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Returns to Tertiary Education among Employed Individuals in Indonesia: Propensity Score Matching Evidence

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ABSTRACT

Tertiary education is associated with higher earnings, yet its income returns among employed individuals in Indonesia require further examination. This study examines the income advantage associated with tertiary education using cross-sectional data from the fifth wave of the Indonesian Family Life Survey, involving 1,112 employed individuals. Propensity Score Matching (PSM) was applied to reduce observable selection bias and estimate the Average Treatment Effect on the Treated (ATT). Propensity scores were estimated using disability status, household size, household income, parental education, sex, and residence. Nearest-Neighbor, Kernel, and Radius-Caliper Matching were employed to assess robustness. The results indicate improved comparability between treatment and control groups, with Kernel and Radius-Caliper estimates showing that tertiary-educated workers earned approximately 37.74%–44.27% more than comparable workers with secondary education or below. Household income and parental education were positively associated with tertiary-education completion, indicating unequal access. These findings highlight the importance of equitable educational access, improved educational quality, and stronger alignment between graduate competencies and labor-market demands.

Keywords: IFLS; Individual Income; Propensity Score Matching; Returns to Education; Tertiary Education

JEL Classification: C21; I26; J24; J31

INTRODUCTION

Education is considered one of the paths to improve individual well-being by enhancing the quality of human resources. Human resources are considered to have economic value, which is manifested in their understanding, practical abilities, and flexibility (Kimbal, 2020). When education enhances it, the output of a laborer increases and permits entry into working positions that offer higher pay (Becker, 1964). Variations in educational attainment are often connected to gaps in employment and person-based earnings. Developing economies experience a strong connection between these factors because a lack of fair entry into high-quality education helps maintain wealth gaps among people and their descendants. Experts claim that education determines the long-term success of families within these specific regions.

This issue is particularly important in Indonesia. The expansion of educational participation has increased the number of individuals with secondary and tertiary qualifications, but educational expansion has not automatically ensured that all graduates enter employment corresponding to their qualifications (Pritadrajati, 2022). Constraints on formal-sector job creation, variation in educational quality, local policy, and discrepancies between graduate competencies and employer requirements may limit the extent to which tertiary education is translated into higher income (Mulyaningsih et al., 2021; Prihatini & Zulaika, 2022). Sukanti & Sulistyaningrum (2022) and Wicaksono et al. (2023) documented substantial mismatch between workers' education and occupational requirements in the Indonesian labor market. Therefore, the existence of graduate unemployment or educational mismatch does not necessarily imply that tertiary education has no economic return. Tertiary-educated individuals who obtain employment may still earn more than comparable workers without tertiary education.

Recent Indonesian researches further emphasizes that educational attainment is linked to labor absorption, poverty reduction, and access to formal employment, although these studies address aggregate or participation outcomes rather than the individual income counterfactual examined here (Novriansyah et al., 2025; Roring & Rondonuwu, 2022; Yuniashri et al., 2022)The present analysis therefore complements this literature by focusing on employed individuals and estimating the income difference associated with completed tertiary education after observable selection is reduced.

Despite these contributions, estimating the income effect of tertiary education remains methodologically challenging. Individuals who complete tertiary education are not randomly selected. They may differ systematically from those who do not in terms of household economic resources, parental education, health, demographic characteristics, motivation, and ability (Purnastuti et al., 2011). These characteristics may influence both educational attainment and subsequent income. Therefore, a direct comparison of average income between tertiary-educated and non-tertiary-educated individuals may combine the effect of education with pre-existing differences between the two groups.

Against this background, the present study examines the income return to tertiary education among working individuals in Indonesia using cross-sectional data from the fifth wave of the Indonesian Family Life Survey. Tertiary educational attainment is defined as the completion of a diploma, bachelor's degree, or another university-level qualification, while the outcome is the natural logarithm of monthly individual income. Propensity scores are estimated using individual and household characteristics, including disability status, household size, household income, parental education, sex, and area of residence.

The study estimates the Average Treatment Effect on the Treated using Nearest-Neighbor, Kernel, and Radius-Caliper Matching. The central research question is whether individuals who completed tertiary education earn higher income than observationally comparable individuals whose highest educational attainment is secondary education or below. Based on Human Capital Theory, Signaling Theory, and previous empirical evidence, the study hypothesizes that tertiary education is positively associated with individual income after observable differences between the treatment and control groups are addressed.

This study contributes to the literature in three ways. First, it provides evidence on the income return to completed tertiary education using recent micro-level information from IFLS 5. Second, it addresses observable selection into tertiary education by comparing individuals with similar estimated probabilities of completing tertiary education. Third, it examines the robustness of the estimated ATT across several matching procedures rather than relying on a single matching algorithm.

The interpretation of the findings is deliberately limited to employed individuals represented within the common-support region. The study does not estimate the effect of tertiary education on employment probability, unemployment, or labor-force participation. It also does not claim to eliminate selection arising from unobserved characteristics. Within these boundaries, the analysis provides evidence on whether tertiary education is associated with an income advantage among observationally comparable working individuals in Indonesia.

LITERATURE REVIEW

Human Capital and Signaling Foundations

Human Capital Theory provides the principal theoretical foundation for explaining the relationship between education and individual income. The theory considers education, training, and health as investments that increase an individual's productive capacity and generate economic benefits over time. Individuals are assumed to invest in education by considering its direct costs, opportunity costs, and expected future benefits. When education improves knowledge and economically relevant skills, the resulting increase in productivity is expected to be reflected in higher income (Becker, 1964).

Signaling Theory provides an alternative explanation for the positive relationship between educational attainment and income. Employers do not possess complete information about the productivity, ability, discipline, or trainability of job applicants. Educational qualifications can therefore function as observable signals that help employers distinguish between applicants with different levels of potential productivity.

Hendajany et al. (2016) empirically examined the human-capital and signaling explanations of educational returns in Indonesia using IFLS data from 2000, 2007, and 2014. Their human-capital model used years of schooling to represent skill accumulation, while their signaling model used completed educational qualifications to capture credential effects. A hybrid model combined both measures. Their findings provide evidence that educational returns in Indonesia reflect both additional schooling and the completion of educational credentials.

Human Capital Theory and Signaling Theory are therefore not necessarily mutually exclusive. Tertiary education may increase income because it develops productive skills and because the resulting qualification provides a credible signal to employers. However, distinguishing the relative contribution of these mechanisms is empirically difficult

because skill acquisition and credential completion occur simultaneously (Huntington-Klein, 2021).

Empirical Evidence on Educational Returns

Using data from Ecuador, Ponce et al. (2019) found that schooling was an important determinant of individual income. Their application of PSM showed that the positive effect remained after individuals with similar observed characteristics were compared. The study demonstrates the importance of addressing selection bias because individuals with different educational levels may also differ in socioeconomic and demographic characteristics.

The economic return to higher education is nevertheless heterogeneous. Pang (2023) found that the type and quality of the university attended affected graduate earnings in China. Graduates from prestigious institutions received higher labor-market returns than graduates from non-prestigious institutions, even after individual characteristics and abilities were considered. This finding indicates that completed educational level alone may not fully capture differences in educational quality, institutional reputation, and access to professional networks.

Hendajany et al. (2016) extended the literature by examining whether educational returns in Indonesia were consistent with Human Capital Theory, Signaling Theory, or a combination of the two. Their results showed that both additional schooling and completed educational qualifications contributed to income differences. This finding highlights the importance of distinguishing between the amount of schooling received and the credentials obtained.

Within the JICP literature, education has been associated with labor absorption and lower poverty, while human-capital development has been framed as a foundation for inclusive participation in economic systems (Novriansyah et al., 2025). These studies reinforce the broader developmental relevance of education, but they do not identify the income return among observationally comparable workers. This gap motivates the individual-level treatment-effect approach used in the present study.

Family Background and Selection into Tertiary Education

Estimating the income return to tertiary education is complicated by the non-random nature of educational attainment. Individuals who complete tertiary education may differ systematically from those who do not before entering higher education. These differences may affect both the decision to pursue tertiary education and subsequent labor-market outcomes.

Household economic resources are among the most important determinants of educational participation. Higher-income families are more capable of paying tuition fees and other costs related to transportation, accommodation, learning materials, and technology. They can also reduce the pressure on young household members to enter employment immediately after secondary school. Empirical evidence shows that household income is positively associated with educational participation and attainment (Li et al., 2023; Liu, 2023).

Parental education is another important source of selection into tertiary education. Highly educated parents may possess more information about educational pathways, admission procedures, student financing, and the long-term benefits of higher education. They may also establish stronger academic expectations and provide more effective learning support.

Propensity Score Matching and Hypothesis Development

Conventional regression methods estimate the relationship between education and income by statistically holding other variables constant. However, regression estimates may rely heavily on functional-form assumptions and may compare individuals with substantially different observed characteristics.

PSM addresses this issue by estimating each individual's probability of receiving treatment—in this study, completing tertiary education—conditional on observed characteristics. Treated individuals are then compared with control individuals who have similar estimated probabilities of treatment. This procedure reduces observable selection bias by improving the comparability of the treatment and control groups.

The effectiveness of PSM depends on the Conditional Independence Assumption and the common-support condition. The Conditional Independence Assumption requires potential income outcomes to be independent of tertiary educational attainment after observed covariates are controlled for. The common-support condition requires sufficient overlap in the propensity-score distributions of the treatment and control groups (Shiba & Kawahara, 2021).

PSM cannot eliminate bias arising from unobserved characteristics. Ability, motivation, educational quality, field of study, and professional networks may influence both tertiary-education completion and income but remain unmeasured. Therefore, PSM estimates should be interpreted as conditional treatment effects under the assumption that the relevant selection process is adequately represented by the included covariates (Nuryadin et al., 2023).

Despite this limitation, PSM provides a useful complement to conventional regression and instrumental-variable approaches. It makes the comparison between treatment and control observations more transparent, requires an explicit examination of common support, and allows covariate balance to be evaluated after matching. Different matching algorithms can also be used to assess whether the estimated treatment effect is sensitive to the construction of the counterfactual group.

The theoretical mechanisms and previous evidence lead to the study hypothesis: employed individuals who complete tertiary education have higher monthly individual income than observationally comparable employed individuals whose highest completed education is secondary level or below. The hypothesis concerns the ATT within the common-support region and does not imply an effect on employment probability.

RESEARCH METHOD

Research Design, Data, and Sample

This study uses cross-sectional data from the fifth wave of the Indonesian Family Life Survey (IFLS 5), conducted in 2014–2015. The IFLS is a longitudinal household survey that collects extensive information on individual and household socioeconomic conditions, including education, employment, income, health, and family background. The original IFLS sampling framework covers 13 provinces and represents approximately 83% of the Indonesian population (Siramaneerat et al., 2024).

The study focuses on individuals who were employed at the time of the survey and for whom information on individual income, educational attainment, and relevant household and parental characteristics was available. The initial sample-selection procedure identified 1,412 eligible individuals. After excluding observations with incomplete

information for the treatment, outcome, or matching covariates, the propensity-score estimation was conducted using 1,112 complete observations.

Because the analytical sample includes only employed individuals, the estimated effect should be interpreted as the return to tertiary education among working individuals. Accordingly, the analysis does not estimate the effect of tertiary education on employment participation or the probability of unemployment.

Variables and Measurement

The outcome variable is the natural logarithm of monthly individual income. The logarithmic transformation is applied to reduce the influence of extreme income values and obtain a less skewed distribution. Consequently, the estimated treatment effect represents the difference in log income between individuals who completed tertiary education and comparable individuals who did not.

The treatment variable is tertiary educational attainment. It is coded as one for individuals who completed a diploma, bachelor's degree, or another university-level qualification and zero for individuals whose highest completed education was senior secondary school or below. Thus, the treatment captures the income effect of completing tertiary education rather than the return to each additional year of schooling.

The propensity-score model includes a set of observed individual and household characteristics associated with both educational attainment and income. These covariates consist of disability status, household size, the natural logarithm of household income, paternal education, maternal education, sex, and area of residence. Parental education is measured using four ordered categories, ranging from primary education to tertiary education.

The operational definitions of the variables are presented in Table 1.

Table 1. Operational Definitions of Variables

Variable	Measurement	Operational definition
Individual income	Natural logarithm	Natural logarithm of monthly individual income in 2014
Tertiary education	Binary	1 = completed diploma, bachelor's, or other tertiary qualification; 0 = senior secondary or below
Disability status	Binary	1 = reported disability; 0 = otherwise
Household size	Number	Number of individuals living in the household
Household income	Natural logarithm	Natural logarithm of monthly household income in 2014
Paternal education	Ordinal, 1–4	Primary to tertiary education
Maternal education	Ordinal, 1–4	Primary to tertiary education
Sex	Binary	1 = male; 0 = female
Urban residence	Binary	1 = urban; 0 = rural

Source: Authors' operationalization based on IFLS 5.

Empirical Strategy

A direct comparison of income between individuals with and without tertiary education may produce a biased estimate because educational attainment is not randomly assigned. Individuals who complete tertiary education may systematically differ from those who do not in terms of family background, socioeconomic resources, health, and demographic characteristics. These pre-existing differences may affect both the probability of completing tertiary education and subsequent income.

To reduce selection bias arising from observed characteristics, this study applies Propensity Score Matching (PSM). PSM constructs a comparison group of individuals without tertiary education whose observed characteristics are similar to those of individuals who completed tertiary education. The propensity score is defined as the conditional probability of completing tertiary education given a vector of observed covariates:

Identification of the ATT using PSM requires two main assumptions. The first is the Conditional Independence Assumption, which states that, conditional on the observed covariates, potential outcomes are independent of treatment assignment:

The second requirement is the overlap or common-support condition:

This condition requires individuals with and without tertiary education to have sufficiently comparable propensity scores. Observations outside the common-support region cannot be used to construct credible counterfactual comparisons.

$$p(X_i) = P(D_i = 1 \mid X_i); \; ATT = E[Y_i(1) - Y_i(0) \mid D_i = 1]$$

Matching Procedures and Diagnostics

Three matching algorithms are employed to examine the robustness of the estimated ATT: Nearest-Neighbor Matching, Kernel Matching, and Radius-Caliper Matching. Nearest-Neighbor Matching pairs each treated individual with a control individual who has the closest propensity score. Kernel Matching constructs the counterfactual outcome using a weighted average of multiple control observations, assigning greater weights to observations with propensity scores closer to those of the treated individuals. Radius-Caliper Matching restricts comparisons to control observations whose propensity scores fall within a predetermined distance from the score of each treated individual.

The quality of the matching procedure is evaluated by comparing the distribution of the propensity scores and the balance of the observed covariates before and after matching. Covariate balance is assessed using standardized percentage bias, differences in covariate means, t-tests, and treated-to-control variance ratios. A reduction in standardized bias and greater similarity in covariate distributions after matching indicate that the matched control group provides a more appropriate counterfactual for the treated group.

All estimates were obtained using Stata 17. The retained output does not document the number of neighbors, replacement rule, Kernel bandwidth, radius-caliper value, or standard-error procedure. These settings should be confirmed from the original command log before final submission because they affect reproducibility, while the reported estimates themselves are not altered in this formatted manuscript.

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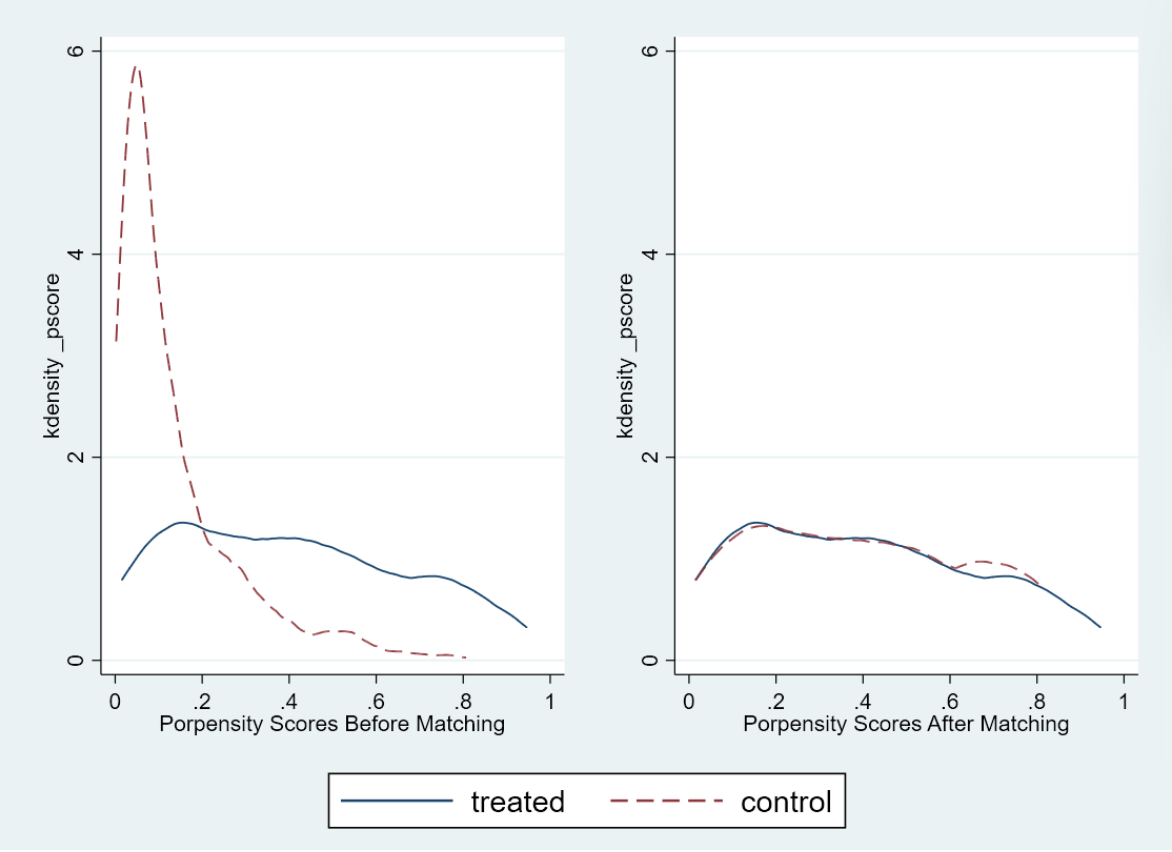
RESULTS

Common Support and Covariate Balance

Before estimating the treatment effect, the distributions of the estimated propensity scores were examined to assess the common-support condition. Figure 1 compares the propensity-score distributions of individuals with tertiary education and those without tertiary education before and after matching.

Before matching, the propensity-score distributions differed substantially between the treatment and control groups. Individuals in the control group were concentrated at relatively low propensity-score values, whereas individuals with tertiary education were more widely distributed across the propensity-score range. These differences indicate that individuals who completed tertiary education had systematically different observed characteristics from individuals who did not complete tertiary education.

Figure 1. Propensity-Score Distributions Before and After Matching



Source: Authors' calculations based on IFLS 5.

Table 2. Covariate Balance after Propensity Score Matching

Covariate	Treated mean	Control mean	Bias (%)	t	p	V(T)/V(C)
Disability status	0.00971	0.00485	4.8	0.58	0.563	—
Household size	7.0922	6.7524	12.2	1.34	0.179	1.18
Log household income	17.0340	16.9430	7.3	0.80	0.427	1.61*

Covariate	Treated mean	Control mean	Bias (%)	t	p	V(T)/V(C)
Paternal education	2.5049	2.4709	3.2	0.29	0.773	1.12
Maternal education	2.1990	2.1845	1.4	0.14	0.892	1.47*
Male	0.41262	0.38350	6.0	0.60	0.547	—
Urban residence	0.65534	0.70388	−10.1	−1.05	0.292	—

Source: Authors' calculations based on IFLS 5. An asterisk indicates a variance ratio outside the range reported by the statistical procedure.

The results indicate that the matching procedure generally produced comparable treatment and control groups. None of the post-matching differences in covariate means was statistically significant at the 5% level. The smallest standardized biases were observed for maternal education, paternal education, and disability status, at 1.4%, 3.2%, and 4.8%, respectively. The standardized biases for sex and household income were also relatively low, at 6.0% and 7.3%.

Overall, the balance diagnostics suggest that matching substantially improved the comparability of the treatment and control groups, although it did not produce perfect balance for every covariate. The ATT estimates should therefore be interpreted as treatment-effect estimates obtained from a substantially improved, but not completely identical, comparison sample.

Determinants of Tertiary Educational Attainment

Table 3. Probit Estimates of Tertiary Educational Attainment

Variable	Coefficient	Standard error
Disability status	0.0332	0.5000
Household size	−0.000704	0.0179
Log household income	0.1390***	0.0467
Paternal education	0.3540***	0.0570
Maternal education	0.2770***	0.0614
Male	−0.5520***	0.0990
Urban residence	−0.3060***	0.1060
Constant	−3.7950***	0.7570
Observations	1,112	

Source: Authors' calculations based on IFLS 5. *** indicates statistical significance at the 1% level.

Household income and parental education were positively and significantly associated with the likelihood of completing tertiary education. The coefficient on log household income was positive and statistically significant at the 1% level. This result indicates that individuals from households with higher income had a higher latent propensity to complete tertiary education, holding the other observed characteristics constant.

Both paternal and maternal education were also positively associated with tertiary educational attainment. The coefficients on paternal education and maternal education

were 0.354 and 0.277, respectively, and both were statistically significant at the 1% level. These findings demonstrate a strong intergenerational relationship in educational attainment: individuals whose parents had higher educational qualifications were more likely to complete tertiary education.

Urban residence also had a negative and statistically significant coefficient. Given that urban residence was coded as one, this result indicates that individuals residing in urban areas had a lower estimated latent propensity to complete tertiary education after the other covariates were held constant. This conditional result should not be interpreted as a simple urban–rural difference because it is obtained after accounting for household income, parental education, household size, sex, and disability status.

Disability status and household size were not statistically significant. Thus, the available evidence does not show that these two characteristics were systematically associated with tertiary educational attainment after the other covariates were controlled for.

Average Treatment Effect on the Treated

Table 4. Estimated Average Treatment Effect on the Treated

Matching method	Treated outcome	Matched control	ATT	SE	t
Nearest-Neighbor	16.1444	15.3980	0.2933	0.2230	3.35
Kernel	16.1533	15.7868	0.3665	0.1468	2.50
Radius-Caliper	16.1394	15.8192	0.3202	0.1416	2.26

Source: Authors' calculations based on IFLS 5. The Nearest-Neighbor row is reproduced without changing the reported estimates; it requires verification because 16.1444 − 15.3980 = 0.7464 and 0.2933/0.2230 ≈ 1.32, which do not match the reported ATT and t-statistic.

The ATT estimates were positive across all three matching methods. This consistency indicates that individuals who completed tertiary education earned higher income than observationally comparable individuals who did not complete tertiary education.

Kernel Matching produces an ATT of 0.3665 log points, with a standard error of 0.1468 and a t-statistic of 2.50. Applying the exponential transformation gives number of 44.27%. This result indicates that, among individuals who completed tertiary education and were located within the common-support region, monthly individual income was approximately 44.27% higher than the counterfactual income they would have earned without completing tertiary education, conditional on the observed characteristics included in the matching model. The effect is statistically significant at the 5% level.

Radius-Caliper Matching produces an ATT of 0.3202 log points, with a standard error of 0.1416 and a t-statistic of 2.26. The exact percentage transformation is 37.74%. Thus, the Radius-Caliper estimate suggests that completing tertiary education was associated with an approximately 37.74% increase in monthly individual income among treated individuals relative to observationally comparable individuals without tertiary education. This estimate is also statistically significant at the 5% level.

The Nearest-Neighbor estimate is not converted into a percentage or used to define the substantive range because its reported row is internally inconsistent. For the two internally consistent methods, the exact percentage transformation 100[exp(ATT) − 1] gives 44.27% for Kernel Matching and 37.74% for Radius-Caliper Matching. These are conditional income differences among treated workers in the common-support region, not population-wide returns or effects on employment.

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DISCUSSION

Income Return and Robustness across Matching Methods

The empirical findings demonstrate that tertiary education is positively associated with individual income after observable differences between tertiary-educated and non-tertiary-educated individuals are addressed through Propensity Score Matching. Based on the internally consistent Kernel and Radius-Caliper estimates, individuals who completed tertiary education earned approximately 37.74%–44.27% more than observationally comparable individuals who did not complete tertiary education. This income advantage applies specifically to tertiary-educated individuals represented within the common-support region.

The consistency of the positive effect across different matching procedures strengthens the conclusion that the estimated income premium is not solely driven by a particular method of constructing the counterfactual group. Nevertheless, the variation in magnitude across the matching algorithms indicates that the size of the estimated return remains sensitive to the selection and weighting of control observations.

The positive income return should not be interpreted as implying that every graduate receives an identical benefit. Pang (2023) demonstrates that institutional type and individual abilities affect the market return to tertiary education. Similarly, Baktash (2025) show that educational attainment can generate a wage premium even among overeducated workers employed in semi-skilled and low-skilled occupations. These findings imply that tertiary education may continue to provide an income advantage even when graduates are not perfectly matched to their occupations, although the return may be smaller than it would be under an appropriate education–occupation match.

Human Capital and Signaling Interpretations

The positive association between tertiary education and income can be interpreted through Human Capital Theory and Signaling Theory. Human Capital Theory views education as an investment that enhances knowledge, productive skills, cognitive ability, and adaptability. These improvements increase worker productivity and allow individuals to perform more complex tasks, thereby increasing their access to higher-paying occupations (Kriesi & Sander, 2024).

Nevertheless, the estimated income return may not arise entirely from productivity improvements. Signaling Theory argues that educational credentials convey information to employers about characteristics that are difficult to observe directly, such as trainability, perseverance, discipline, and potential productivity. Employers may therefore use diplomas and university degrees as screening instruments when making recruitment and wage decisions.

Evidence from Indonesia supports the possible relevance of both mechanisms. Hendajany et al. (2016) compared a human-capital model based on additional years of schooling, a signaling model based on completed educational qualifications, and a hybrid model combining both approaches. Their results indicated that the returns to education in Indonesia reflected both the accumulation of human capital and the credential effects associated with completing particular educational levels.

Family Background and Intergenerational Inequality

Higher household income can reduce the financial constraints associated with tuition fees, transportation, accommodation, learning materials, and the opportunity cost of remaining in education. More affluent households may also provide better learning

environments and greater access to information about university admission and educational financing. Previous evidence consistently shows that household economic resources are positively related to educational participation and attainment (Tompsett & Knoester, 2023).

The positive associations between paternal and maternal education and tertiary educational attainment indicate an intergenerational transmission of educational advantage. Parents with higher educational qualifications may have greater knowledge of educational pathways, stronger expectations regarding their children's education, and better access to academic and professional networks. They may also provide more effective assistance with educational decisions and academic preparation.

The combination of unequal access and positive economic returns has important implications for income inequality. Individuals from more affluent and highly educated families are more likely to complete tertiary education, while tertiary education subsequently provides access to higher income. This process may reproduce socioeconomic advantage across generations. Consequently, expanding the overall availability of tertiary education may not be sufficient if students from disadvantaged families continue to face greater barriers to entry and completion.

Policies should therefore combine the expansion of educational access with targeted support for lower-income and first-generation students. Relevant interventions include need-based scholarships, affordable student financing, academic preparation, mentoring, and improved information about university admission and financial assistance. A multidimensional approach is necessary because educational inequality reflects not only financial constraints but also differences in information, expectations, preparation, and family support (Douglas et al., 2024).

The positive roles of household income and parental education also accord with evidence that access to human-capital development is conditioned by location and socioeconomic resources. JICP studies emphasize unequal rural–urban labor opportunities and the importance of inclusive human-capital policies in remote Indonesian settings (Yuniashri et al., 2022). In the present study, these family-background variables are matching covariates rather than treatments; their coefficients should therefore be read as conditional associations, not causal parental effects.

Labor-Market Relevance, Policy Implications, and Boundaries

Although the results indicate a substantial average return to tertiary education, the economic value of education depends on the ability of graduates to translate their qualifications into appropriate employment. Differences in field of study, institutional quality, occupation, and local labor demand may produce substantial variation in individual returns.

Consequently, a positive ATT does not imply that the tertiary-education system is perfectly aligned with labor-market demand. The estimated effect represents an average income difference among employed individuals. Some graduates may receive substantially higher returns, while others may experience low returns because of occupational mismatch, weak labor demand, or differences in educational quality.

This distinction is also important when considering graduate unemployment. The present study includes only individuals who were employed and received observable income. It therefore estimates the return to tertiary education conditional on employment and does not estimate whether tertiary education increases the probability of obtaining

employment. A positive income return among employed graduates can coexist with unemployment or underemployment among other tertiary-educated individuals.

The policy implication is consequently twofold. Financial and informational barriers to tertiary education should be reduced through need-based support, academic preparation, and assistance for first-generation students. At the same time, expansion should be accompanied by quality assurance, curriculum renewal, work-integrated learning, employer collaboration, and opportunities for continuing skills development. Evidence from an Indonesian setting indicates that training effectiveness can improve employee performance directly and indirectly (Zuama et al., 2023).

This suggests that the economic value of tertiary education may be strengthened when formal qualifications are complemented by workplace learning and skills development after graduation. Such measures can increase access without overlooking heterogeneity in institutional quality, field of study, and education–occupation matching. The evidence supports targeted investment in tertiary education, but it does not justify the claim that expansion alone will eliminate inequality or guarantee employment.

CONCLUSION

This study examines the effect of tertiary education on individual income in Indonesia using cross-sectional data from IFLS 5 and Propensity Score Matching. The matching procedure was employed to reduce observable selection bias by comparing tertiary-educated individuals with non-tertiary-educated individuals who had similar individual, household, and parental characteristics.

The findings show that tertiary education is positively associated with individual income. Based on the internally consistent Kernel and Radius-Caliper estimates, working individuals who completed tertiary education earned approximately 37.74%–44.27% more than observationally comparable individuals whose highest educational attainment was secondary education or below. The positive direction of the ATT across alternative matching procedures supports the robustness of the main finding, although differences in magnitude indicate some sensitivity to the method used to construct the counterfactual group.

The study also demonstrates that access to tertiary education is closely associated with family background. Household income and parental education are positively related to the likelihood of completing tertiary education. This pattern suggests that the economic benefits of tertiary education may be distributed unequally because individuals from more advantaged families have greater opportunities to obtain the qualifications that subsequently generate higher income. Consequently, expanding tertiary education without addressing disparities in access and completion may reproduce socioeconomic inequality across generations.

These findings have several policy implications. First, policies should reduce the financial and informational barriers faced by students from lower-income and less-educated families. Need-based scholarships, affordable student financing, academic preparation, mentoring, and targeted support for first-generation university students can improve both access and completion. Second, the expansion of tertiary education should be accompanied by improvements in instructional quality, curriculum relevance, competency development, and institutional accountability. Third, stronger collaboration between tertiary institutions and employers is necessary to improve the correspondence between graduate competencies and labor-market requirements.

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DECLARATION OF CONFLICTING INTERESTS

The authors declare that there are no potential conflicts of interest concerning the research, authorship, and/or publication of this article.

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