and Verspoor, 2012). The expansion of vocational training, in theory, provides wider and better labor market opportunities for such students.

In addition to formulating educational policy as well as various programs, the government of Ethiopia spent huge investment in the sector. Government data shows that the share of public expenditure on the education sector is among the highest. Trends in the education sector expenditure as a ratio of total government expenditure shows that not only does the sector get the highest share but also that it has increased from 14% in 1996/97 to 24% in 2018 (see figure 1). In fact, Ethiopia has surpassed the internationally set target of 20% total expenditure on education.

Figure 1: Trends in Education Expenditure as a Ratio of Total Government Spending



Source: Alekaw and Firew (2023)

The agriculture sector employs about 73% of 42.4 million employed people

aged 10 and above in 2013. The employment share of the service and industrial sector respectively accounted for 20% and 7%. Manufacturing alone accounts for 4.5% of employment. In urban areas, unemployment is particularly severe among the most highly educated (and especially the youth). In rural areas, agriculture still provides employment to the largest share of the population and diversification into services is likely to represent only a secondary source of income for households. Job quality in the agricultural industry is quite low because agriculture is a low-productivity sector that offers low and unstable incomes.

Despite high unemployment especially in urban areas (about 19% and even more in bigger towns) and high underemployment (about half of those employed) as well as the expansion in higher education and TVET centers, the manufacturing sector suffers from shortage of labor and high labor turnover (EDRI, 2017). A recent study by Blattman and Dercon (2018) that compares manufacturing jobs with informal self-employment shows the workers found manufacturing jobs to be more hazardous to health, poorly paid, and difficult resulting in a higher turnover. The coexistence of high unemployment especially of youth and women, high labor turnover and a shortage of labor in the manufacturing sector, and expansion of TVET in the country is a sign of a fundamental problem in the public investment in education that raises a question on the lack of synergy between the country's effort in improving human capital formation and its utilization.

3. Conceptual framework

We base our approach on the theory of Human capital that puts forward the notion that investments in education increase future productivity. From the point of view of economic development, education is the acquisition of knowledge and skills that increase productivity (broadly defined). The proximate determinants of education are the experiences or inputs into the production function that determines knowledge and skills that increase productivity. Based on the theory of human capital, returns to investment in education have been estimated for decades. The estimated return may be the private rate of return and/or social rate of return. See Psacharopoulos and Patrinos (2021) for the recent review work on return to investment in education. Evidence suggests that these returns are much higher in developing countries than in developed countries (Psacharopoulos (1994), Psacharopoulos and Patrinos (2004a)).

The Mincer earnings function has become the standard model for statistical measurement of the supply of educated labor and for estimating the internal rate of return to education:

$$\log Y = \log Y_0 + rS + b_1 T + b_2 T^2 + b_3 X + u \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Where Y is income, S is length of schooling, T is length of time in the workforce as a proxy for years of work experience, X represents other socioeconomic characteristics of individuals, and u is the error term; the constant term is the log of the equivalent annuitized income of initial human capital value (innate and family background effects), r is the rate of return to schooling, b_1 and b_2 capture the effects of experience (Rosen 1992, p. 162).

There are literally hundreds of studies that report generally positive associations between schooling attainment and (usually potential) experience and wages or other indicators of productivity that might be viewed as representing wage production function estimates (see the reviews in Psacharopoulos, 1994; Psacharopoulos & Patrinos, 2004). However, the Mincerian relationship can have many interpretations since a given set of facts is rarely compatible with a single theoretical interpretation of those facts. In other words, the relationship depends on the context in which the function operates or the factors that generate the relationship

(Rosen, 1977). The relationship can be interpreted based on the economic characteristics in which the relationship originates. For instance, the Becker's model of "human capital", which generally states that education conveys productive skills (general), requires a well-functioning competitive labor market with profit maximizing private firms, which will result in an equilibrium where workers with a higher marginal product will make higher wages.

In Schultz model of human capital, what generates a return to formal schooling is some type of technological dynamism, which can be either (i) there are innovations in farming and those with schooling can adopt those better/faster, or (ii) children switch from "traditional" occupations to "modern" employment (Schultz, 1961). His argument is that in technologically static economic environment, children can be as efficient as their parents as they learn through trial and error and, thus, children without formal education can become as efficient as children with formal education, implying that the Mincer return to schooling is zero. This evidence is recently supported by Foster and Rosenzweig (1980). Using a household level panel data, the authors showed that the return to primary schooling in rural areas of India that did not have the "green revolution" was zero whereas in the Green Revolution areas, there was a return to schooling. It is worth noting that, given the difficulty of measuring agricultural incomes, many Mincer regressions are actually with data that only uses "wage employment" and

hence these Mincer results cannot speak to the Schultz conjecture as it could be that there is a return to education in the wage sector (which is "modern" and "dynamic") but not in agriculture and the standard regressions would not find this. The mincer relationship may also arise from an economy that is characterized by ‘metaphorical piracy’ as per the terms used by North (1990). In such an economy, two groups of individuals may exist. There are more productive educated individuals, who maintain higher private return. On the other hand, there are also "pirates" who extract stuff from the productive people and result in socially wasteful or counterproductive activities. In such an economy, the Mincer wage premium is positive for the first group of individuals, but the aggregate output may stagnate or even be negative due to the piracy. Finally, one can also think of a variant of an economy in which even if schooling does not augment a person’s productivity to a hiring firm, it may signal productivity, whereas, actually, schooling is a negative externality. Because even if schooling does not augment a person’s productivity (this may be due to the low quality of the education system), it may signal productivity. In summary, the above discussion shows that even if the evidence generally shows a positive relationship between schooling and earning, it does not mean that the relationship is the same in all areas since the economic context in which the relationship is operating matters a lot particularly from policy perspective.

Beyond the conceptual issues in the interpretation of the Mincerian earnings function, the Mincerian method of estimating returns to education is subject to omitted variable bias. Such bias may arise due to the failure to control the ability and motivation endowments and any other factors such as physical capital and non-school forms of human capital that may be correlated with the observed schooling and experience. The foremost source of bias embodied in estimated education-wage relationships occurs because of the role of student ability and parental status in a more completely specified model of the wage determination process. The ability of students, parents' background and school quality are also important variables that affect the relationship (Boissiere, Knight and Sabot, 1985). Their omission may lead to biased estimates of the partial association between schooling and wages that is the basis for benefit-cost calculations or internal rate of return estimation. Second, the profile of post schooling on-the-job training investment cannot generally be observed, and alternative proxies for Mincer's post- schooling investment profile should be identified in the estimation. Third is the absence of suitable comparison groups. It is never possible to observe what particular persons would have earned if they had obtained more or less schooling than they did.

Individuals with different levels of education may choose to work different numbers of hours. Rates of return to education will then differ depending on whether returns are based on comparisons of hourly wage rates or on an annual rate of earnings (Schultz, 1968). Comparisons are needed across schooling groups to estimate benefits. One important and pervasive characteristic of low-income countries is the large proportion of the labor force is in agriculture. The environment in which labor markets operate in urban areas is different in three important respects from that in rural areas. First, there is substantially more heterogeneity in the products produced; technologies are thus diverse, requiring a wide variety of worker activities and skills. Second, production in urban areas is not so highly seasonal or as highly sensitive to weather variations. Third, production activities are, by definition, not so geographically dispersed as in rural agriculture. These technological features of the urban environment have important implications for the operation of the urban labor market. In our case, a major line of research is concerned with the effect of skills mismatch on wages (Groeneveld and Hartog, 2004; Hartog, 2000; Rubb, 2003a); for different age groups (Söderbom et al. 2006); across segments of employment such as between sectors, self – vs wage – employment, formal vs informal (Cling et al., 2007; Vijverberg, 1995; Bennell, 1996) as well as labor market segments (Sparreboom and Nübler, 2013).

Given the above brief review of the literature and the Ethiopia context, our approach adopts the notion that any effort in human capital development should go beyond improving human capital formation per se. Investment in human capital development should also be linked with how that human capital can be utilized (Pritchett, 2021). The notion is particularly important from Ethiopia perspective. As briefly described in section two, the country spent huge public investment in the formation of human capital to acquire specific cognitive skills in school. Despite this, there are two facts that are contradictory in the labor market of the economy.

On the one hand, there is high unemployment and underemployment among the educated (university and TVET graduates). On the other hand, productive sectors such as the manufacturing sector suffer from shortage of labor and high labor turnover (EDRI, 2017). The implication is that human capital formation in Ethiopia requires a systematic investigation to understand whether “investment in human capital” should go beyond the standard simplistic “spend on schools” or not. That is, has the huge public investment in education been grappled with its utilization or how has it been linked with its productive use? The adoption of a true “Invest in Human Capital” is also important both from economics and policy perspective. Since policies that

impact development is wide-ranging and human capital is a complex set of interactions across the entire range of economic policies and institutions, it is essential that true investment in human capital should link the formation of human capital with its utilization. From an economic perspective, human capital is considered as an essential input for economic growth, evidence on public investment in education can be considered as true investment if it can respond to labor outcome of individuals. Thus, beyond understanding of the effect of public investment in educational attainments, it is essential to help Ethiopian policy makers to understand the responses of investment in education to the labor market outcome. The findings will help policy makers to design policy interventions that have a high degree of complementarities in addressing challenges in human capital development with true "invest in human capital" approach.

4. Method and data

Method

The conventional Mincerian earnings function is the basic earning function used to estimate the return to investment in education in which the log of hourly wages (LnW) is regressed on years of schooling (S) and other explanatory variables such as years of experience in the labor market (Psacharopoulos and Patrinos, 2004; and Walker and Zhu, 2001). The basic Mincerian earnings function takes the form

$$lnWi = \alpha + \beta Si + +\gamma_1 T + \gamma_2 T^2 + \gamma_3 X + u \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

In this equation, β can be interpreted as the average private rate of return to one additional year of schooling, regardless of the educational level to which this year of schooling refers. This method assumes that forgone earnings represent the only cost of education and so measures only the private rate of return and further assumes that individuals have an infinite time horizon.

The standard earnings function (2) may give misleading results, because the return to surplus schooling—beyond what is required by the job—is likely to be lower than the return to required schooling (Chiswick and Miller (2010)). Hartog (2000) indicated that in the existence of skill mismatch, over – required – under education (ORU) model is superior to the conventional Mincerian earnings function which uses total schooling as an explanatory variable. The standard earnings function may give misleading results, because the return to surplus schooling—beyond what is required by the job—is likely to be lower than the return to required schooling (Chiswick and Miller (2010)). The ORU model may be presented as follows:

$S_{ij}^{T} = S_{ij}^{r} + S_{ij}^{o} - S_{ij}^{u} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots. (3)$

Where S_{ij}^{T} is the total educational achievement of individual i employed in occupation j; Sr denotes required years of schooling by the job, So denotes years of over-education, and Su denotes years of under-education. The earning equation can be given by:

$lnW_{ijt} = \beta_0 + \beta_1 S_{ij}^{r} + \beta_2 S_{ij}^{o} - \beta_3 S_{ij}^{u} + \beta_4 X_{ij} + \varepsilon_{ij} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots. (4)$

The subscripts i and j index, represent individual and occupation respectively. Xij is a vector of control variables such as age, sex, marital status, work experience, type of employment, and regional dummies. ε_{ij} is the standard residual term. It should be noted that So and Su are mutually exclusive, and for each individual, one of them or both must be zero. The ORU model is reduced to the standard Mincerian earning equation if =β3 = |β4|. However, if this does not hold, the ORU model will yield a better fit and the return to required education will be greater than the return to total education (Büchel et al., 2003). Under the ORU model, over-educated and under-educated workers are compared to coworkers, that is, workers with the same required schooling who are just educated.

Accordingly, the coefficients in the ORU model are interpreted as follows:

β1: return to an additional year of required schooling,

β2: return to an additional year of surplus schooling relative to coworkers,

β3: wage loss of an additional year of deficit schooling relative to coworkers,

β2 – β1: return to an additional year of surplus schooling relative to workers, and with the same total year of schooling which is adequately used.

Several findings concerning the earnings impact of job education mismatch are documented in the literature (see: Büchel et al., 2003; Groot and H. Maassen, 2000; Kiker, et al, 1997; Sicherman, 1991). First, the return to over-education is positive (β2 > 0) but smaller than required education (β2 < β1), while the return to under-education is negative (β3 < 0). Second, over-educated workers earn less than workers with the same educational attainment in jobs which require that level of schooling (β2 – β1) < 0. However, under-educated workers earn more than workers with the same educational level working in jobs requiring the level of education that they have and earn less than coworkers possessing the required level of education.

We used the International Standard Classification of Occupations (ISCO-8) ILO

(ILO, 2012) and the International standard Classification of Education (ISCED-97) UNESCO (UNESCO, 1999) to match occupation and required level of education. See Table 1 for the classification. In this approach, the required level of education corresponding to an occupation takes a range of educational achievement values. In this case, the estimation of the return to required level of education, and hence the use of ORU model per se, is difficult. Therefore, we estimate a modified form of Eqn. (4) given below.

$$lnW_{ijt} = \delta_0 + \delta_1 S_{ij}^r + \delta_2 U_{ij} + \delta_3 O_{ij} + \delta_4 S_{ij}^o - \delta_5 S_{ij}^u + \delta_6 X_{ij} + \mu_{ij} \ldots\ldots\ldots\ldots\ldots\ldots\ldots (5)$$

Where U and O indicate whether the individual is undereducated and overeducated, respectively.

Moreover, the results from estimation of (4) and (5) might be biased due to unobserved heterogeneity arising from potential failure to control for all relevant individual characteristics that might affect both earnings and education. Therefore, we employed instrumental variable estimation technique where individual educational achievement is instrumented through community level average educational achievement. There are arguments and evidence that individual educational achievement is influenced by the learning performance of peers, rendering the latter as a plausible instrument for the former. We specifically used average educational achievements at the levels of enumeration area, Kebele and District as instrumental variables. We, therefore, estimated (6), in addition to (5), as it allows us to estimate the productivity of those who are over/under qualified and at the same time tackle the issues of unobservable heterogeneity. Similar specifications can be found in earlier studies2.

$$lnW_{ijk} = \gamma_0 + \gamma_1 S'_{ijk} + \gamma_2 D^o + \gamma_3 D^u + \gamma_4 D^o * S'_{ijk} - \gamma_5 D^u * S'_{ijk} + \gamma_6 X_{ijk} + \nu_{ij} \ldots\ldots (6)$$

Where S'_{ijk} denotes predicted (exogenous) total education of individual i from neighborhood k and working under occupation, ν_{ij} is the error term.

Eq. (6) is estimated by incorporating the results from the following first stage IV specification.

$$S'_{ik} = \pi_0 + \pi_1 Z_{ik} + \pi_2 X_{ik} + \xi_{ik} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (7)$$

[2] See for example Di Pietro & Urwin (2006); Rubb (2003b); Verdugo and Verdugo (1989)

Where Z_{ik} denotes average neighborhood educational achievement of individual, i living in neighborhood k, and X represents exogenous individual characteristics such as sex and age. ξ_{ik} is the error term. Table 2 contains the list of endogenous and exogenous variables used in the model with their definition.

We used average educational achievement at the levels of enumeration area (EA), which is similar to a small village consisting of 150-200 households (ESS, 2021), Kebele and District administrative levels. We draw the justification for our instrumental variable from the neighborhood effect and peer effects literature (Amcoff, 2022; Aaronson, 2000; Amme, Mueller & Pischke, 2009; Bifulco, Fletcher & Ross, 2011; Bramoullé, Djebbari & Fortin, 2020; Calvó-Armengol, Patacchini & Zenou, 2009; Galster, 2012; Otero, Carranza & Contreras, 2017; Sacerdote, 2011). Community level educational achievement would drive individual educational achievements through Social-Interactive Mechanisms that set social standards, transmit important information and knowledge that influence individual behavior, aspiration and decisions (Galster, 2012).

Table 1: Occupation and Education Mapping

Code	ISCO-08 Major Occupation Groups	Skill Level	ISCED-97 groups	Education Level Equivalent
1	Managers, senior officials and legislators	4	6	PhD Degree
			5a	Bachelor's or master's Degree
		3	5b	Short-Term Tertiary Education
2	Professionals	4	6	PhD Degree
			5a	Bachelor's or master's Degree
3	Technicians and associate professionals	3	5b	Short-Term Tertiary Education
4	Clerks	2	4	Technical and Vocational Training
5	Service and sales workers		3	Senior Secondary School
6	Skilled agricultural and fishery workers		2	Junior Secondary School
7	Craft and related trades workers			
8	Plant and machine operators, and assemblers			
9	Elementary occupations	1	1	Primary Education
0	Military occupations	1 + 4		

Source: Compiled by the authors based on ILO (2012) and UNESCO (1999)

Table 2: Descriptive statistics of Variables used in the estimation													
	2005				2013				2021				remark
Variable	**Obs**	**Mean**	**Min**	**Max**	**Obs**	**Mean**	**Min**	**Max**	**Obs**	**Mean**	**Min**	**Max**	
Real Monthly wage	22,165	323.06	0	7624	27,379	298.6	0	20088.6	20,930	378.011	0	8513	
Number of Schooling Years Completed	71,799	7.365	0	17	95,258	7.394	0	17	74,709	9.403	0	20	
Undereducated	42,857	0.543	0	1	60,331	0.069	0	1	44,034	0.011	0	1	dummy
Overeducated	42,857	0.041	0	1	60,331	0.055	0	1	44,034	0.149	0	1	dummy
matched	42,857	0.416	0	1	60,331	0.876	0	1	44,034	0.840	0	1	dummy
Over-Required-Under Education	48,840	1.58	1	3	74,4	1.15	1	3	48,140	1.28	1	3	1=have the required level of education, 2=undereducated 3=overeducated
Under education (Education Deficit)	22,690	-0.46	-5	0	27,782	-0.47	-5	0	21,100	-0.22	-5	0	Computed as the difference between actual educational achievement and the minimum of required level l of education. Values are negative or zero
Over Education (Surplus Education)	17,828	0.116	0	3	21,746	0.127	0	5	18,968	0.309	0	4	Computed as the difference between actual educational achievement and the minimum of required level l of education. Values

													are positive or zero.
Average Educational Achievement at the level of enumeration area	134,7	5.967	4.51	9.37	146,198	5.57	4.514	9.526	107,500	5.696	4.51	8.19	
Average Educational Achievement at Kebele level	134,71	5.562	0.46	6.46	146,198	5.89	1.472	6.464	107,500	5.981	3.42	6.46	
Average Educational Achievement at district level	134,71	5.968	4.60	7.04	146,198	5.84	4.842	7.037	107,500	5.870	4.61	7.338	
Work Experience (potential)	17,717	15.71	0	50	24,605	15.76	0	50	18,305	13.79	0	50	Computed as: Age-schooling years completed-7. The maximum value is set at 50.
sex	134,71	0.532		1	146,198	0.522	0	1	107,500	0.517	0	1	
Age	134,71	32.92	15.0	99	146,198	33.53	15	97	107,500	33.32	15.0	97	
Marital Status	134,71	1.901	1	9	146,198	1.878	1	6	107,500	1.858	1	6	*values : 1,2,3,4,5,6
Type of Employer	89,922	6.971	1	99	101,035	6.784	1	12	64,320	7.651	1	16	*values : 1,2,3,4,5,6
Major Occupation Group	89,922	6.660	1	9	101,035	6.333	1	9	64,320	6.158	1	9	*values : 0, 1,2,3,4,5,6, 7, 8, 9
ISCECD-97 Education classification	71,799	1.678	0	6	91,548	1.696	0	6	74,475	2.320	0.00	5	*values : 1,2,3,4,5,6
Job satisfaction	109,85	0.643	0	1	28,141	0.64	0	1	-	-	-	-	

Data

The study is based on a nationally representative labor force survey (LFS) data of Ethiopia. The data was collected by the Statistical Service of Ethiopia (ESS) for the periods: 2005, 2013 and 2021. It is conducted both in urban and rural areas covering all parts of the country. The survey contains information on the economic characteristics of the population aged 10 years and above, i.e., their activity status, employment, and unemployment situation during the last seven days prior to the survey date. It has also covered detailed socio-demographic background variables such as age, sex, relationshipto the head of household, migration, disability, literacy status, educational level, training and marital status. The data has more than 58,000 household level observations.

5. Results

Descriptive results

Educational and Occupation Mismatch

Table 3 shows that skilled agriculture and related workers and workers with elementary occupations combined constitute about two-thirds of all the workers in Ethiopia. While the share of the former is declining, that of the latter is rising over time. Although professionals and technical workers constitute a small proportion of workers, their share is growing over time.

Table 3: Distribution of Respondents by Occupational Groups

Occupational Groups	2005	2013	2021	Total
Managers	1.12%	1.32%	1.21%	1.12%
Professionals	1.65%	3.20%	6.63%	1.65%
Technicians and Associate Professionals	2.43%	4.04%	5.10%	2.43%
Clerical Support Workers	2.17%	1.59%	1.43%	2.17%
Service and Sales Workers	12.53%	14.62%	18.60%	12.53%
Skilled Agricultural, Forestry and Fishery Workers	26.41%	32.61%	31.68%	26.41%
Craft and Related Trades Workers	11.32%	7.15%	3.67%	11.32%
Plant and Machine Operators, and Assemblers	1.87%	2.72%	3.86%	1.87%
Elementary Occupations	40.50%	32.75%	27.82%	40.50%
Total	100%	100%	100%	100%

The data in Table 4 shows that professionals, technicians, managers and clerical support workers have the highest level of educational achievement

compared to other occupational groups. On the other hand, agriculture and related workers have the lowest educational achievement.

Table 4: Average Schooling Years Completed by Major Occupation Group

Code	ISCO-08 Major Occupation Groups	2005	2013	2021
1	Managers	12	10	15
2	Professionals	13	10	16
3	Technicians and Associate Professionals	11	11	16
4	Clerical Support Workers	11	11	15
5	Service and Sales Workers	7	7	9
6	Skilled Agricultural, Forestry and Fishery Workers	4	4	6
7	Craft and Related Trades Workers	7	8	9
8	Plant and Machine Operators, and Assemblers	9	9	11
9	Elementary Occupations	5	5	7

Temporally, while average educational achievement of all occupations has generally increased from 2005 to 2021, the average educational achievement of managers and professionals declined from 2005 to 2013 but ultimately increased in 2021. Figure 2 further shows that about two-thirds of all workers have only primary level of educational achievement. This is consistent with the pattern in Table 3 that most of the workers subsist on elementary occupations and agriculture-related activities. Yet, the educational achievement of workers is generally growing over time.

Figure 2: Distribution of Educational Achivement of Workers

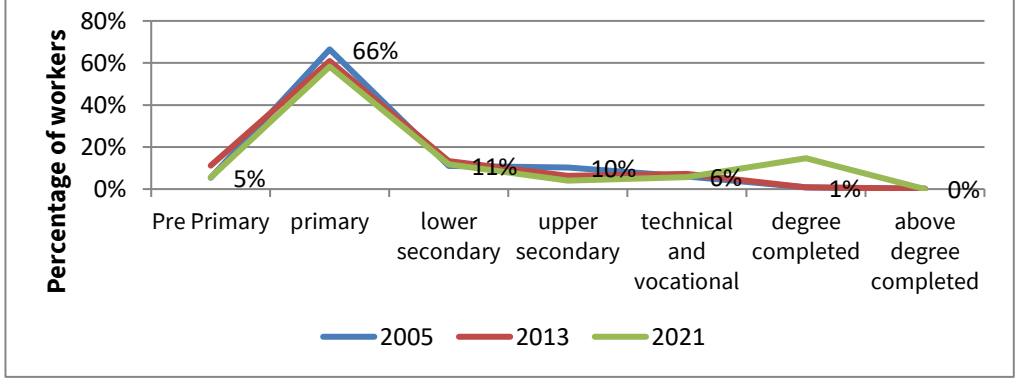


Table 5 shows that the education-occupation matching has considerably improved over time. In 2005, education-occupation matching was only 51%, and about 45% of workers were undereducated for their job, while only 4% of workers were overeducated for their job. In 2013, the matching rate increased to about 90% while the proportion of undereducated workers fell to only 6%.

Nevertheless, the rate of education-occupation matching decreased again to 85% in 2021, this time due to increased over-education. It seems the proportion of overeducated workers would take an increasing trend, ceteris paribus.

Table 5: Education-Occupation Mismatch (%)

Education-Occupation Mismatch	**2005**	**2013**	**2021**
Over educated	3.62	4.50	13.65
Under educated	51.16	5.84	1.05
Education matched to requirements	45.21	89.66	85.30

Table 6 further disaggregates the pattern of education-occupation mismatch by occupation group. The data shows that most of the managers, professionals, technicians and skilled agriculture and related workers were undereducated in 2005. However, in 2013 and 2021 almost all the workers in these occupational groups just matched the educational requirements of their occupations. It seems the government was pursuing targeted education investment towards training workers in/for these occupation groups. On the other hand, low paying/low productivity occupations, particularly clerical support workers, have recently become overeducated for their jobs.

Table 6: Education-Occupation Mismatch by Occupation Group (%)

		Matched			**Overeducated**			**Undereducated**		
Code	**ISCO Occupation Group**	**2005**	**2013**	**2021**	**2005**	**2013**	**2021**	**2005**	**2013**	**2021**
1	Managers	18.35	98.63	99.87	0.00	0.00	0.00	81.65	1.37	0.13
2	Professionals	27.22	100	100	0.00	0.00	0.00	72.78	0.00	0.00
3	Technicians and Associate Professionals	2.64	97.95	99.45	0.53	0.47	0.00	96.83	1.58	0.55
4	Clerical Support Workers	88.39	96.43	33.17	1.92	3.33	66.73	9.69	0.24	0.10
5	Service and Sales Workers	32.24	95.90	88.48	0.19	0.31	10.68	67.58	3.79	0.83
6	Skilled Agricultural, Forestry and Fishery Workers	7.13	87.08	93.52	0.08	0.06	3.95	92.79	12.86	2.53
7	Craft and Related Trades Workers	31.64	95.07	87.21	0.00	0.43	11.81	68.27	4.50	0.98

8	Plant and Machine Operators, and Assemblers	54.24	98.23	84.12	0.00	0.39	15.84	45.49	1.38	0.04
9	Elementary Occupations	83.83	82.22	69.36	11.06	13.54	29.82	5.11	4.24	0.82
Overall		45.21	89.66	85.30	3.62	4.50	13.65	51.16	5.84	1.05

Educational-Occupation Mismatch and Productivity

Figure 3 shows that managers are the most productive workers as they make the highest monthly earnings, followed by professionals and technicians. Workers with elementary occupations are the least productive ones, narrowly exceeded by service and sales worker occupation group. The monthly earnings include only payment to employees made in cash or kind. All the earnings are adjusted to 2003 prices. The patterns in Table 4 and Figure 3 combined reflect that workers with a higher educational achievement seem to have greater productivity/earnings. Nevertheless, worker productivity, measured at 2003 constant prices, has not increased since 2005. Surprisingly, it has even declined for managers, professionals and technicians, and showed only a slight increment for the low-productivity workers. A notable exception is the productivity of agriculture-related skilled workers, which is more than double in 2021 compared to 2005. Another notable feature of worker productivity dynamics is its non-linearity for high productivity workers as shown in Figure 3.

Figure 3: Monthly Earning /Labour Productivity by Occupation Group (in 2003 prices)

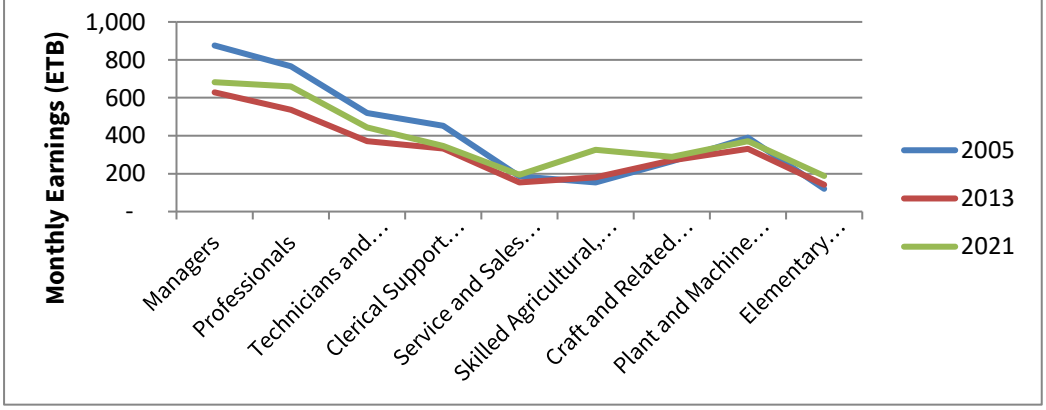
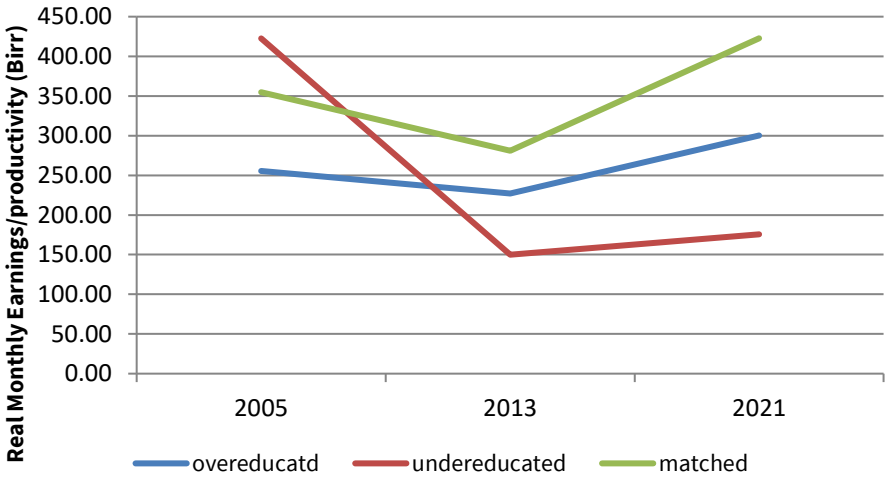


Figure 4 shows productivity by education-job matching status. The results show that workers whose educational achievements match the educational requirements of their job are more productive than their overeducated and undereducated counterparts. This might be because the workers in the relatively high-productivity occupation groups such as managers, professionals and technicians have also a lower rate of education-occupation mismatch. Moreover, Figure 4 shows that overeducated workers are more productive than undereducated workers.

Figure 4: Worker Productivity by status of education-occupation matching



6. Regression Results

Return to education

We continue our investigation of the relationship between real monthly earnings/worker productivity on one hand and occupation-education mismatch on the other through estimation of Eq. (5) and Eq. (6) using OLS and IV techniques, respectively. To control the effect of inflation on earning over time, we adjusted earnings to 2003 prices. The focus of the analysis is on the relationship between earnings and education-occupation mismatch measures. The results from the OLS regression presented in Table 7 (column 5) show that education and earnings are positively related. The results further show that being undereducated is positively related with earnings indicating that the earnings of workers who are employed in a job that requires more than their level of education is greater than the earnings of those with similar level of educational achievement and work on a job which requires that level

of education. In contrast, being overeducated is inversely related to earnings, implying that workers who are overeducated for their job earn less than other workers who have similar educational achievement and work on a job which requires that level of education. Besides, the return to surplus education is negative indicating workers who are overeducated for their job are penalized for their surplus education. The results also show that closing the gap between actual and required education by one schooling year increases earnings of undereducated workers by about 5%.

Table 7: Real monthly Earning and Education-Occupation Mismatch (OLS Regression Results, Marginal effects in percentage change)

Dependent Variable: ln (Real Monthly Wage)	(1)	(2)	(3)	(4)	(5)
Number of Schooling years (actual)	0.072***	0.112***	0.114***	0.111***	0.124***
Under-Required-Over Education (baseline= with required level)					
Undereducated (1= yes)		0.404***	0.194***	0.224***	0.239***
Overeducated (1= yes)		-0.33***	-0.181***	-0.19***	-0.185***
Under Education (Education Defict in sch. years)			-0.053***	-0.052***	-0.054***
Over Education (Surplus Education in sch. years)			-0.127***	-0.122***	-0.119***
Sex (1= Women, 0= Men)	-0.286***	-0.266***	-0.259***	-0.273***	-0.26***
Age	0.012***	0.011***	0.011***	0.009***	0
Marital Status (baseline= Never Married)					
Married (1=yes)	0.112***	0.163***	0.157***	0.183***	0.111***
Divorced (1=yes)	-0.057***	0.032*	0.032*	0.047**	-0.034*
Widowed (1=yes)	-0.08***	0.037	0.033	0.041*	-0.022
Separated (1=yes)	-0.024	0.044	0.04	0.044	-0.035
Living together (1=yes)	-0.044	0.001	0.033	0.05	-0.006
Type of Employer (baseline= Government/Public Service)					
Government Enterprise (Parastatal) (1=yes)	-0.071***	-0.013	0	-0.02*	-0.018*
Private organization(1=yes)	-0.321***	-0.171***	-0.15***	-0.19***	-0.178***
NGO (including international organization)	0.101***	0.113***	0.104***	0.091***	0.105***
Domestic Work (1=yes)	-0.58***	-0.412***	-0.412***	-0.445***	-0.436***
Other Employers (1=yes)	-0.41***	-0.234***	-0.225***	-0.249***	-0.236***
Time Period (baseline= 2005)					
Year_2013 (1=yes)			-0.185***	-0.171***	-0.164***
Year_2021 (1=yes)			-0.108***	-0.046***	-0.023*
Administrative Region/State (baseline= Tigray)			0	0	0
Afar (1=yes)				0.07***	0.075***
Amhara (1=yes)				-0.126***	-0.125***
Oromiya (1=yes)				-0.095	-0.101
Somalie (1=yes)				0.138***	0.135***
Benishangul-Gumuz (1=yes)				-0.11***	-0.078***
SNNPR (1=yes)				-0.176***	-0.185***
Sidama (1=yes)				-0.246***	-0.231***
Gambella (1=yes)				-0.024	-0.026
Harari (1=yes)				-0.023	-0.033
Addis Ababa City Administration (1=yes)				0.084***	0.062***

Dire Dawa City Administration (1=yes)				0.046*	0.031
Residence (1=urban, 0= rural)				0.292***	0.264***
Experience (potential)					0.043***
Square of Experience (potential)					-0.00057
Constant	110.274***	62.82***	67.72***	60.87***	55.83***
N	61676	58480	58480	58480	57431
Adjusted R-squared	0.42	0.504	0.512	0.529	0.541
* p<0.05; ** p<0.01; *** p<0.001					

To address the potential bias that might arise from unobserved heterogeneity, which might result in co-movement of education and earnings, in the OLS estimation, we supported our analysis with IV regression. We instrumented individual educational achievement by community level average achievements. We used the interaction between the fitted individual level of education and dummy variables denoting whether individuals are overeducated or undereducated, to represent surplus/over education and under deficit education, respectively. To mitigate the undesirable effect of high multicollinearity between the interaction term and the interacting variables, we used the centered value of the education variable.

Table 8: Real monthly Earning and Education-Occupation Mismatch (IV regression Results, Marginal Effects in Percentage Change)

Dependent Variable: ln(Real Monthly Wage)	**Instrumental Variable Estimation**				
	(1)	(2)	(3)	(4)	(5)
Number of Schooling years_predicted	0.221***	0.131***	0.048***	0.024***	
Under-Required-Over Education (baseline= with required level)					
Undereducated (1= yes)	0.176***	-0.005	0.045*	0.149***	0.142***
Overeducated (1= yes)	-0.065***	-0.085***	-0.155***	-0.275***	-0.213***
Undereducated*number of schooling years completed__predicted	0.009	0.033***	0.026***	0.085***	
Overeducated*number of schooling years completed__predicted	-0.059***	-0.041***	-0.033***	-0.044***	
Sex (1= Women, 0= Men)		-0.264***	-0.273***	-0.261***	-0.321***
Age		0	0.006***	0.117***	
Marital Status (baseline= Never Married)					
Married (1=yes)		0.15***	0.135***	0.11***	0.285***
Divorced (1=yes)		-0.083***	-0.093***	-0.039**	0.038*
Widowed (1=yes)		-0.152***	-0.145***	-0.023	0.105***
Separated (1=yes)		-0.047	-0.055*	-0.038	0.059*
Living together (1=yes)		-0.095*	-0.069	-0.01	-0.009
Type of Employer (baseline= Government/Public Service)					
Government Enterprise (Parastatal) (1=yes)		-0.072***	-0.118***	-0.023**	-0.099***
Private organization(1=yes)		-0.454***	-0.459***	-0.191***	-0.468***
NGO (including international organization)		-0.053***	-0.046	0.103***	-0.014
Domestic Work (1=yes)		-0.721***	-0.734***	-0.446***	-0.743***

Other Employers (1=yes)		-0.552***	-0.571***	-0.243***	-0.564***
Time Period (baseline= 2005)					
Year_2013 (1=yes)			-0.123***	-0.134***	-0.101***
Year_2021 (1=yes)			0.297***	0.006	0.336***
Administrative Region/State (baseline= Tigray)					
Afar (1=yes)			-0.016	0.058***	-0.03
Amhara (1=yes)			-0.123***	-0.142***	-0.106***
Oromiya (1=yes)			-0.106***	-0.124***	-0.083***
Somalie (1=yes)			0.141***	0.138***	0.111***
Benishangul-Gumuz (1=yes)			-0.101***	-0.107***	-0.078***
SNNPR (1=yes)			-0.162***	-0.212***	-0.141***
Sidama (1=yes)			-0.223***	-0.256***	-0.218***
Gambella (1=yes)			-0.039	-0.059***	-0.031
Harari (1=yes)			-0.001	-0.054***	0.034
Addis Ababa City Administration (1=yes)			0.115***	0.01	0.228***
Dire Dawa City Administration (1=yes)			0.031	0.006	0.071***
Residence (1=urban, 0= rural)			0.452***	0.175***	0.611***
Experience (potential)				-0.06***	0.017***
Square of Experience (potential)				-0.0009***	-0.0005***
Constant	165.002***	287.59***	204.408***	29.265***	206.473***
N	58542	58542	58542	57431	57431
Adjusted R-squared	0.091	0.343	0.383	0.527	0.383

*** p<0.05; ** p<0.01; *** p<0.001"**

The results in Table 7 show that monthly earnings are related to education (measured in number of schooling years completed). Completing one more schooling year increases real earnings by about 2.4% (column 4 of Table 8) which is much less than the result from the OLS estimation (12.4%, Column 5 of Table 7). The results also show that being overeducated for one's occupation reduces earnings by about 27.5% compared to workers with the same level of education and work on a job that requires that level of education. This is consistent with mismatch and productivity pattern depicted on Figure 4, where the earnings of overeducated workers are less than the earnings of workers whose educational achievements match the educational requirement of their occupations. Workers who are undereducated for their job earn about 14.9% more than other workers who have the same level of education but work on a job which requires that level of education. For example, a 10th grader who is working on a job that requires completion of 12th grade earns more than a 10th grader who is working for a job that requires just completion of 10^{th} grade. As it can be seen from Table 8, both the coefficients of the interaction terms between number of schooling years completed and the education-occupation mismatch measures in the IV estimation are statistically significant, but with opposite signs. These interaction terms measure the returns to additional year of schooling only

under the circumstance of occupation-education mismatch. The negative coefficient of the interaction between number of schooling years completed and being overeducated indicates a decreasing return to education for overeducated workers. On the other hand, the positive coefficient of the interaction between number of schooling years and being undereducated tells us the existence of increasing returns to education for undereducated workers.

Education-Occupation Mismatch and Job Satisfaction

Job satisfaction would indicate to what extent workers are happy with their job. Employee happiness in turn would affect performance on the job. The results from our logistic regression of workers' job satisfaction presented in Table 9 indicate that completing a year of schooling increases the likelihood of being satisfied with one's own job by about 5.6%. Similarly, undereducated workers are about 33% more likely to be satisfied with their job compared to workers whose job is matched to their educational level. Contrarily, overeducated workers are about 45% less likely to be satisfied with their job compared to the workers whose job and educational achievement is matched. Moreover, women workers are about 10% less likely to be satisfied with their job. These results are interestingly consistent with the findings on the relationship between workers' productivity on the one hand and educational achievement, over-education and under-education, respectively, on the other hand. The relationship between measures of education and productivity is monotonic with the relationship between measures of education and job satisfaction.

Table 9: Education-Occupation Mismatch and Job Satisfaction (Odds Ratio of Logistic regression)

Dependent Variable: Satisfied with Job=1, Otherwise= 0	**(1)**	**(2)**	**(3)**
Number of Schooling years completed	1.046***	1.025***	1.056***
Under-Required-Over Education (baseline= with required level)			
Undereducated (1= yes)	1.280***	1.204***	1.333***
Overeducated (1= yes)	0.540***	0.564***	0.555***
Sex (1= Women, 0= Men)		0.832***	0.904***
Age		1.009***	1.011***
Marital Status (baseline= Never Married)			
Married (1=yes)		1.114***	1.050*
Divorced (1=yes)		0.755***	0.766***
Widowed (1=yes)		0.750***	0.783***

Separated (1=yes)		0.720***	0.721***
Living together (1=yes)		1.065	0.987
Type of Employer (baseline= Government/Public Service)		1	1
Government Enterprise (Parastatal) (1=yes)		0.833***	0.832***
Private organization(1=yes)		0.516***	0.541***
NGO (including international organization)		1.115	1.150*
Domestic Work (1=yes)		0.822***	0.949
Other Employers (1=yes)		0.594***	0.619***
Time Period (baseline= 2005)			
Year_2013 (1=yes)			1.201***
Administrative Region/State (baseline= Tigray)			
Afar (1=yes)			0.968
Amhara (1=yes)			1.027
Oromiya (1=yes)			1.202***
Somalie (1=yes)			1.911***
Benishangul-Gumuz (1=yes)			1.747***
SNNPR (1=yes)			0.968
Gambella (1=yes)			0.850*
Harari (1=yes)			1.836***
Addis Ababa City Administration (1=yes)			1.310***
Dire Dawa City Administration (1=yes)			1.243***
Residence (1=urban, 0= rural)			0.388***
N	70724	69687	69687
* p<0.05; ** p<0.01; *** p<0.001"			

7. Discussion and Conclusion

The theory of Human capital that puts forward the notion that investments in education increase future productivity has gained policy relevance over the last decades. As a result, developing countries hugely invested their limited public resources to expand access to education. This resulted in rapid expansion of educational infrastructures, enrollment rate, and an increasing numbers of university graduates over the last few decades. On the other hand, whether this rapid expansion has resulted in overall economic growth is controversial.

While it is true that there is micro evidence that there is a positive relationship between schooling and earning, the evidence on the impact of educational expansion on aggregate output per worker is not. Recent empirical evidence revealed that there is apparently a micro – macro contradiction. While additional schooling led to higher wage increment, the macro evidence using a standard growth accounting model suggests that education has not uniformly had the growth impact (Pritchett, 2001. Temple (1990) indicated that the development impact of education varied widely across countries. This evidence has huge policy consequence for countries like Ethiopia, where, because of the rapid expansion of the education system, there coexists high unemployment rate among the university graduates, on one hand, and firms suffer from shortage of skilled labor and high labor turnover, on the other hand.

This paper investigated this puzzle using a national longitudinal data from labor force survey collected by the Ethiopian Statistical Service. We used the over – required – under education model to estimate the returns to education. This enables the wage premium to higher education to be different contingent on whether the person's employment is undermatched, correctly matched, or overmatched with their current employment.

The findings show that the education-occupation mismatch has significantly declined to about 1% compared to 2005, when more than 50% of the workers were undereducated for their occupation. Contrarily, over education is gradually rising from about 3.5% in 2005 to 13.5% in 2021. Despite the considerable improvement in education-occupation matching, overall productivity measured in real earnings has not improved since 2005. This implies that all the considerable government investment in the education sector and the growth in educational achievement has not paid off in terms of aggregate productivity improvement. This might be an indicator to the poor quality of education in Ethiopia. Yet, it shall be noted that the individual return to education is positive, justifying why people want to study more despite the

rising educated-unemployment and negative returns to surplus-to-requirement education. Occupations that require a high level of education, such as managers, professionals and technicians pay higher wages than the rest of occupation categories. The absence of temporal growth in aggregate workers' productivity might be attributed to the limited creation of such high paying job opportunities in Ethiopia over the years. Of course, these three occupational categories employ only about 13% of the workers in 2021. Mehta et.al. (2011) has argued in a similar fashion that over-education is a structural problem in which workers are [temporarily] employed in jobs that require and pay less than their level of education.

The findings of the study also show that while over-education is on the rise, there is a decreasing return to additional years of schooling for overeducated workers. But there is an increasing return to additional years of schooling completed by undereducated workers. The study further disaggregates who is over/under educated for their occupation. The educational level of managers, professionals and technicians is well matched to their job requirements. Nevertheless, a growing proportion of workers in low paying/low productivity occupations including, clerical support workers; workers in elementary Occupations; Plant and Machine Operators, and Assemblers; Craft and Related Trades Workers; and Service and Sales Workers, is becoming overeducated for their jobs. This systematic pattern might have important implications for targeted human capital development and job creation interventions. The main take away from the study is that the government of Ethiopia should focus on ensuring quality of education instead of expanding education as the later has failed to bring meaningful productivity gain in the last two decades.

Several findings concerning the earnings impact of job education mismatch are documented in the literature (see: Di Pietro & Urwin, 2006; Büchel et al., 2003; Groot and H. Maassen, 2000; Kiker, et al, 1997; Rubb, 2003a; Rubb, 2003b; Sicherman, 1991). First, the return to over-education is positive but smaller than required education, while the return to under-education is negative. Secondly, over-educated workers earn less than those with the same educational attainment in jobs that require that level of schooling. However, under-educated workers earn more than their peers with the same level of education working in jobs that match their qualifications but earn less than coworkers who meet the required education level.

Our findings, except for the negative return to surplus education, align with the existing literature. This deviation seems surprising from the perspective of prior studies but is consistent with our expectations. One possible explanation is that Ethiopia's educational system may not sufficiently reward

higher skills or redistribute economic rent. Two key factors could contribute to this: first, we found that over-educated workers tend to be unhappy, which may reduce their productivity. Second, over-educated workers might have fewer years of experience compared to their counterparts with only the required education level. Given the poor quality of education, employers may prefer to reward additional work experience over extra years of schooling. Additionally, our findings suggest that unless investment in education is aligned with the effective utilization of human capital, it may become counterproductive, leading to inefficiencies and wasted public resources. However, these conclusions should be interpreted with caution, as we were unable to fully isolate the effect of work experience. Our estimation of returns to experience in the IV specification was problematic due to the high correlation between potential work experience, age, and predicted educational attainment.

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