

Estimating Returns to Education in Tanzania: Evidence on Trends and Policy Implications

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Abstract

Over recent decades, Tanzania, like many developing countries, has undertaken reforms that substantially expanded access to education, driving rapid gains in enrollment and attainment and reshaping the composition and supply of the educated workforce. Human capital theory suggests that such rapid growth in educated labor may alter the return to education through supply–demand imbalances in the labor market. Yet empirical evidence on how expanding access affects returns to education in developing countries remains scarce. Using four rounds of comparable, nationally representative labor force surveys spanning 2001 to 2024, this study examines the trends in the private return to education in Tanzania. The estimated return averages 10 percent, remaining high by international standards and consistent with prior evidence. The return to an additional year of schooling declined over the study period, from about 11.5 percent in 2001 to 7.8 percent in 2024. The decline in return is driven by a decline in the wage premium to primary and secondary schooling. The primary premium has eroded to become small and statistically insignificant. The secondary premium falls substantially, while the return to higher education, though gradually declining, remains large and statistically significant. A parallel decline in returns is evident across successive birth cohorts. Together, these patterns indicate that the value of education is increasingly concentrated at higher levels of schooling. As access continues to widen, sustaining returns to education will require labor market policies that stimulate demand for skilled workers through structural transformation, private sector development, and job creation.

Keywords: Education expansion, rate of return, trend, Heckman, Tanzania

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1. INTRODUCTION

The rapid expansion in education in developing countries has increased access to education and improved equity among rural and vulnerable societies (UNESCO, 2020). However, such an unprecedented education expansion has led to an oversupply of educated workforce in the labour market, creating a supply-demand imbalance. The labour market imbalance of the educated workforce may further diminish the economic returns to education (Brown et al., 2008; Li et al., 2025; Psacharopoulos, 1989). The effect occurs due to limited growth in private and formal sector jobs that typically reward educational attainment, wage stagnation, declining quality of education, and skill mismatch in the labour market (Brown et al., 2008; Colclough et al., 2009; Daly et al., 2006; Hægeland, 2001; Li et al., 2025; Psacharopoulos, 1989; Söderbom et al., 2006). With the limited formal job growth, many educated workers are forced to enter low-productivity informal sector jobs, further driving down the returns to education (Appleton et al., 1999).

Like many other developing countries, Tanzania substantially expanded access to education through large-scale public investments, policy reforms, and the abolition of school fees, leading to a rapid growth in enrollment and educational attainment (UNESCO, 2020; World Bank, 2018). While this expansion significantly improved educational attainment and equity, it has also altered the composition of the workforce and the supply of educated labor (UNESCO, 2020). The rapid expansion in education access and changing labour market composition have an implication on the rate of returns to education due to labour market saturation, skill mismatches, and declining education quality (Montenegro & Patrinos, 2014; Patrinos & Rivera-Olvera, 2025). However, empirical evidence on the response of the labour market to the changing education access remains scarce and unexplored in developing countries. This paper adds to the limited literature by examining the trends of the private return to education following a two-decade period of education expansion in Tanzania.

Previous evidence on the return to education shows that low- and middle-income countries, including those in Sub-Saharan Africa (SSA), exhibit relatively high average private returns to schooling in comparison to developed countries (Montenegro & Patrinos, 2014; Psacharopoulos, 1989; Psacharopoulos & Patrinos, 2004). The most recent estimates by Psacharopoulos and Patrinos (2018) show a mean return to an additional year of schooling in many developing countries, ranging from 7 to 12 percent, with higher returns for secondary and tertiary education. The existing cross-country variation is tied to labor-market structure, prevalence of informal work, sample, and estimation method (Canavire-Bacarreza et al., 2017; Psacharopoulos, 1989; Psacharopoulos & Patrinos, 2004, 2018). Available evidence also suggests that, despite the higher returns in developing countries, the returns to education do not appear to be stable either within countries or over time (Psacharopoulos, 1989; Psacharopoulos & Patrinos, 2004). This is due to increasing access to education that changes the supply and composition of the workforce, sluggish labour market demand, and changing quality of education, which tend to alter the rate of return in developing countries.

Human capital theory suggests that return to education may be influenced by the expansion of the education system and changes in demand for skills in the labor market (Mincer, 1974). However, empirical studies reveal no single, universal trend, but rather a heterogeneous response (Jones et al., 2023; Montenegro & Patrinos, 2013, 2014; Peet et al., 2015; Söderbom et al., 2006). While some countries exhibit modest declines in returns along with the expansion of education, others show stable and even rising returns depending on labor demand dynamics and the quality of schooling (Boockmann & Steiner, 2006; Jones et al., 2023; Patrinos & Rivera-Olvera, 2025;

Psacharopoulos & Patrinos, 2018). Other studies indicate that following education expansion, the rate of return to education initially increases and declines later (Li et al., 2025; Ryoo et al., 1993; Yang et al., 2011). The timing, magnitude, and persistence of these declines differ across countries, data sources, and the estimation approach. Similarly, in SSA, micro-level evidence suggests heterogeneity in the trends in return to education (Psacharopoulos, 1989; Psacharopoulos & Patrinos, 2018; Söderbom et al., 2006; Psacharopoulos, 1989).

Examining the trends on the return to education following the education expansion is important for understanding the labor market dynamics, support for further education expansion, and evaluating the equalizing effects of educational expansion in income distribution (Colclough et al., 2009; Peet et al., 2015; Psacharopoulos, 1989; Psacharopoulos & Patrinos, 2004, 2018). Also, the long-term shifts in economic return to education may signal the contribution of education to productivity and diversification, with declining trends indicating that the economy is not absorbing skilled labor efficiently and thus limiting the role of education in driving growth (Appleton et al., 1999; Montenegro & Patrinos, 2014; Peet et al., 2015; Psacharopoulos & Patrinos, 2004).

Using a comparable nationally representative survey with a large sample size spanning multiple years, this work contributes to the limited empirical research examining the changing trends in the private return to education. Specifically, the study provides an estimate of the private rate of return to education and explores how it has changed over time following education expansion.

The study findings show that education continues to yield a substantial private return in Tanzania at an average of 10 percent per additional year of schooling over the study period, broadly in line with earlier regional estimates (Psacharopoulos, 1989; Psacharopoulos & Patrinos, 2018). While the overall return is high, it is heavily concentrated among individuals with higher education. When examining the behavior of these returns over time, the results reveal a clear downward trend. The return to a year of schooling has declined substantially, falling from 11.5 percent in 2001 to 7.8 percent in 2024. The decline is driven by a shrinking wage premium for secondary and higher education over the period, whereas the premium for primary education has eroded to become small and mostly statistically insignificant. These patterns remain robust when the estimation is restricted to the male subsample. Also, the study finds strong evidence of declining returns to education across successive birth cohorts, highlighting the shifting labor market dynamics and the expanding supply of educated workforce.

Other similar empirical studies show that while the rate of returns to schooling has remained relatively high in developing countries, it tends to fall gradually over time, especially in the recent decade (Colclough et al., 2009; Dearden & Sianesi, 2001; Psacharopoulos, 1989). There are several possible explanations, but not mutually exclusive, for the observed declining economic return to education, especially in developing countries. The mismatch between the recent rapid expansion in the education system and sluggish job creation, changing composition effects of educational attainment, technological change, and the effects of changing globalization patterns (Appleton et al., 1999; Montenegro & Patrinos, 2014; Psacharopoulos & Patrinos, 2018). Studies also show that in many SSA countries, secondary and tertiary enrollment increased substantially during the 1990s and 2000s, but job creation in high-skill sectors did not keep pace (Klinger et al., 2023; Mashindano & Maro, 2011; Söderbom et al., 2006; Teal, 2011).¹ The observed declining

¹ Deteriorating quality of education stemming from the rapid expansion of access to education is another possible explanation for the observed falling economic returns. Poor-quality education that fails to translate into real productivity gains or cognitive skills leads to lower returns, as employers pay less to less-productive workers. Additionally, as education becomes more universal, the marginally educated may have relatively lower ability or productivity, reducing overall economic returns. Institutional and labor market rigidities, such as inflexible pay scales, may also contribute to the decline in returns to education in these countries.

returns in Tanzania are partly attributed to the recent rapid expansion in education (post-2000 reforms) and the limited job creation in highly productive sectors (Appleton et al., 1999).

After the introduction section, the rest of the paper is organized as follows. Section 2 provides a discussion on education reforms and the expansion of access in Tanzania. Section 3 presents the methods and data, and Section 4 presents and discusses the empirical results. Section 5 summarizes and concludes.

2. EDUCATION REFORMS AND ATTAINMENT IN TANZANIA

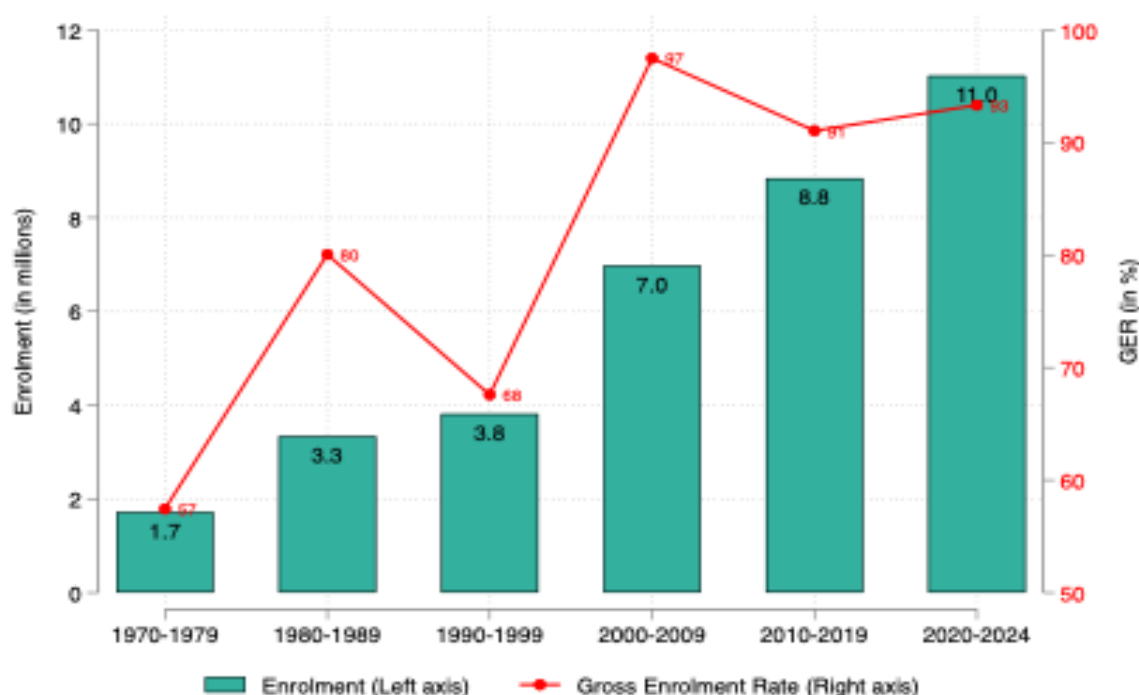
Tanzania implemented two major education reforms aimed at expanding access and equity since its independence in 1961. The Universal Primary Education (UPE) policy of 1974–1977 and the Education Sector Development Program (ESDP) of 1997. These policies were designed to increase access and reduce long-standing disparities in educational opportunity between rural and urban. The 1974-77 UPE policy established free and compulsory primary education for all children aged 7–13 and was accompanied by large-scale school construction, teacher recruitment, and the abolition of school fees. These measures led to a rapid increase in primary enrollment and significantly enhanced educational equity in Tanzania (Mushi, 2009; URT, 1997, 2014). The UPE reform marked a critical milestone in Tanzania's human capital development, providing a policy foundation for the subsequent reforms, such as the Primary Education Development Programme (PEDP) and the Secondary Education Development Programme (SEDP), which sought to advance and sustain the original goals of universal access (URT, 2018; World Bank, 2011).

Later in 1997, the Government of Tanzania introduced the Education Sector Development Programme (ESDP) as a comprehensive, sector-wide reform framework to coordinate and strengthen the education system from pre-primary to higher education. The ESDP sought to expand educational opportunities for marginalized populations, including girls, rural communities, and economically disadvantaged groups, while simultaneously improving quality through enhanced teacher training, upgraded learning materials, and expanded school infrastructure (World Bank, 2011). The ESDP was implemented through several sub-sector programs: the Primary Education Development Programme (PEDP I & II, 2001–2011), the Secondary Education Development Programme (SEDP I & II, 2004–2017), the Higher Education Development Programme (HEDP), and the Technical and Vocational Education and Training Development Programme (TVETDP). PEDP revitalized Universal Primary Education (UPE) by constructing classrooms, recruiting teachers, and abolishing school fees. The SEDP targeted the expansion and quality improvement of secondary education, while HEDP and TVETDP strengthened the relevance and capacity of tertiary and vocational institutions (URT, 1997, 2014). Collectively, these coordinated reforms produced significant gains, most notably, sharp increases in primary and secondary school enrollment and sustained growth in educational infrastructure. The ESDP continues to serve as Tanzania's principal policy framework for education sector reform and development.

Figures 1 and 2 show enrollment trends across education levels in Tanzania. The primary school enrollment expanded markedly from about 1.7 million pupils in the 1970s (1970-1979) to roughly 3.3 million in the 1980s (1980-1989), as shown in Figure 1. Within this period, the gross enrollment rate (GER) rose sharply from 50 to about 80 percent. These sharp increases in enrollment and gross enrolment rate can be traced to the UPE policy of the 1970s. The most pronounced growth occurred between 2000 and 2009, when enrollment rose from 3.8 million in the 1990s to over 7 million. Again, this surge in enrollment is largely attributed to the implementation of the Primary Education Development Programme (PEDP 2001–2011), which revitalized Universal Primary Education through extensive classroom construction, large-scale teacher recruitment, and the

abolition of school fees that substantially improved access and reduced disparities (HakiElimu, 2017; World Bank, 2011). Reflecting this progress, the GER also increased from an average of 68 percent in the 1990s to about 97 percent in the 2000s. Although enrollment growth later stabilized, it remained consistently high above 90 percent, demonstrating the sustained legacy of PEDP-led reforms.

Figure 1: Enrollment Trend in Primary Education: 1970-2024



Source: Author estimation from World Bank Development Indicators (WDI)

Figure 2 shows the improvements in access to secondary and higher education following education reforms in Tanzania. Before the introduction of major reforms such as the Secondary Education Development Programme (SEDP I, 2004–2009), the gross enrollment rate in secondary education stood at approximately 5 percent, with total enrollment around 200,000 students. However, following the implementation of SEDP, which expanded school infrastructure, enhanced teacher deployment, and introduced capitation grants, enrollment surged to between 2 and 2.7 million students by 2020, corresponding to a gross enrollment rate of nearly 30 percent (HakiElimu, 2017; URT, 2014; World Bank, 2011, 2016). Similar upward trends are evident in higher education, where the gross enrollment ratio rose sharply from about 0.4 percent in the 1990s to approximately 5.5 percent by 2020, reflecting sustained expansion in tertiary education access and institutional capacity.

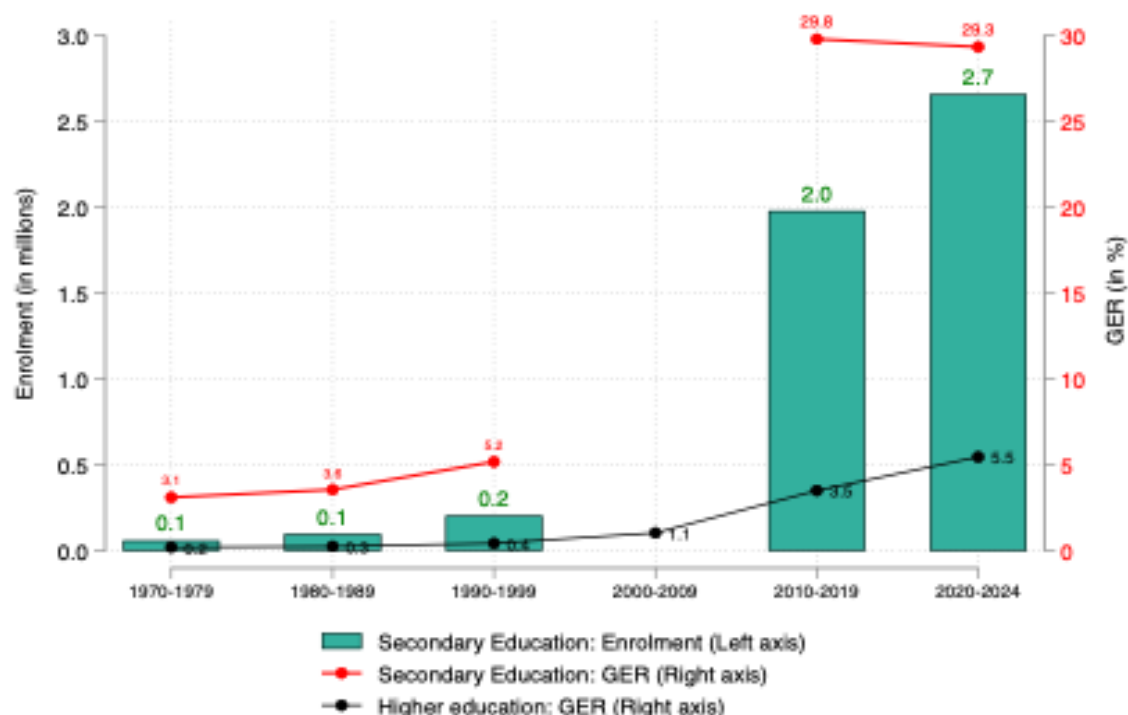


Figure 2: Enrollment Trend in Secondary and Higher Education: 1970-2024

Source: Author estimation from World Bank Development Indicators (WDI)

Figure 3 shows the educational attainment across cohorts and census for individuals aged 25 to 60. As shown in the left plot, the share of workers with at least secondary education increased significantly for the young cohorts as compared to the older cohorts and the census year. For example, less than 1 percent of young cohorts aged 20-25 and 25-30 had at least a secondary education in 1988 and 2002. However, this rate has significantly increased to around 4 percent and 11 percent in 2012 and 2022, respectively. The improvement in educational attainment is observed across all age categories, with young individuals having high educational attainment. The remarkable increase in educational attainment for youth cohorts in 2022 (the gap between the two graphs) is due to educational expansion following the early 2000s reforms on secondary education.

A similar pattern is observed for higher education, with the proportion of individuals with higher education increasing over time and the young cohort having higher attainment than older cohorts. The increase in higher educational attainment is recorded as higher from 2010 to 2020, as indicated by the gap between the two graphs. The increasing educational attainment indicates a changing composition of the labor force over time. The rapid increase in the supply of the educated workforce due to educational reforms and the sluggish job creation in the formal sector is expected to alter the economic return to education.

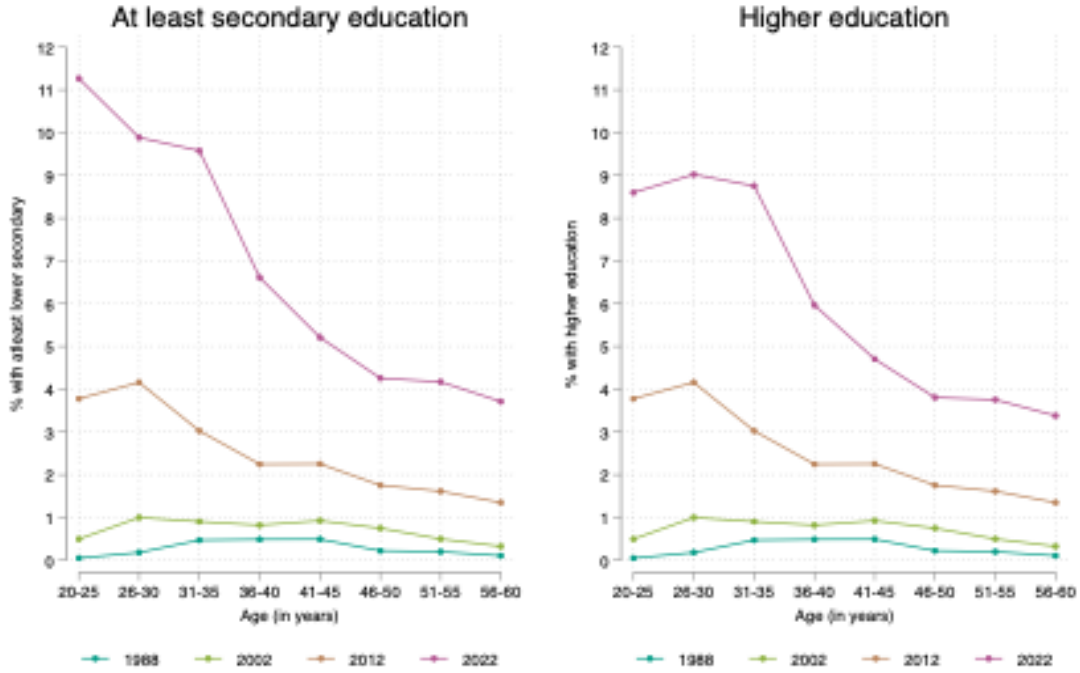


Figure 3: Educational Attainment by Cohorts Across Census

Source: Author estimation based on Tanzania census data (1988, 2002, 2012, 2022). The estimation is restricted to those aged 25 to 60 at the time of the survey.

3. METHODS AND DATA

3.1 Model Specification and Estimation

The study adopts a Mincerian-type earnings function to estimate the rate of return to education (Mincer, 1974). The Mincerian earnings function is a standard and widely used framework for estimating private returns to education.² The econometric model specification is as follows:

$$\log(w_{is}) = \alpha + \gamma Educ_i + \sum_s \pi_s (Educ_i \cdot D_s) + \theta Exp_i + \phi Exp_i^2 + \mu_s + \varepsilon_{is} \quad (1)$$

Where the outcome variable $\log(w_{is})$ denotes the natural logarithm of the real monthly wage/earnings of the individual i . $Educ_i$ is the year of schooling (number of years spent in school), Exp_i and Exp_i^2 denote the actual labor market experience (in years), measured as the number of years since the individual started paid employment, and its squared term, respectively. ε_{is} is the mean-zero idiosyncratic error term for individual i in survey round s . The parameter γ measures the return to an additional year of schooling in the 2001 base round, while the interaction parameters π_s capture the change in the return in each subsequent survey round relative to 2001, so that the round-specific return is $\gamma + \pi_s$; D_s are survey-round dummies and μ_s the associated survey-round fixed effect. The parameters of interest (γ) are estimated jointly in a pooled interaction model, permitting direct hypothesis tests on changes in the return over time. In the most flexible version, the experience profile and the selection correction are also allowed to vary by round, in which case the implied round-specific returns $\gamma + \pi_s$ coincide with round-by-round estimation while the π_s remain directly testable (Hægeland, 2001; Li et al., 2025; Montenegro & Patrinos, 2014; Söderbom et al., 2006).

² As compared to other approaches such as internal rate of return (IRR) and net present value (NPV), mincerian earning function requires minimal data, and the estimated returns are credible and comparable (Li et al., 2025).

An important challenge in the estimation of the earnings function (equation (1)) is that wage is only observable for individuals who are actually working (selection bias), and that unobservable factors such as ability may lead to an endogeneity problem. To account for the possible bias due to the selection problem, the study applies the Heckman selection model that corrects for the selection bias (Heckman, 1979; Heckman & Navarro-Lozano, 2004). Under the assumption of joint normality of the error terms in the wage and selection equations, the Heckman procedure yields consistent estimates of the return to education. The model is estimated using Heckman's two-step procedure: a probit participation (selection) equation is estimated in the first step, and the resulting inverse Mills ratio is included as an additional regressor in the wage equation (equation (1)). Second-step standard errors are corrected for the inclusion of the estimated inverse Mills ratio (Heckman, 1979; Greene, 2012); the implied error correlation (ρ) and outcome standard deviation (σ) are computed alongside the Mills coefficient, and full-information maximum likelihood provides an alternative estimator under the same distributional assumptions. The selection equation is specified as follows:

$$E_{is}^* = \delta_0 + \delta_1 Educ_i + \delta_2 Age_i + \delta_3 Age_i^2 + \delta_4 Married_i + \delta_5 Rural_i + u_{is} \quad (2)$$

Where E_{is}^* is a latent index of participation in paid employment of individual i in survey round s , and wages are observed only for individuals with a positive latent index. Because actual labor market experience is undefined for individuals who have never held paid employment, the selection equation replaces the experience terms with age and its square, which are observed for the full sample; years of schooling, marital status, and rural residence complete the specification, and the pooled model adds survey-year fixed effects to both equations. Marital status and rural residence shift the probability of participation and serve as exclusion restrictions. We acknowledge, however, that both variables may plausibly enter the wage equation as well, so identification is partly parametric, resting on the joint-normality assumption and the nonlinearity of the inverse Mills ratio; candidate exclusion restrictions that shift the reservation wage more cleanly, such as the presence of young children or other employed household members, are not consistently available across all four rounds. The current estimation does not address the potential endogeneity of education arising from unobserved ability (omitted variable bias) due to the absence of credible instruments for schooling.

To estimate the return to education level, the extended earning function specification uses a series of dummy variables for the highest education level attained and, to explore trends in the level premia, interacts each education-level dummy with the survey-round dummies. The extended earning equation is as follows:

$$\log(w_{is}) = \alpha_0 + \gamma_P Prim_i + \gamma_S Sec_i + \gamma_H High_i + \sum_s [\pi_{Ps}(Prim_i \cdot D_s) + \pi_{Ss}(Sec_i \cdot D_s) + \pi_{Hs}(High_i \cdot D_s)] + \theta Exp_i + \phi Exp_i^2 + \mu_s + \epsilon_{is} \quad (3)$$

Where *Prim* is the dummy for primary education level, *Sec* for secondary education level, and *High* for higher/ tertiary education. The category with those with no schooling or some primary is the reference category. The parameters, γ_P , γ_S and γ_H show the return to each education level in the 2001 base round with reference to the omitted category (no education or some primary), while the interaction parameters π_Ps , π_Ss and π_Hs capture the change in the premium to primary, secondary and higher education, respectively, in survey round s relative to 2001. The round-specific premium for a given level is therefore the sum of the base coefficient and the relevant interaction. This mirrors the interaction structure of equation (1) and permits direct hypothesis tests on trends in the premia by education level.

The cohort-specific return to education is estimated as a sensitivity check of the previously estimated return. Cohort analysis allows us to study the dynamics of returns over time across cohorts. The main idea is that the supply of educated workers for the older cohort was slightly lower in comparison to the young cohort. The rising educational attainment of the workforce and sluggish labour market dynamics create pressure for the declining rate of return as more educated workers accept lower-paying and unproductive jobs (Boockmann & Steiner, 2006; Daly et al., 2006; Li et al., 2025). This may lead to declining returns to education for the young cohorts following education expansion. However, the changing return across birth cohorts may reflect changing conditions other than education expansion, including changes in labor-market demand for skills, quality of education, technological change, and institutional reforms (Daly et al., 2006; Hægeland, 2001; Söderbom et al., 2006).

The study employs a modified earnings function (equation (1)) by augmenting cohort dummies and their interactions with years of schooling as follows:

$$\log(w_{is}) = \alpha_0 + \sum_{k=2}^K \delta_k C_{ik} + \sum_{k=1}^K \gamma_k (Educ_i \cdot C_{ik}) + \theta Exp_i + \varphi Exp_i^2 + \eta_{is} \quad (4)$$

Where C_{ik} is a cohort dummy taking the value 1 if the individual i is a member of the birth cohort k and 0 otherwise. η is the error term. To have cohorts with a sufficient number of observations, the estimations are restricted to all individuals born between 1950 and 1990 and aged between 15 and 60 at the time of the survey. The main effect of years of schooling is omitted because its interactions with the full set of cohort dummies are included, so that the parameters γ_k directly measure the cohort-specific return to an additional year of schooling; the oldest cohort serves as the reference category for the cohort intercepts. Although birth cohort, survey year, and age are linearly dependent (the age–period–cohort identification problem), the joint inclusion of cohort dummies and survey-year fixed effects is feasible because it is measured as actual labor-market experience, which varies across individuals independently of birth year and survey year. The oldest cohort serves as the reference category (insert older cohort), and survey-year effects are left unrestricted. An important interpretive caveat is that educational attainment expanded dramatically across the cohorts studied, so the composition of who completes each level of schooling changed over time; declining cohort-specific returns may therefore reflect changing selection into schooling rather than falling skill prices alone.

3.2 Data and Descriptive Statistics

The study uses data from four rounds of a comparable nationally representative Integrated Labor Force Survey (ILFS) collected in 2001, 2006, 2014, and 2024.³ The ILFS is a household-based survey that collects various labor market information and other socio-economic information. The surveys cover modules on household and individual characteristics: gender, age, education, marital status, employment, and earnings from paid employment. The four rounds of surveys provide an excellent setting for comparisons of the estimated return to education.

The outcome of interest is the reported monthly wages (in the log) from the main job. Nominal wages are deflated using the national Consumer Price Index (CPI) to obtain real earnings that are comparable across survey rounds. As defined in the earnings function, the main explanatory variables are the year of schooling and the dummies for the highest completed level of education. The number of years of schooling is calculated based on the highest education level completed. The four dummies for the highest completed education level include no education level, primary,

³ The 2020/21 ILFS round is not used in the analysis as it was collected during the COVID-19 pandemic. The wage employment among the educated contracted sharply, and the wage distribution was unusual as it reflects pandemic-induced selection rather than the underlying price of schooling. The analysis therefore uses the 2001, 2006, 2014, and 2024 rounds of ILFS.

secondary, and higher education. Experience is the number of years since starting paid employment (survey year minus the year started paid employment). The description and measurement of the key variables are presented in Table 1.

Table 1: Variable Name, Description, and Measurement

VARIABLE	DESCRIPTION	MEASUREMENT
Age	Age in years	Age in years
Male	Gender, Male	1 if the gender is male and 0-Otherwise
Marstat	Marital status	1 if married/cohabiting and 0-Otherwise
Educ	Years of schooling	Year spent in education (in years)
Exp	Years of Experience	Year since started paid employment in years
Noeduc	No educational level	1 if have not completed any educational level (not attended and those with some primary)
Prim	Primary education	1 if the highest completed education level is primary, 0-Otherwise
Sec	Secondary education	1 if the highest completed education level is secondary and 0-Otherwise
High	Higher education	1 if the highest completed education level is higher education (degree and above) and 0- Otherwise
Rural	Location, rural	1 if the location is rural and 0-Otherwise
Emp	Paid employment	1 if have a paid employment and 0-Otherwise
ln(wage)	Real monthly wage	Natural logarithms of real monthly wage in Tanzanian Shillings

Table 2 presents descriptive statistics for the pooled sample, including individuals both in and outside paid employment. On average, respondents were 32.8 years old, 46.5 percent were male, and approximately 61.6 percent were married. The average educational attainment was 6.5 years of schooling, while the majority of respondents (66.9 percent) had primary education as their highest level. Slightly more than half (52.3 percent) lived in rural areas⁴ and only 17.1 percent were engaged in paid employment.

Educational attainment improved substantially over the study period. The average years of schooling increased from 5.6 years in 2001 to 5.6 years in 2006, 7.6 years in 2014, and 7.9 years in 2024. Consistent with this trend, the proportion of individuals with secondary education rose from 8.7 percent in 2001 to 7.8 percent in 2006, 20.9 percent in 2014, and 25.7 percent in 2024, while the share with higher education increased from only 0.5 percent in 2001 to 6.4 percent in 2024. Conversely, the proportion of individuals with no education or incomplete primary education declined from 21.4 percent in 2001 to 8.7 percent in 2024.

Table 2: Descriptive Statistics

	(1) Full sample	(2) 2001	(3) 2006	(4) 2014	(5) 2024
Age in years	32.812 (11.416)	31.980 (11.588)	32.782 (11.240)	33.088 (11.182)	33.670 (11.650)
Gender (Male)	0.465 (0.499)	0.463 (0.499)	0.465 (0.499)	0.465 (0.499)	0.468 (0.499)
Marital status (married)	0.616 (0.486)	0.602 (0.489)	0.649 (0.477)	0.598 (0.490)	0.603 (0.489)
Experience	16.059	18.237	19.113	12.558	15.917

⁴ The comparatively low rural share recorded in the 2014 round (25.9 percent) departs from the surrounding rounds; it should be treated with caution, as it likely reflects differences in sample coverage across survey rounds rather than a genuine reversal of urbanisation

	(11.245)	(11.063)	(10.900)	(10.445)	(11.440)
Year of schooling	6.502	5.586	5.608	7.617	7.869
	(3.797)	(3.561)	(3.454)	(3.673)	(4.014)
Education level:					
Never attended school	0.158	0.214	0.209	0.084	0.087
	(0.365)	(0.410)	(0.407)	(0.277)	(0.282)
Primary education	0.669	0.694	0.710	0.652	0.592
	(0.470)	(0.461)	(0.454)	(0.476)	(0.491)
Secondary education	0.145	0.087	0.078	0.209	0.257
	(0.352)	(0.282)	(0.268)	(0.407)	(0.437)
Higher education	0.027	0.005	0.003	0.055	0.064
	(0.163)	(0.071)	(0.059)	(0.228)	(0.244)
Rural	0.523	0.672	0.625	0.259	0.466
	(0.499)	(0.470)	(0.484)	(0.438)	(0.499)
Paid employment	0.170	0.124	0.131	0.237	0.218
	(0.376)	(0.330)	(0.337)	(0.425)	(0.413)
Monthly wage (log)	10.845	10.363	10.436	11.241	11.103
	(1.173)	(1.226)	(1.223)	(0.999)	(1.019)
Observations	103746	27624	32182	23702	20238

Note: Standard deviation is in parentheses. All descriptive statistics are unweighted. The estimation is restricted to individuals aged 15 to 59 years. The 2020 survey round is not used in the analysis because it was collected in the midst of the COVID-19 pandemic, when labor market conditions and selection into wage employment were severely disrupted.

Source: Author estimates from Integrated Labor Force Surveys (ILFS) (2001, 2006, 2014, 2024).

4. EMPIRICAL RESULTS AND DISCUSSION

4.1 Return to Additional Year of Schooling

Table 3 reports the estimated returns to an additional year of schooling using pooled Ordinary Least Squares (OLS) and Heckman selection models for the full sample and the male subsample. Column (1) presents the baseline Mincer earnings equation, while Columns (2) and (3) allow the return to education to vary across survey rounds through interactions between years of schooling and survey-year dummies. Columns (4)–(6) replicate the analysis for the men subsample.

The OLS estimates in columns (1) and (4) show that an additional year of schooling is associated with an increase in monthly earnings of 10.7 percent for the full sample and 9.8 percent for men. These estimates are statistically significant at the one-percent level. The estimate is broadly consistent with past empirical evidence on returns to education in developing countries (Jones et al., 2023; Kahyarara, 2020; Kahyarara & Teal, 2008; Psacharopoulos & Patrinos, 2004, 2018), suggesting that education continues to yield substantial private labour-market benefits in Tanzania.

Examining dynamics of private return to education by allowing the return to education to vary across survey rounds reveals a clear downward trend. In the pooled interaction specification (Column 2), the estimated return to an additional year of schooling in the base year (2001) is 13.0 percent. The interaction term for 2006 is small and statistically insignificant, indicating that the return to education remained broadly unchanged during the first half of the decade. However, the interaction coefficients for 2014 (-0.015) and 2024 (-0.037) are negative and statistically significant, implying a progressive decline in returns over time. The estimated return declined from 13.0 percent in 2001 to 12.7 percent in 2006, 11.5 percent in 2014, and 9.3 percent in 2024.⁵ Although the return remains

⁵ The implied returns are computed as the sum of the coefficient on the education variable and its corresponding interaction with the survey-year dummy: $\gamma_j + \pi_{js}$ for education level j , where γ_j is the baseline return and π_{js} is the interaction effect (equation (1)). The 2001 estimate is the reference category.

positive and economically meaningful throughout the study period, the results suggest that the earnings premium associated with additional schooling has gradually diminished over time.

Heckman estimates in columns (3) and (6) provide evidence of non-random selection into paid employment. For the full sample, the Mills coefficient is negative and highly significant ($\lambda = -0.248$), indicating negative selection into wage employment after controlling for observed characteristics. In contrast, the positive and statistically significant Mills coefficient for the male sample ($\lambda = 0.284$) suggests positive selection among men, implying that unobserved characteristics associated with participation in paid employment also increase earnings. These findings justify the use of the Heckman correction and highlight the importance of accounting for labour market selection when estimating returns to education.

Correcting for potential sample-selection bias arising from observing wages only for individuals in paid employment produces a similar pattern. The baseline return increases slightly to 11.5 percent, while the interaction terms continue to indicate declining returns in later survey rounds. The estimated return falls from 11.5 percent in 2001 to 11.2 percent in 2006, 10.0 percent in 2014, and 7.8 percent in 2024. The similarity between the OLS and Heckman estimates suggests that sample-selection bias does not substantially alter the estimated trend, although the significant Mills ratio indicates that selection into paid employment is not random.

A similar pattern emerges for the male subsample (columns (4)-(6)). The baseline return of 11.2 percent in the interaction OLS model (Column (5)), declining to 11.2 percent in 2006, 10.6 percent in 2014, and 8.7 percent in 2024. After correcting for selection using the Heckman model (Column (6)), the corresponding returns are 12.6 percent, 12.6 percent, 12.0 percent, and 9.9 percent, respectively. Thus, although male workers continue to enjoy relatively high returns to education, the evidence likewise points to a gradual erosion of the education premium over time.

The declining return to education is consistent with the rapid expansion of educational attainment documented in the descriptive statistics. Over the study period, average years of schooling increased substantially, while the proportions of individuals completing secondary and tertiary education rose markedly. The expansion in the supply of educated workers may have outpaced the growth in demand for skilled labour, thereby reducing the scarcity premium previously enjoyed by educated workers. This interpretation is consistent with theoretical predictions of the human capital model and with empirical evidence from countries experiencing rapid education expansion, where increased educational attainment is often accompanied by a gradual decline in marginal returns unless matched by commensurate structural transformation and job creation.

Table 3: Return to Year of Schooling by Survey Years

	All Sample			Men Sample		
	(1)	(2)	(3)	(4)	(5)	(6)
	OLS	OLS	Heckman	OLS	OLS	Heckman
Year of schooling	0.107*** (0.003)	0.130*** (0.006)	0.115*** (0.013)	0.098*** (0.004)	0.112*** (0.007)	0.126*** (0.009)
Schooling * 2006		-0.003 (0.007)	-0.003 (0.010)		-0.000 (0.008)	-0.000 (0.009)
Schooling * 2014		-0.015* (0.007)	-0.015 (0.014)		-0.006 (0.009)	-0.006 (0.012)
Schooling * 2024		-0.037*** (0.006)	-0.037** (0.014)		-0.025*** (0.008)	-0.027** (0.010)
Rural	-0.196*** (0.022)	-0.198*** (0.022)	-0.081* (0.038)	-0.265*** (0.027)	-0.267*** (0.027)	-0.393*** (0.056)
Experience	0.020***	0.017***	0.019***	0.023***	0.020***	0.020**

	(0.004)	(0.004)	(0.005)	(0.005)	(0.005)	(0.006)
Experience squared	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Adjusted R-squared	0.490	0.492		0.474	0.476	
P-value	0.000	0.000		0.000	0.000	
Mills (lambda)			-0.248			0.284
Standard error			0.060			0.105
t-value			-4.138			2.712
Observations	17685	17685	103746	11562	11562	48244

Note: *, **, *** denote significance at 5%, 1%, and 0.1% levels, respectively. Columns (1) and (4) present pooled OLS estimates; columns (2) and (5) include education-by-round interactions; and columns (3) and (6) report Heckman two-step estimates. The schooling coefficient represents the return in the 2001 base round, while interaction terms capture changes relative to 2001. Heckman models use the full sample, whereas OLS models are estimated for wage earners only. All estimates apply adjusted survey weights to account for the survey design and ensure nationally representative estimates. All specifications include region and survey-round fixed effects. Standard errors are reported in parentheses.

Source: Author's estimates from Tanzania Integrated Labor Force survey (2001, 2006, 2014, 2024).

Overall, the results in Table 3 show strong evidence that the private return to education in Tanzania has declined over the past two decades but remains positive and economically significant. The decline is gradual rather than abrupt, suggesting that the labour market continues to reward educational attainment, albeit at a lower rate than in the early 2000s. This pattern is consistent with an expanding supply of educated workers alongside slower growth in high-productivity employment opportunities, underscoring the need for policies that complement investments in education with structural transformation, private sector development, and the creation of skilled jobs.

4.2 Return to Education Level

Table 4 reports estimates from the extended Mincer earnings equation, allowing returns to education to vary across survey years through interactions between education levels and survey-year dummies (equation (3)). The 2001 survey year serves as the reference category. The coefficients on primary, secondary, and higher education represent the wage premiums relative to individuals with no formal education in the reference year, while the interaction terms capture changes in these premiums over time.

For the full sample, the baseline OLS estimates (column (1)) indicate that, relative to individuals with no formal education, workers with primary, secondary, and higher education earn 10.7%, 59.3%, and 137.0% higher wages, respectively. When returns are allowed to vary over time (column (2)), the wage premiums decline substantially across successive survey years. The premium to primary education falls from 62.0% in 2001 to 44.8% in 2006, 18.7% in 2014, and turns marginally negative (about -26 percent) by 2024.⁶ Similarly, the return to secondary education declines from 139.9% to 128.6%, 72.7%, and 1.9%, respectively. Although the return to higher education also decreases over time, from 154.4% to 152.3%, 140.9%, and 102.6%, it remains large and statistically significant throughout the study period. The Heckman estimates (column 3) produce a similar pattern, confirming that the observed decline in education premiums is robust to correction for sample selection bias.

The results for the male sample are broadly consistent with those of the full sample. The implied returns from the OLS model (column (5)) show that the wage premium for primary education

⁶ The return to education level j in survey year s is computed as $\gamma_j + \pi_{js}$, where γ_j is the coefficient on the education-level dummy (Primary, Secondary, or Higher) and π_{js} is the coefficient on the interaction between education level j and survey-year dummy D_s .

declines from 34.8% in the reference year to 34.6% in 2006, 22.8% in 2014, and turns marginally negative (about -20 percent) by 2024. The premium for secondary education decreases from 109.6% to 106.3%, 68.9%, and 1.3%, while the return to higher education falls from 120.7% to 144.3%, 135.4%, and 97.9%, remaining statistically significant across all survey years. The Heckman estimates (column (6)) reinforce these findings, although they suggest a more pronounced decline in returns after accounting for labour market selection.

Consistent with results in Table 3, the findings in Table 4 show a clear decline in the returns to primary and secondary education over time, whereas higher education continues to yield substantial and statistically significant wage premiums. These results suggest that although education remains an important determinant of earnings in Tanzania, the labour market value of lower levels of education has weakened over time, while tertiary education continues to command a relatively high economic return.

The observed significant decline in return, particularly at lower education levels, suggests that the rapid educational expansion in Tanzania outpaced labor market absorption, consistent with evidence from other Sub-Saharan African economies (Appleton et al., 1999; Montenegro & Patrinos, 2013; Teal, 2011). As primary education approaches universality, its signaling and productivity advantages have largely eroded. Secondary education continues to yield positive but shrinking returns, reflecting rising credential inflation and labor market congestion associated with expanded access to education. Despite a gradual narrowing, tertiary education remains the most rewarding investment, highlighting the persistent demand for higher-level skills amid limited structural transformation.

Table 4: Return to Education Level

	All sample			Men		
	(1)	(2)	(3)	(4)	(5)	(6)
	OLS	OLS	Heckman	OLS	OLS	Heckman
Primary education	0.107* (0.042)	0.620*** (0.085)	0.586*** (0.098)	0.361*** (0.050)	0.348*** (0.105)	0.339*** (0.088)
Primary * 2006		-0.172 (0.105)	-0.173 (0.102)		-0.002 (0.131)	0.012 (0.124)
Primary * 2014		-0.433*** (0.126)	-0.434** (0.165)		-0.120 (0.160)	-0.096 (0.169)
Primary * 2024		-0.880*** (0.099)	-0.880*** (0.131)		-0.550*** (0.123)	-0.514*** (0.102)
Secondary education	0.593*** (0.049)	1.399*** (0.090)	1.339*** (0.129)	0.967*** (0.054)	1.096*** (0.110)	1.112*** (0.124)
Secondary * 2006		-0.113 (0.107)	-0.114 (0.131)		-0.033 (0.135)	0.010 (0.140)
Secondary * 2014		-0.672*** (0.129)	-0.673*** (0.193)		-0.407* (0.165)	-0.494** (0.192)
Secondary * 2024		-1.380*** (0.102)	-1.378*** (0.167)		-1.083*** (0.126)	-1.055*** (0.135)
Higher education	1.370*** (0.055)	1.544*** (0.202)	1.464*** (0.283)	1.881*** (0.058)	1.207*** (0.215)	1.311*** (0.260)
High * 2006		-0.021 (0.229)	-0.019 (0.266)		0.236 (0.253)	0.263
High * 2014		-0.135 (0.221)	-0.131 (0.316)		0.147 (0.245)	-0.044 (0.307)
High * 2024		-0.518* (0.205)	-0.513 (0.263)		-0.228 (0.221)	-0.242 (0.247)
Experience	0.012*** (0.004)	0.011** (0.004)	0.012* (0.005)	0.013*** (0.003)	0.011** (0.005)	0.036*** (0.004)
Experience (squared)	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***

	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Rural	-0.239***	-0.250***	-0.212***	-0.354***	-0.326***	-0.052
	(0.021)	(0.021)	(0.041)	(0.026)	(0.026)	(0.051)
Adjusted R-squared	0.504	0.518		0.473	0.500	
P-value	0.000	0.000		0.000	0.000	
Mills (lambda)			-0.091			-0.686
Standard error			0.088			0.078
t-value			-1.030			-8.815
Observations	17685	17685	103746	11562	11562	48244

Note: *, **, *** denote significance at 5%, 1%, and 0.1% levels, respectively. Columns (1) and (4) report pooled OLS estimates without interactions; columns (2) and (5) add education level-by-round interactions as in equation (3); columns (3) and (6) report Heckman two-step estimates with the selection equation (2). The coefficient on education indicates the return in the 2001 base round, and the interaction coefficients give the change in the return relative to 2001 (π_{js}). Heckman estimates use the full sample of censored and uncensored observations; OLS estimates use wage earners only. All specifications include region and survey-round fixed effects. Standard errors are reported in parentheses. All specifications include region of residence and survey-round fixed effects. Standard errors are in parentheses

Source: Own estimates from Tanzania Integrated Labor Force survey (2001, 2006, 2014, 2024).

4.3 Cohort Return to Additional Year of Schooling

Figure 4 presents the estimated returns to education across birth cohorts for the full sample and male sample. The results indicate a gradual decline in the wage premium associated with an additional year of schooling across successive cohorts, although education continues to generate substantial earnings benefits throughout the period. For the earliest cohort (1950–1954), the estimated return to education is approximately 12.5% for the full sample and 9.7% for males. Returns remain relatively high among cohorts born between 1955 and 1969, ranging between 10.5% and 11.8% for the full sample and around 9.5–10.4% for males, suggesting that schooling generated strong earnings advantages among these cohorts.

A downward trend becomes more apparent among younger cohorts. For individuals born in 1970–1974, the return declines to approximately 9.5% for the full sample and 9.8% for males, followed by further reductions among the 1975–1979 and 1980–1984 cohorts. Among the youngest cohorts, the decline is more pronounced, with returns falling to about 9.6% for the full sample and 8.1% for males born in 1985–1989, and further declining to approximately 8.5% and 5.9%, respectively, for the 1990–1994 cohort.

The observed pattern suggests that the wage premium associated with education has weakened for more recent generations, with the decline being particularly pronounced among male workers. This trend may reflect the rapid expansion of educational attainment, which has increased the supply of educated labour, coupled with slower growth in demand for skilled workers. Changes in labour market structure, employment opportunities, and sectoral composition may also have contributed to the declining returns. Nevertheless, the estimated returns remain positive across all cohorts, confirming that education continues to provide a significant earnings advantage. The larger decline among males relative to the full sample in younger cohorts points to increasing differences in the returns to education associated with gender composition, labour market participation, and employment opportunities across cohorts.

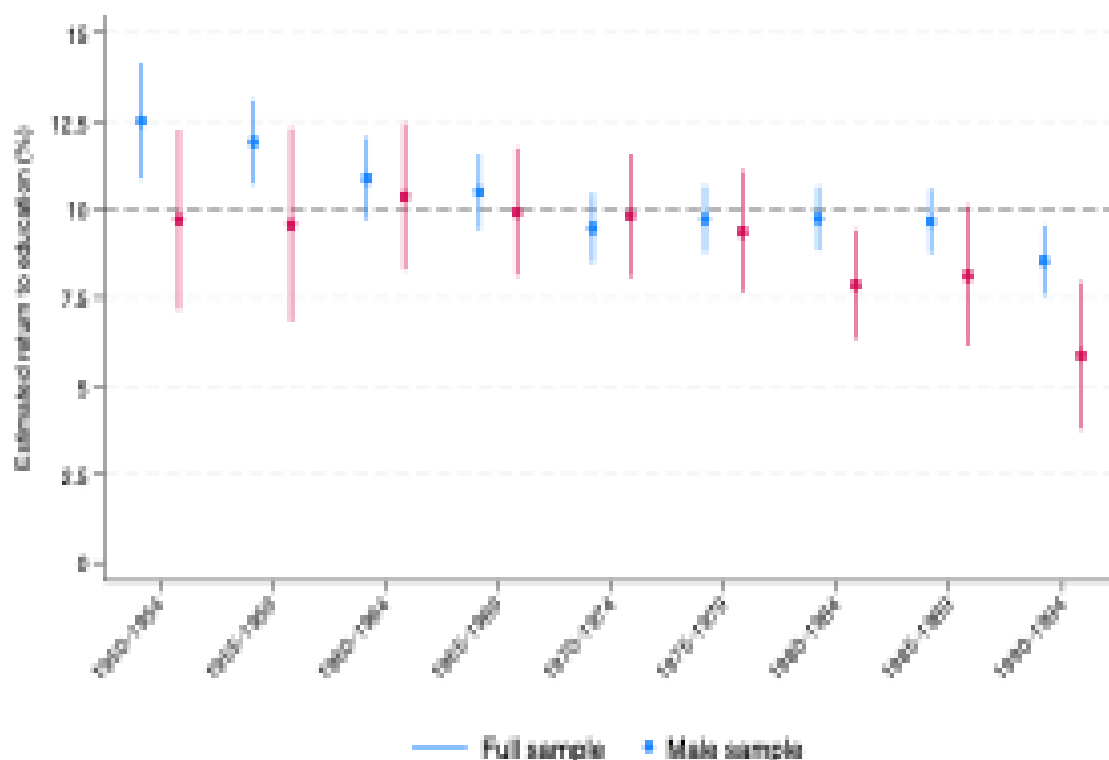


Figure 4: Cohort-specific Return to Year of Schooling
Source: Author estimates based on ILFS (2001, 2006, 2014, 2024).

5. SUMMARY AND POLICY IMPLICATIONS

This study examined trends in private returns to education in Tanzania between 2001 and 2024 using four rounds of the Integrated Labour Force Survey and Mincerian earnings functions. The results show that returns to an additional year of schooling remained positive, averaging about 11 percent, but declined steadily from 11.5 percent in 2001 to 7.8 percent in 2024. Returns to primary education fell to near zero, while returns to secondary education declined substantially. Although returns to higher education also decreased, they remained large and statistically significant. Cohort analysis further reveals that younger generations receive lower returns to education than older cohorts, indicating a progressive weakening of education's labour market value.

The findings suggest that the decline in returns reflects a growing mismatch between the rapid expansion of educational attainment and the economy's capacity to absorb skilled labour. Policy efforts should therefore shift from expanding access alone to promoting demand for skilled workers through structural transformation, private sector development, and job creation. At the same time, improving the quality and labour market relevance of education, strengthening TVET, and aligning higher education with emerging labour market needs are essential to sustain the economic value of education and improve youth employment outcomes.

A key limitation of the study is that the estimated returns are not strictly causal because unobserved factors, such as ability and motivation, may influence both educational attainment and earnings. While the Heckman model addresses sample selection, it does not eliminate ability bias. Consequently, the estimated returns should be interpreted as upper-bound estimates. A further limitation concerns external validity: wages are observed only for the roughly one in six respondents in paid employment, so the estimated returns describe the paid, largely formal, segment of the

labour market and need not generalise to the self-employment, subsistence agriculture, and unpaid family work in which most working-age Tanzanians are engaged. Nevertheless, the study's primary contribution lies in documenting changes in returns over time, and these trends are likely to be robust provided that the degree of unobserved ability bias remains relatively stable across survey rounds. Future research should employ longitudinal data and credible causal identification strategies, such as instrumental variables or natural experiments, to establish causal returns to education and examine how these returns varies overtime.

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