

Original Article

# Sheepskin Effect and Returns to Investment in Education: A Mincer Earnings Function Approach in Eastern Indonesia, 2023

<sup>1</sup>Jenny Helenatasya Putri, <sup>2</sup>Banatul Hayati

<sup>1,2</sup>Faculty of Economics and Business, Diponegoro University, Semarang, Indonesia.

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**Abstract:** Human capital theory views education as an investment that can increase individual capacity and productivity. However, educational disparities and income inequality remain challenges in labor development in Eastern Indonesia. This study aims to examine the determinants of labor earnings, identify the existence of a sheepskin effect, and estimate the returns to education in Eastern Indonesia. The data used is from the 2023 National Labor Force Survey (Sakernas). The estimated rate of return on educational investment was calculated using the Mincer model and the Two-Step Heckman Method procedure to correct for sample selection bias. The results show that education, work experience, monthly working hours, region of residence, gender, employment sector, and employment status have a positive and significant effect on income. Work experience increases income, but at a certain point it declines (diminishing returns), with a peak at 29.24 years of work experience. In addition, workers in urban areas, males, the non-agricultural sector, and the formal sector tend to earn higher incomes. The findings also show a sheepskin effect, reflected in the increase in the coefficient at each level of education. The highest rate of return on education investment is found at the college level (7.83%), while the lowest is at the elementary school level (0.35%). The rate of return on educational investment increases at higher levels of education.

**Keywords:** Human Capital, Mincer Model, Sheepskin Effect, Return to Investment in Education, Heckman Method.

## I. INTRODUCTION

Education is seen as a long-term investment that plays a strategic role in developing higher-quality human resources and simultaneously serves as a driver of a country's economic growth. Through education, individuals can acquire skills and knowledge, thereby increasing their productivity and income and improving their standard of living [1]. Education occupies a strategic position in the direction of national development policies. This is reflected in various planning policies, such as the National Medium-Term Development Plan (RPJMN), the National Long-Term Development Plan (RPJPN), and the 2030 Sustainable Development Goals (SDGs).

There is a positive relationship between education level and individual income [2]. In human capital theory, Becker [3] explains that education increases a person's productivity, which is ultimately reflected in increased income. The relationship between education and income is explained through Mincer's earnings function [2], which states that both education level and work experience influence an individual's income. Education contributes to increased income through increased productivity, while work experience reflects the on-the-job training process that gradually improves an individual's abilities. However, the effect of work experience on income is not linear, but rather shows a pattern of diminishing returns over time, represented by the square work experience.

In Eastern Indonesia, as education levels increase, income distribution shifts toward higher-income groups. This finding indicates a positive relationship between education levels and income, with higher education levels leading to greater opportunities to earn higher incomes.

Several studies have shown that earnings often increase with a certain level of education, not solely with additional years of education. This phenomenon is known as the sheepskin effect, whereby possessing a formal education diploma or certificate provides a greater wage return than the additional years of education itself [4], [5]. These findings suggest that the labor market not only values the accumulation of years of education but also provides specific compensation for formal certificates that signify completion of a level of education.

The existence of the sheepskin effect can also be explained by the signaling theory proposed by Spence [6], which holds that education serves as a signal to employers about an individual's abilities, productivity, and characteristics. In this case, a diploma is an important indicator in the workforce selection process because it is considered to reflect cognitive abilities.



Human capital theory holds that education is an investment in human resources that yields returns in the form of increased productivity and income. According to Blundell et al. [7], the benefits of investing in education include private returns and social returns. Therefore, the return on investment in education can be expressed in terms of individual income (private return) [8].

The urgency of this research is further strengthened by the characteristics of Eastern Indonesia, which has a distinct labor market structure and continues to face educational and income inequality. These conditions may lead to different returns to education than in other regions. However, research specifically examining the influence of various factors on income, the existence of the sheepskin effect, and the estimate of return to education in Eastern Indonesia remains limited. The purpose of this study is to analyze factors that influence income, analyze the existence of the sheepskin effect, and estimate the level of return to education.

## II. THEORETICAL FRAMEWORK

This study is based on economic theories explaining the relationship between education and earnings in the labor market. Education is viewed not only as a means to increase individual productivity but also as a signal of ability under conditions of imperfect information. To provide a comprehensive analysis, this study integrates human capital theory, Mincer's earnings function, and signaling theory. These approaches collectively explain how education, work experience, and other factors affect earnings and form the basis for analyzing the sheepskin effect and returns to education.

### A) Human Capital Theory

Schultz [9] and Becker [3] pioneered the idea of the importance of human capital in the economy. According to Schultz [9], not only physical capital and production factors, but also human capital, influence national output. From this perspective, humans are viewed as a form of capital whose quality and productivity can be improved to achieve greater economic benefits in the future.

In education, human capital is defined as efforts made to improve a person's quality of life and work capacity [10]. Education, as an investment in human capital, has been shown to correlate positively with economic growth. The development of science and technology can improve a person's work ability and other factors in the production process, thereby increasing economic growth.

### B) Determinant of Income

Human capital theory [3] and Mincer's earnings function [2] explain that a person's income results from investments in education and work experience. Within the framework of Mincer's income theory, education and work experience are factors that influence income levels. However, an individual's socioeconomic and demographic conditions also influence income.

### C) Mincer Earnings Function

Estimating the rate of return on educational investment is generally done using the human capital wage function approach [11]. This approach is known as the Mincer model, which models the logarithmic function of wages ( $\ln y$ ) by including explanatory variables such as years of schooling, work experience, and work experience squared. In some studies, the variable number of hours worked is also added as a controlling factor.

In the semi-log specification, the coefficient on years of schooling is interpreted as the average private rate of return to an additional year of education, regardless of the level of education. Mincerian Rates of Return (MRR) is used to analyze the costs and benefits of education and can be considered in formulating fiscal policies in the education sector, including financing policies. However, MRR cannot be taken as direct evidence of a causal relationship between education and income across various contexts of its application.

This model defines the natural logarithm of earnings as a function of years of education and work experience, as follows:

$$\ln W = \beta_0 + \beta_1 S + \beta_2 A + \beta_3 A^2 + \varepsilon$$

In the model,  $\ln W$  represents the natural logarithm of earnings;  $S$  is the years of schooling;  $A$  is work experience;  $A^2$  is the square of work experience;  $\beta_0$  is a constant;  $\beta_1$  indicates the rate of return for each additional year of schooling;  $\beta_2$  and  $\beta_3$  are coefficients, and  $\varepsilon$  is the error component.

In this equation, the variable  $S$  is defined as years of schooling, so  $\beta_1$  can be directly interpreted as the general rate of return to education. However, because this study uses a dummy for education level and adds control variables, the model specification is adjusted as follows:

$$\ln W_i = \beta_0 + \sum_{i=1}^n \beta_i \text{DummyEdu}_i + \beta_2 A + \beta_3 A^2 + \beta_4 X_i + \varepsilon_i$$

Where  $\ln W_i$  is the natural logarithm of the monthly income of individual  $i$ ;  $DummyEdu$  is a dummy variable of  $n$  levels of education; and  $X$  is a control variable that represents individual characteristics.

When applying the human capital earnings function (HCEF) model with an education-level dummy variable, the  $\beta_1$  coefficient cannot be interpreted directly as the rate of return to education. However, the  $\beta_i$  coefficient can capture the sheepskin effect [12]. The value of the rate of return on investment in education, referring to Amalia and Sugiharti [13], is:

$$r_i = \frac{\beta_i - \beta_{i-1}}{n_i} \times 100$$

$r_i$  is the rate of return at level  $i$ ,  $\beta_i$  is the coefficient at level  $i$ ,  $\beta_{i-1}$  is the coefficient at level  $i - 1$ , and  $n_i$  is the length of schooling at level  $i$ .

#### D) Signaling Theory and Sheepskin Effect

Signaling theory was proposed by Spence [6], who argued that in the labor market, there is information asymmetry between employers and job seekers. In this situation, employers do not have perfect information about prospective workers' abilities and productivity. Therefore, education serves as a signal to help employers make recruitment decisions. Spence [6] assumed that individuals have different levels of productivity. However, if two individuals have the same level of education, employers tend to offer the same wage rate, even if their actual productivity differs.

Hungerford and Solon [4] provide empirical evidence supporting this mechanism by finding a sheepskin effect, a tendency for income to increase with increasing levels of education, as evidenced by the possession of a diploma or educational certificate. This suggests that the labor market provides a greater return to the possession of a diploma than to additional years of education.

#### E) Returns to Education

This rate of return shows the relationship between education level and income level. Mincer [2] explained in his research that the rate of return to education is obtained by comparing the present value of net income between two groups of individuals with different levels of education.

Within the framework of rate-of-return analysis, education is related to an individual's income level. Education serves as an initial screening mechanism for employers to quickly and cost-effectively assess the productivity of prospective workers, thus providing a basis for wage determination [14]. On the other hand, individuals use education to signal to employers their level of productivity [6]. The higher a person's education, the higher the perceived inherent productivity, which is ultimately reflected in higher income levels.

### III. MATERIALS AND METHOD

#### A) Data Sources and Sample

This study aims to analyze the determinants of income, identify the existence of sheepskin effects, and estimate the returns to education in Eastern Indonesia. The data used in this study come from the August 2023 National Labor Force Survey (Sakernas), which provides nationally representative individual-level data on occupation and socioeconomic characteristics.

Two datasets were constructed for this analysis. The first dataset covers individuals aged 15 and above, comprising 249,633 observations in Eastern Indonesia, and is used in the first stage of the Heckman model to estimate labor force participation. The second dataset consists of employed individuals aged 15–64 who earn positive income, totaling 159,265 observations. These datasets are used in the second stage to estimate the determinants of earnings, the effects of sheepskin, and the returns to education.

#### B) Variables

The dependent variable in this study is monthly income (in Indonesian Rupiah), transformed into its natural logarithm. The primary independent variable is education level, represented by a set of dummy variables to capture differences across educational attainment levels.

Education is categorized into four levels: elementary school (SD), junior high school (SMP), senior high school (SMA), and college (Diploma/University). Each category is coded as a dummy variable (1 if the individual has completed that level, and 0 otherwise). Higher education includes Diploma (D1–D4) and undergraduate to postgraduate levels (S1–S3).

Work experience is measured using the standard proxy  $Exp = age - education - 7$ , where 7 represents the assumed school entry age in Indonesia. To capture the nonlinear relationship between experience and earnings, a squared term of experience is also included in the model.

Additional control variables were included to account for socioeconomic and demographic characteristics. These included monthly hours worked (calculated as weekly hours worked multiplied by four), dummy variables for urban residence (1 = urban, 0 = rural), gender (1 = male, 0 = female), employment sector (1 = non-agricultural, 0 = agricultural), and employment status (1 = formal, 0 = informal).

**C) Two-Step Heckman procedure**

In applying the human capital earnings function (HCEF), the Heckman method is used because not all workers have income. This occurs because these individuals are unemployed or work but do not receive income. Therefore, if the entire workforce is included in the human capital earnings function (HCEF) model and estimated using Ordinary Least Squares (OLS), sample selection bias will arise. To overcome sample selection bias, the human capital earnings function (HCEF) model is modified to the Two-Step Heckman method.

There are two stages in implementing the Two-Step Heckman Method. The first stage calculates the probability of work participation using a probit model, producing the Inverse Mills Ratio (IMR,  $\lambda$ ) as a correction for sample bias, known as the Work Participation Model. The second stage includes lambda as one of the independent variables in the human capital earnings function (HCEF) model. The final estimation model is specified as follows:

$$\ln Wage_i = \beta_0 + \beta_1 SD_i + \beta_2 SMP_i + \beta_3 SMA_i + \beta_4 PT_i + \beta_5 Pnglmi + \beta_6 Pnglmn2_i + \beta_7 Jmkrj_i + \beta_8 Urban_i + \beta_9 JK_i + \beta_{10} Nonper_i + \beta_{11} Formal_i + \beta_{12} \lambda + \mu$$

Where  $\lambda_i$  represents the Inverse Mills Ratio used to correct for selection bias, and  $\mu_i$  is the error term.

**IV. RESULTS AND DISCUSSION**

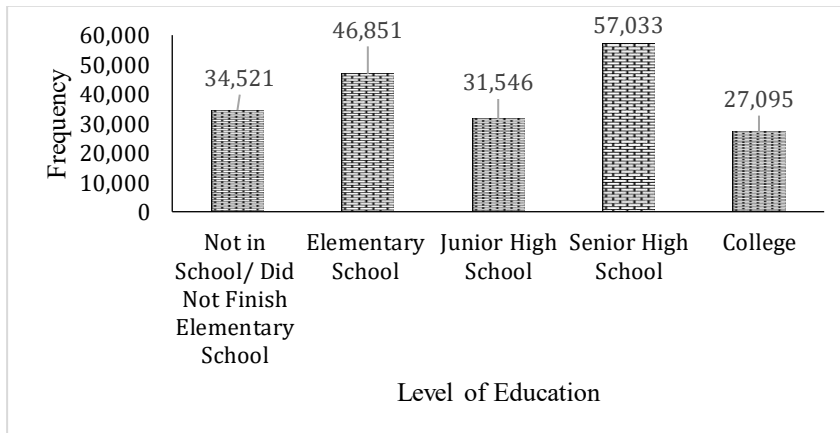
**A) Overview of Respondents and Educational Conditions in Eastern Indonesia**

Table 1 explains the distribution of the highest level of education completed by respondents aged 15 years and above in the Eastern Indonesia Region in 2023.

**Table 1: Distribution of Educational Attainment in Eastern Indonesia (%)**

Respondent Category	Education Percentage						Total
	≤ Elementary School (SD)	Junior High School (SMP)	Senior High School (SMA)	Vocational School (SMK/MAK)	DI/DII/DIII	DIV/S1/S2/S3	
All Respondents	41.10	20.19	21.79	6.20	1.85	8.87	100
Gender:							
Male	39.62	20.28	23.52	7.12	1.35	8.11	100
Female	42.58	20.10	20.07	5.30	2.34	9.61	100
Residence:							
Urban	25.42	19.63	27.98	9.67	2.94	14.35	100
Rural	49.56	20.49	18.45	4.34	1.25	5.91	100

Respondents' educational levels in Eastern Indonesia remain relatively low. This is evident in the large proportion of respondents who completed only elementary school, at 41.10%. Meanwhile, respondents with a high school/vocational high school (SMA/MAK) or diploma education were only 6.20% and 1.85%, respectively.



**Figure 1. Sample Distribution (Ages 15-64 Years) Based on Education Level**

Figure 1 shows the education levels of individuals in Eastern Indonesia. The majority of the sample, 57,033 individuals, completed a high school or equivalent (SMA/SMK/MAK). It can be said that the majority of the workforce in Eastern Indonesia has a high school education or equivalent.

**B) Descriptive Statistics**

Table 2 presents descriptive statistics for the research variables based on 2023 Sakernas data, including the number of observations (N), mean, standard deviation, and minimum and maximum values.

**Table 2: Descriptive Statistics**

Variables	N	Mean	Std. Dev	Min	Max
Income	159.265	2,519.884	3,089.293	54.200	175.000.000
Elementary School (Dummy)	249.633	0,2185809	0,4132844	0	1
Junior High School (Dummy)	249.633	0,2102246	0,4074689	0	1
Senior High School (Dummy)	249.633	0,3042146	0,4600749	0	1
College (Dummy)	249.633	0,1245629	0,4600749	0	1
Experience	249.633	21,68941	15,46893	0	57
Experience <sup>2</sup>	249.633	709,7172	761,5516	0	3.249
Monthly Working Hours	159.265	151,8332	71,80077	0	672
Residence (Dummy)	249.633	0,3799418	0,485373	0	1
Gender (Dummy)	249.633	0,5295614	0,4991264	0	1
Employment Sector (Dummy)	159.265	0,6515619	0,4764771	0	1
Employment Status (Dummy)	249.633	0,2671762	0,442486	0	1

Based on the table, the average respondent income was Rp2,59,884, with a standard deviation greater than the mean, indicating significant income inequality within the sample. The wide income range, from Rp54,200 to Rp175,000,000, indicates variations in economic conditions between individuals.

The educational composition of respondents shows that approximately 21.85% had an elementary school education, 21.02% had a junior high school education, 30.42% had a high school education, and 12.46% had a tertiary education. This means that the majority of the sample's workforce has a secondary education (high school or equivalent), while the proportion with tertiary education remains relatively small. This indicates that the majority of the workforce has a secondary education.

**C) Estimation Results**

The model's limitations in explaining wage variation stem from the assumptions of the Mincerian approach. This model assumes that the private costs of education are offset by part-time income and considers only indirect costs in the form of forgone income. Furthermore, it assumes no change in the slope of the income function at each level of education and no credit constraints in accessing education. Furthermore, the Mincer model may be subject to endogeneity because it does not fully control for unobserved factors, such as individual abilities and motivations.

**Table 3: Two-Step Heckman Estimation Results**

Variabel	HCEF Model (Outcome)
Level of Education (Dummy)	
Elementary School (Dummy)	0,021 (0,007)***
Junior High School (Dummy)	0,111 (0,008)***
Senior High School (Dummy)	0,236 (0,007)***
College (Dummy)	0,549 (0,009)***
Experience	0,026 (0,000)***
Experience <sup>2</sup>	-0,000 (0,000)***
Monthly Working Hours	0,003 (0,000)***
Residence (Dummy)	0,199 (0,004)***
Gender (Dummy)	0,270 (0,007)***
Employment Sector (Dummy)	0,050 (0,005)***
Employment Status (Dummy)	0,370 (0,005)***
Lambda (λ)	-0,410 (0,014)***
Constanta	13,105 (0,018)***
N	249.633
Selected	159.265
Nonselected	90.368
F	5672,42
Prob > F	0,000

R-square	0,24994
Root MSE	0,74962

**Note:** Numbers in parentheses indicate standard error.

\*Significant at the 10% level;

\*\*Significant at the 5% level;

\*\*\*Significant at the 1% level.

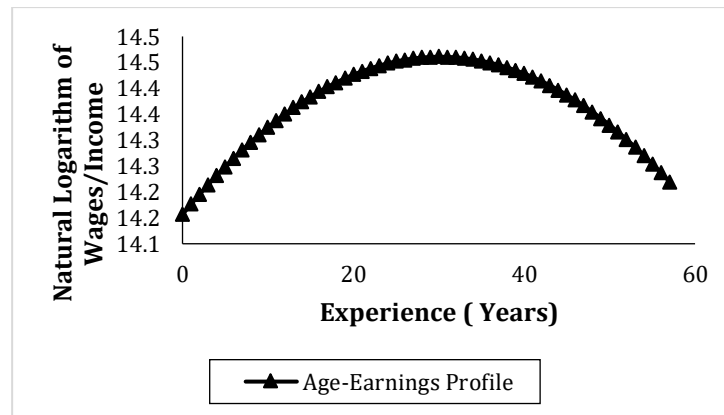
Table 3 shows that all independent variables have positive values, except for the squared experience variable and the lambda correction factor ( $\lambda$ ), which have negative values. The significance of the lambda coefficient indicates the presence of *sample selection bias*, with a correction value of -0.410. The negative sign on the lambda coefficient indicates that selection bias is more likely in groups with low income levels.

**D) Determinants of Income**

This study uses four *dummy* variables for education level: elementary school, junior high school or equivalent, senior high school or equivalent, and tertiary education (college). The reference variable (code 0) used is for those who never attended school/did not complete elementary school. All coefficients for the education-level dummy variables are positive and increase with higher levels of education.

Work experience has a positive effect on income, meaning the longer a person's work experience, the higher their income. Each additional year of work experience increases income by 2.6%, assuming other variables remain constant (*ceteris paribus*). Work experience reflects the accumulation of skills and increased productivity through the process of learning by doing [15]. This aligns with the findings of Bandara et al. [16], who found that work experience influences income levels because individuals with longer work experience are considered to have higher skills and productivity.

The square of work experience hurts income, indicating diminishing returns. Additional work experience only increases income up to a certain maximum, after which its effect tends to decline with increasing experience. This pattern is reflected in the inverted U-shaped relationship between age and income [17]. Based on the HCEF Model's estimated experience variable, the peak work experience in Eastern Indonesia in 2023 is 29.24 years. Thus, income will increase until it reaches 29.24 years of work experience, and then it tends to decline after that point. For example, if a bachelor's degree graduate starts working at age 22, his peak income is estimated to occur at age 51. The profile of the relationship between age and earnings is shown in Figure 2.



**Figure 2. Age-Earnings Profile in Eastern Indonesia 2023**

Monthly working hours positively affect income. This is consistent with the dynamics of the labor force life cycle, in which individuals of working age tend to maximize their working hours to increase income. In contrast, at older ages, there is an adjustment in time preferences that results in a decrease in income. Each additional hour of work per month will increase income by 0.3%, *ceteris paribus*.

Residence has a positive effect on income. Urban residence results in a 19.9 percent difference in income for workers living in rural areas, *ceteris paribus*. This finding aligns with research by Ahmed and Maitra [18] and Xia and Xu [19], which found that workers living in urban areas generally receive higher incomes than those in rural areas. This is due to the more advanced urban economic structure and a wider variety of jobs, which provide greater income opportunities.

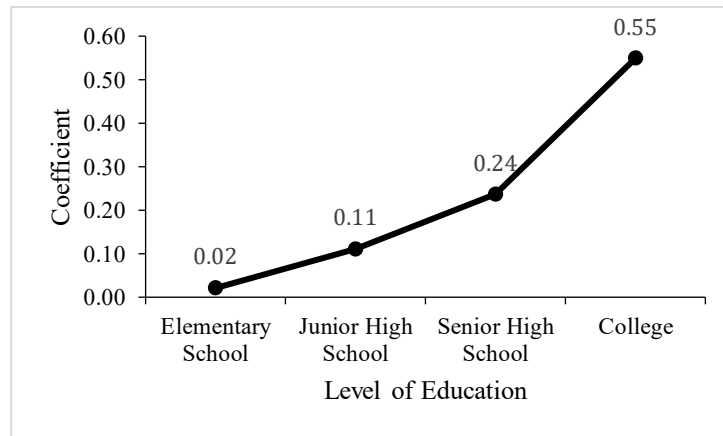
Gender has a positive effect on income. Male workers receive 27.0% higher income than female workers, *ceteris paribus*. This difference is related to social and cultural constructions that position men as the household's main breadwinners [20], as well as to differences in culture and religious values [21].

The employment sector positively affects income. Workers in the non-agricultural sector receive incomes that are approximately 5.0% higher than those in the agricultural sector, *ceteris paribus*. This can be attributed to differences in business scale and productivity, with the non-agricultural sector generally larger and more structured than the agricultural sector [22].

Employment status positively affects income. Workers working in the formal sector earn 37.0% higher income than workers working in the informal sector, *ceteris paribus*. This finding suggests that the formal sector tends to offer better job quality, higher wage levels, and more secure working conditions than the informal sector [23].

**E) Sheepskin Effect in Eastern Indonesia**

The sheepskin effect is a phenomenon in which income tends to increase with higher education levels, as indicated by the acquisition of educational certificates [22], [24]. This phenomenon is generally reflected in the significant coefficient of the dummy variable for education level, which increases with each higher level. Based on the estimation results, the dummy coefficient for education level in this study shows an increasing pattern from elementary school (0.02), junior high school (0.11), senior high school (0.24), to college (0.55). This pattern indicates that the labor market tends to provide greater compensation to individuals with higher levels of education.

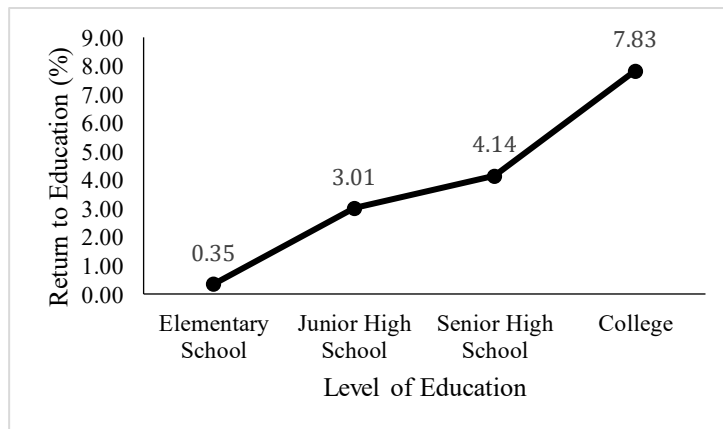


**Figure 3. Sheepskin Effect in Eastern Indonesia (2023)**

This finding is consistent with the literature showing that certification at certain levels of education, particularly higher education, provides greater compensation increases than additional years of regular schooling (sheepskin effect) [4], [24].

**F) Return to Education in Eastern Indonesia**

Figure 4 shows the rate of return on investment in education in Eastern Indonesia in 2023, by education level. The value of the education investment level at each level is obtained from data processing and calculations using the formula in the equation.



**Figure 4. Return to Education by Level of Education in Eastern Indonesia, 2023 (%)**

Based on Figure 4, the rate of return on investment in education in Eastern Indonesia in 2023 shows an increasing trend with increasing educational level. This finding aligns with research by Purnastuti et al. [25], which states that the higher the level of education completed, the greater the rate of return on investment. The lowest rate of return is found at the elementary school level, while the highest is at the tertiary level (college).

Elementary school education has a 0.35% return on investment. At the junior high school level, the return increases to 3.01%. Furthermore, high school education has a return of 4.14%, while tertiary education (college) has the highest return at 7.83%. The finding that the highest rate of return is in higher education is consistent with the results of research by Psacharopoulos and Patrinos [26], which show that higher education generally earns higher wages than lower levels of education, especially in developing countries.

## V. CONCLUSION

Based on the estimation results of the Mincer Model with the Two-Step Heckman Method on the 2023 Sakernas data, this study concludes that the level of education, work experience, working hours per month, area of residence, gender, employment sector, and employment status are proven to have a positive and significant effect on labor income in the Eastern Indonesia Region in 2023. Meanwhile, the squared work experience has a negative effect, suggesting diminishing returns. A sheepskin effect is observed in the workforce in the Eastern Indonesia Region in 2023. This is indicated by the positive dummy coefficient for education level, which increases gradually at each level. This finding indicates that the labor market provides greater rewards for individuals who complete a certain level of education. The rate of return to education shows an increasing pattern along with the level of education completed. This shows that the higher the level of education completed, the greater the increase in income earned by the workforce in the Eastern Indonesia Region in 2023.

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