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RETURN ON INVESTMENT IN EDUCATION IN INDONESIA

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Abstract

This study examines the returns to investment in education in Indonesia within the Becker–Mincer human capital framework. Using cross-sectional data from the 2024 Indonesian Labor Force Survey, this research aims to estimate wage premiums associated with different levels of completed education while accounting for work experience, age, gender, employment status, and job location. The analysis employs an extended Mincerian earnings function, where the dependent variable is the logarithm of monthly wages. The results consistently show that education has a positive and statistically significant effect on earnings across all educational levels, with monotonically increasing wage premiums from primary education to postgraduate degrees. Work experience exhibits a positive effect on wages, while its quadratic term is negative, confirming diminishing returns over the life cycle, in line with standard human capital theory predictions. Further disaggregation reveals that although average female wages remain lower than male wages, women experience higher marginal returns to education, particularly at diploma, undergraduate, and postgraduate levels. Additionally, returns to education are higher in urban areas and among salaried employees compared to rural areas and the self-employed. Overall, the findings provide strong empirical evidence that education functions as a productive investment in Indonesia, contributing to income differentials shaped by gender, job characteristics, and labor market structure.

Keywords*: education returns; human capital; labor market; Mincer earnings function; wage inequality*

Abstrak

Penelitian ini menganalisis hasil pengembalian investasi pendidikan di Indonesia dengan menggunakan kerangka teori modal manusia Becker–Mincer. Penelitian ini bertujuan mengestimasi premi upah yang diperoleh individu berdasarkan tingkat pendidikan tertinggi yang ditamatkan dengan mempertimbangkan pengalaman kerja, umur, jenis kelamin, status pekerjaan, dan lokasi kerja. Data yang digunakan merupakan data cross section Survei Angkatan Kerja Indonesia tahun 2024. Metode analisis yang digunakan adalah fungsi pendapatan Mincerian yang diperluas dengan variabel institusional yang relevan dengan kondisi pasar tenaga kerja Indonesia, di mana variabel dependen adalah log upah bulanan. Hasil estimasi menunjukkan bahwa pendidikan memiliki pengaruh positif dan signifikan secara statistik terhadap pendapatan pada seluruh jenjang pendidikan, dengan premi upah yang meningkat secara monoton dari pendidikan dasar hingga pascasarjana. Pengalaman kerja berpengaruh positif terhadap upah, sementara pengalaman kuadrat berpengaruh negatif,

yang mengindikasikan adanya diminishing returns sepanjang siklus hidup pekerja. Analisis berdasarkan gender menunjukkan bahwa meskipun rata-rata upah perempuan lebih rendah dibandingkan laki-laki, perempuan memperoleh hasil pengembalian pendidikan yang relatif lebih tinggi, khususnya pada jenjang pendidikan tinggi. Selain itu, premi pendidikan lebih besar di wilayah perkotaan dan pada pekerja berstatus pegawai dibandingkan pedesaan dan wiraswasta. Temuan ini menegaskan bahwa pendidikan merupakan investasi produktif yang berperan penting dalam pembentukan struktur pendapatan di Indonesia.
Kata Kunci: ketimpangan upah; modal manusia; pasar tenaga kerja; pendidikan; pengembalian pendidikan

I. INTRODUCTION

The issue of inequality between the rich and the poor has long been a global concern, reflected in Pillar 10 of the Sustainable Development Goals (SDGs). Long before that, economists like Mincer (1958) observed that inequality was caused by several factors, including education, age, gender, and even skin color. Mincer's research in the United States in 1939 and 1949 demonstrated a disparity in the incomes of college graduates and those without. Furthermore, Mincer's research demonstrated that the higher the level of training and education of workers, the higher their average income, but at the same time, inequality increased. Mincer's findings reinforced the views of classical economists like Adam Smith, who argued that high annual wages require extensive training. Mincer's research developed into human capital theory, which states that income inequality is influenced by differences in investment in education and training throughout an individual's life cycle.

Economists' interest in education and income has spawned a wealth of research in both macroeconomics and microeconomics. At the macroeconomic level, education is key to achieving a healthy economy and improving human resources in the workforce. Research by Marquez-Ramos & Mourelle (2019) shows a positive correlation between education and economic growth. Furthermore, the more people with secondary or higher education, the higher the economic growth. At the microeconomic level, education can increase an individual's capacity to absorb, recognize new values, and apply other information to their work, making them more productive. This productivity leads to higher incomes, which in human capital theory is referred to as the rate of return on investment in education. This rate of return can ultimately reduce income inequality (Fan & Zhang, 2015). Human capital theory also believes that the benefits of investment are not only enjoyed by individuals but also by society or society, in the form of non-material benefits such as the number of lives

saved due to improved sanitation conditions when women become more educated (Psacharopoulos & Patrinos, 2018).

This research focuses on the additional income earned by individuals due to certain characteristics such as education, type of employment, gender, location of work, and work experience. To examine the benefits of education, this study will compare educational benefits based on the highest level of education, rather than the number of years of education, as in the original Mincer model. Several studies have shown a gap in average wages between those with a high school diploma and a bachelor's degree (Kim et al., 2015). Another variable used in this study is gender, as gender segregation across occupations has contributed to the gender wage gap. Previous research has shown different returns between men and women. Some studies have shown that women receive greater returns than men (Asravor, 2021; Psacharopoulos & Patrinos, 2018; Quadlin et al., 2023). However, other studies have shown that men receive greater benefits than women (Alba-Ramírez & San Segundo, 1995; Black et al., 2008; Finnie & Frenette, 2003). These results are supported by other research showing that men have a greater chance of obtaining permanent employment than women (Ghirelli et al., 2019). The data used in this study is a cross-section of the 2024 Labor Force Survey published by the Indonesian Central Bureau of Statistics.

This research is expected to provide valuable information for policymakers, such as central and regional governments, in allocating spending to the education sector. For the community, this can provide input for investing in education for themselves and their children.

II. THEORETICAL STUDIES

Classical economists such as Adam Smith believed that education, in addition to moral and personal development, can also enhance individual abilities through knowledge, thus increasing productivity (Patrinos, 2019; Asravor, 2021). This relationship between education and productivity was further developed by Becker and Mincer in Becker's human capital theory, which positions education as an investment, not a consumer good. Becker posits that an additional year of education can increase knowledge and the ability to solve more complex problems, thereby creating individual productivity, reflected in higher wages (Fan & Zhang, 2015; Tran & Van Vu, 2020). Human capital theory believes that the wage premium, a

difference in income between two groups with different educational characteristics, assuming other factors are equal, is due to the productivity effect of education.

Another alternative explanation for the wage premium is the credential effect. The credential effect suggests that individuals with the same abilities receive different wages because one individual has a higher degree than another. In other words, a degree merely signals that an individual is more educated, leading to job placement, rather than evidence of greater productivity. However, research conducted by Layard and Psacharopoulos in 1974 showed no supporting evidence that this credential effect exists (Psacharopoulos & Patrinos, 2018).

Investment in knowledge and skilled workers has three phases. First, childhood, which represents human capital dependent on parents, the environment, and elementary school experiences. During this phase, individuals learn basic language and mathematics skills. Second, adolescents and young adults acquire knowledge and skills in high school, college, or vocational training programs. The final stage occurs in the labor market, where job training is provided (Ehrenberg et al., 2021).

Human capital theory also recognizes the concept of the rate of return on investment in education, similar to other financial investments (Psacharopoulos & Patrinos, 2018). The cost of investing in human capital can be measured in two ways: money and time (Dhaoui, 2013). The return on investment in education can be seen in terms of both individual outcomes and positive social or societal externalities (Richards, 2023). To assess the benefits an individual receives from increasing their educational level, one can compare college graduates with high school graduates. To assess the social benefits of educational investment, the costs of renting school buildings and teachers are taken into account. Ideally, the social benefits of education should not be calculated solely in monetary terms, but should also include aspects such as the number of lives saved by more educated women and the improvement in sanitation. However, social benefits are generally still calculated in monetary terms.

Research on income-based education has produced several empirical works at both the macroeconomic and microeconomic levels. At the macroeconomic level, education has been successful in increasing a nation's economic growth and increasing women's participation in the workforce. At the microeconomic level, many researchers have tested hypotheses on various social issues, such as racial, ethnic, and gender discrimination. Psacharopoulos, a

frequent researcher on the benefits of education, found in 1981 that the benefits of primary education for individuals decline over time. In 1985, he found that the highest benefits from education accrue to primary education, general curriculum, women, and poor countries. In 2004, Psacharopoulos and Patrinos stated that the benefits of education accrue to middle- and low-income countries (Psacharopoulos & Patrinos, 2018). Other research in Central and Eastern European countries showed a return on investment of 7 percent for each year of education (Wincenciak et al., 2022).

In addition to examining the relationship between education and income, social sciences also link gender roles to various social patterns, such as the participation of women and mothers in the workforce and the division of paid and unpaid work (Düval, 2023). Research on wage inequality between men and women has increased over the past 40 years. This is due to the increasing number of female college graduates entering the workforce during this period, which has reduced wage inequality between men and women (Quadlin et al., 2023).

III. RESEARCH METHODS

This study refers to Becker (1964) and Mincer (1974) who stated that education is treated as an investment in human capital to increase individual productivity which is reflected in the earnings function through the education wage premium. The dependent variable here is wages in logs. The use of logs helps prevent the possibility that the wage gap mechanically appears larger for high-wage workers simply because their absolute wage levels are higher (Quadlin et al, 2023). While the independent variable is education which is the highest level of education completed as a representative measure of human capital investment (Becker), Experience is work experience which in the Mincer model also uses a quadratic function that creates a convex shape of the income pattern, which illustrates that young people's income grows faster than older people, but income will decrease as they get older. According to (Wooldridge, 2012) the quadratic function can capture the diminishing effect, so that experience has a decreasing effect on wages. This study also includes analysis based on job characteristics, sectors, locations, and institutional variables that are relevant to Indonesia. The research data here is cross-sectional data from the 2024 Labor Force Survey. According to Mincer, data Cross-sectional data can reduce the influence of cyclical and seasonal fluctuations and reflect the income expectations faced by individuals in a given

period. In general, the estimated earnings function following the extended Mincerian specification is:

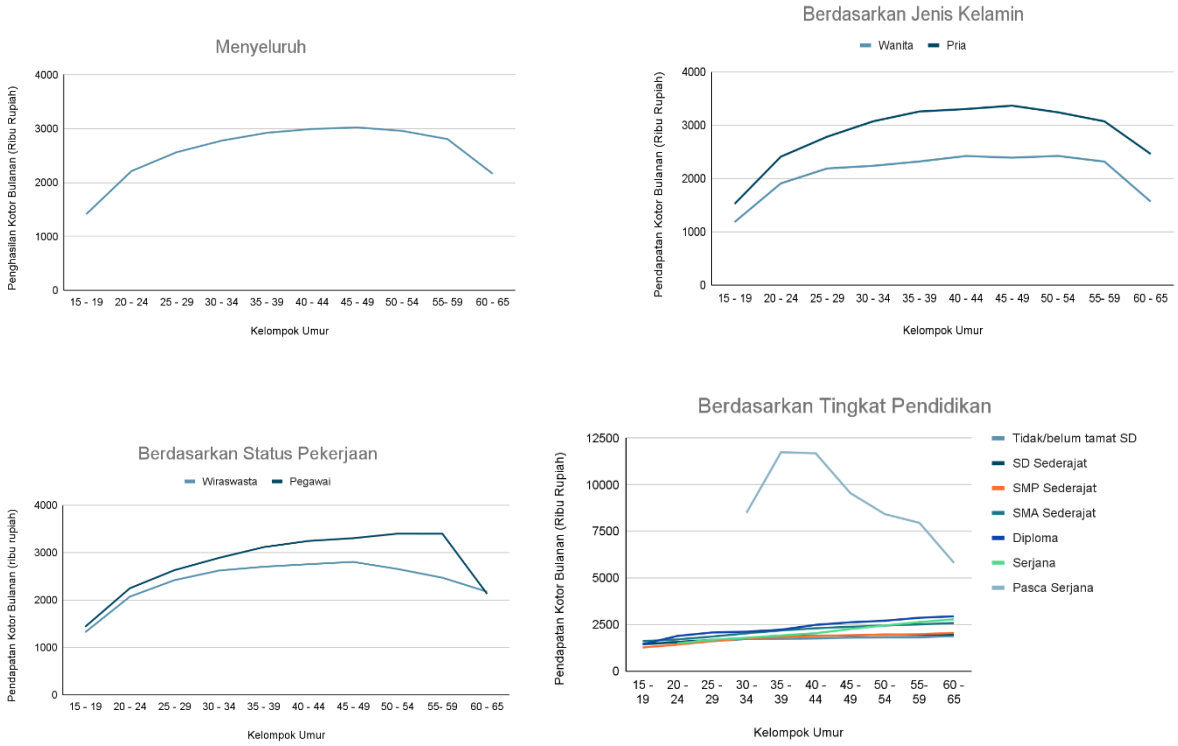
$$ln(Wage_i) = \beta_0 + \beta_1\, education_i + \beta_2 experience_2 + \beta_3\, experience_i^2 + \epsilon_i$$

IV. RESEARCH RESULTS

1. Overview of Income by Age

This study begins by providing an overview of the Indonesian workforce from the 2024 Labor Force Survey data. Some samples, such as workers aged 65 and over, are excluded from the data. Figure 1 shows five different graphs linking worker age groups to their gross monthly income, each with different characteristics.

In the graphs, we can observe the typical convex Mincerian income function pattern, where income increases with age and work experience, peaking in adulthood, then slowing and declining at older ages, a trend referred to in economics as diminishing returns. This finding is consistent with the predictions of human capital theory, which states that the accumulation of human capital through work experience initially provides rapid productivity gains, but these additional benefits diminish over time.



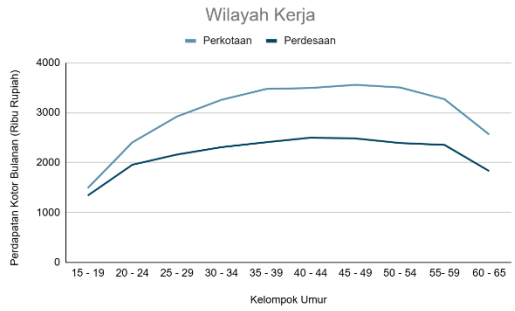


Figure 1 Relationship between age and income based on gender, employment status, education level and work area.

A relatively similar pattern occurs when we classify occupational data by gender, employment status, and region of employment, and relate this to age and average monthly income. The gender graph also shows that men's wages are relatively higher than women's. Regarding region of employment, workers in urban areas earn relatively higher incomes than women. If we look at employment status, whether self-employed or employee, the data shows that employees earn relatively higher wages than entrepreneurs.

Regarding education level, we see that wages increase with higher education levels. The data also indicates that the highest wages are earned by workers with postgraduate education. For postgraduate education, we observe a convex curve, slightly different from other education levels, which have upward-sloping curves, indicating that wages increase with age without experiencing a downward cycle.

2. Return on Investment in Education Results

This study used several different regression models. Table 1 presents two regression models. Model 1 examines the relationship between education and experience and wages, while model 2 adds age as an additional variable. The regression results from both models consistently show that education has a positive and statistically significant effect on earnings at all educational levels. Compared to the reference group of uneducated workers, workers with elementary, junior high, high school, diploma, bachelor's, and postgraduate degrees each receive a larger wage premium. This monotonic increase in the coefficients indicates that the higher a worker's education, the greater the return on their educational investment. This finding reinforces Becker's argument that education serves as a productive investment that increases individual capacity and productivity, reflected in higher wages, rather than simply as a signal of credentials.

The coefficient on work experience is positive and statistically significant, while the squared value of experience is negative and significant. These results confirm a nonlinear relationship between experience and earnings, where additional work experience at a young age provides a relatively large wage increase, but this effect diminishes with increasing tenure. This pattern aligns with Mincer's earnings function, which illustrates that the accumulation of human capital through work experience faces a productivity limit at some point in a worker's life cycle. The results are not significantly different when age is included; the pattern is identical to that for work experience.

Table 1. Results of Return on Investment in Comprehensive Education

VARIABLES	(1) Model 1	(2) Model 2
pendidikan = 1, SD Sederajat	0.171***	0.158***
	(0.00472)	(0.00472)
pendidikan = 2, SMP Sederajat	0.308***	0.293***
	(0.00504)	(0.00508)
pendidikan = 3, SMA Sederajat	0.537***	0.538***
	(0.00450)	(0.00459)
pendidikan = 4, Diploma	0.761***	0.744***
	(0.00835)	(0.00839)
pendidikan = 5, Serjana	0.833***	0.818***
	(0.00543)	(0.00550)
pendidikan = 6, Pasca Serjana	1.446***	1.428***
	(0.0136)	(0.0135)
Pengalaman	0.0388***	0.0320***
	(0.000352)	(0.000382)
pengalaman2	-0.000840***	-0.000659***
	(9.53e-06)	(1.02e-05)
Umur		0.0382***
		(0.000781)
umur2		-0.000451***
		(9.33e-06)
Constant	13.84***	13.13***
	(0.00439)	(0.0154)
Observations	388,590	388,590
R-squared	0.127	0.132

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 2, when analyzing the returns to education investment disaggregated by gender, shows that although women's average wages are lower than men's, women receive a

relatively large wage premium compared to men at almost all levels of education, particularly at the Diploma, Bachelor's, and Postgraduate levels. This finding indicates that education acts as a compensatory mechanism for various structural barriers women face in the labor market, such as worker segregation and limited access to high-paying jobs. In other words, although women's average earnings remain lower than men's, the incremental or marginal returns to education are larger, consistent with the international empirical literature on gender-differentiated returns to education.

Table 2. Returns to Education Investment by Gender

VARIABLES	(1) Pria	(2) Wanita
pendidikan = 1, SD Sederajat	0.161***	0.143***
	(0.00528)	(0.00865)
pendidikan = 2, SMP Sederajat	0.275***	0.319***
	(0.00562)	(0.00947)
pendidikan = 3, SMA Sederajat	0.488***	0.584***
	(0.00504)	(0.00866)
pendidikan = 4, Diploma	0.790***	0.943***
	(0.0111)	(0.0128)
pendidikan = 5, Serjana	0.842***	1.009***
	(0.00668)	(0.00933)
pendidikan = 6, Pasca Serjana	1.359***	1.669***
	(0.0162)	(0.0223)
Pengalaman	0.0310***	0.0358***
	(0.000395)	(0.000700)
pengalaman2	-0.000723***	-0.000746***
	(1.05e-05)	(1.90e-05)
Umur		0.0187***
		(0.00138)
umur2		-0.000193***
		(1.66e-05)
Constant	14.08***	13.09***
	(0.00500)	(0.0273)
Observations	252,251	136,339
R-squared	0.123	0.177

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 3 provides a more in-depth analysis of the returns on investment in education for men and women based on characteristics such as job location and employment status. In general, the results show a close relationship between positive education, positive experience,

and negative quadratic experience with wages, and are statistically significant. Additional information is obtained: urban employment consistently has a higher education premium than rural employment, reflecting a more capital-intensive, more formal, and more skill-based urban labor market structure. Conversely, in rural areas, while education still provides positive benefits, the premium is relatively smaller, indicating limited demand for educated labor in agricultural and informal sectors. Furthermore, in both urban and rural workplaces, the highest returns on investment in education for women are at the junior high school through postgraduate levels. The results differ slightly in the returns on investment for men in urban and rural areas, which are relatively higher than for women.

A clear difference is also evident between the self-employed and employees. For employees, education provides a more stable and structured wage premium, reflecting a remuneration system that relies more heavily on diplomas and formal qualifications. Meanwhile, for the self-employed, although education remains positive, the variation in returns is relatively greater, indicating that the economic success of the self-employed is not solely determined by formal education but is also influenced by other factors such as social capital, market access, and entrepreneurial ability.

Overall, the graphs and regression results provide strong empirical evidence that education is a human capital investment that provides significant returns in Indonesia. These findings are consistent with the Becker-Mincer framework and confirm that differences in income between individuals can be largely explained by differences in investment in education and work experience, with variations in returns influenced by gender, location, and type of employment. The policy implications of these findings are the importance of improving access to and quality of education, particularly for women and in rural areas, and the need to create productive jobs to maximize returns to education within Indonesia's labor market structure.

Table 3. Returns on Education Investment by Gender, Employment Location, and Status

	Perkotaan		Pedesaan		Wiraswasta		Pegawai	
VARIABLES	laki-Laki	Perempuan	Laki-Laki	Perempuan	Laki-Laki	Perempuan	Laki-Laki	Perempuan
pendidikan = 1, SD Sederajat	0.158***	0.148***	0.139***	0.108***	0.130***	0.162***	0.0796***	0.0642*
	(0.00961)	(0.0136)	(0.00639)	(0.0111)	(0.0144)	(0.0332)	(0.0240)	(0.0347)
pendidikan = 2, SMP Sederajat	0.268***	0.311***	0.236***	0.244***	0.250***	0.334***	0.210***	0.202***

	(0.00977)	(0.0140)	(0.00708)	(0.0125)	(0.0161)	(0.0388)	(0.0254)	(0.0388)
pendidikan = 3, SMA Sederajat	0.514***	0.568***	0.362***	0.388***	0.401***	0.503***	0.323***	0.377***
	(0.00890)	(0.0125)	(0.00651)	(0.0115)	(0.0147)	(0.0342)	(0.0232)	(0.0350)
pendidikan = 4, Diploma	0.830***	0.935***	0.536***	0.750***	0.643***	0.892***	0.611***	0.795***
	(0.0144)	(0.0169)	(0.0195)	(0.0196)	(0.0381)	(0.0548)	(0.0523)	(0.0577)
pendidikan = 5, Serjana	0.889***	1.009***	0.600***	0.806***	0.748***	0.947***	0.523***	0.692***
	(0.0102)	(0.0132)	(0.0103)	(0.0127)	(0.0204)	(0.0367)	(0.0294)	(0.0370)
pendidikan = 6, Pasca Serjana	1.311***	1.587***	1.152***	1.441***	1.390***	1.879***	1.264***	1.648***
	(0.0184)	(0.0247)	(0.0381)	(0.0571)	(0.0554)	(0.0950)	(0.0711)	(0.104)
Pengalaman	0.0388***	0.0430***	0.0234***	0.0346***	0.0211***	0.0322***	0.0240***	0.0292***
	(0.000569)	(0.000878)	(0.000544)	(0.000934)	(0.00114)	(0.00266)	(0.00176)	(0.00275)
pengalaman2	-0.000854***	-0.000840***	-0.000581***	-0.000757***	-0.000513***	-0.000698***	-0.000559***	-0.000588***
	(1.60e-05)	(2.57e-05)	(1.40e-05)	(2.48e-05)	(2.89e-05)	(6.88e-05)	(4.77e-05)	(7.59e-05)
Constant	14.11***	13.58***	14.12***	13.49***	14.02***	13.37***	13.96***	13.39***
	(0.00886)	(0.0121)	(0.00627)	(0.0102)	(0.0139)	(0.0310)	(0.0226)	(0.0315)
Observations	120,856	75,160	131,395	61,179	30,717	7,737	13,744	7,409
R-squared	0.162	0.200	0.058	0.110	0.087	0.158	0.067	0.114

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

V. CONCLUSION

This study provides strong empirical evidence that education is a human capital investment that yields significant returns in the Indonesian labor market. Using the Becker–Mincer framework and data from the 2024 Labor Force Survey, the analysis shows that the higher the level of education completed, the greater the wage premium received by workers, with a pattern that increases consistently from primary to postgraduate education. Work experience also plays a significant role in increasing earnings, but with a decreasing effect with age, consistent with the predictions of the Mincerian earnings function. Although women's average wages remain lower than men's, the results show that women receive relatively larger returns to education, especially at the tertiary level, indicating the role of education as a compensatory mechanism for structural barriers in the labor market. Furthermore, returns to education are higher in urban areas and among employees compared to rural areas and the self-employed, reflecting differences in the structure and demand for skills across labor market segments. Overall, these findings underscore the importance of improving access to and the quality of education, particularly for women and in rural areas, as well as the need to create productive employment opportunities so that the benefits of

education investment can be maximized in supporting economic development and reducing income inequality in Indonesia.

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