

DOES VOCATIONAL EDUCATION PAY OFF? WAGE AND UNEMPLOYMENT EFFECTS OF VOCATIONAL HIGH SCHOOL IN INDONESIA

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ABSTRACT

This study examines the labor market performance of Vocational High School (VHS) graduates in Indonesia, with a focus on wage attainment and the probability of unemployment. Utilizing data from the Indonesian National Labor Force Survey (SAKERNAS) for the years 2021 and 2022, with approximately 1.25 million individual observations, this study employs a robust treatment effects framework using Inverse Probability Weighted Regression Adjustment (IPWRA). To capture distributional heterogeneity in wage outcomes, IPWRA estimates are complemented by quantile regressions at the 25th, 50th, and 75th percentiles, attempting to analyze vocational wage returns across wage distribution. The findings indicate that vocational high school (VHS) education yields an average wage premium of 27.8% across the wage distribution, with the strongest effect observed among individuals in the lower quantiles of earnings. Furthermore, logit estimation results demonstrate that VHS graduates exhibit an 18.5% lower probability of unemployment compared to general high school (GHS) graduates, suggesting more favorable labor market outcomes associated with vocational education. These findings indicate that vocational high school education in Indonesia increases income and improves employment opportunities, particularly for workers in the lowest wage percentile. Policy implications highlight the importance of strengthening curriculum-industry alignment and transition mechanisms from high school to the workforce.

Keywords: Vocational High School Graduates, Wage Attainment, Unemployment, Labour Market, Indonesia

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1. INTRODUCTION

Vocational education in Indonesia, particularly in Vocational High Schools (VHS), has become one of the government's primary focuses for improving human resource quality and reducing unemployment rates. With the advent of Industry 4.0 and the growing demand for specific skills in the workforce, vocational education is being viewed as a solution to bridge the gap between workforce needs and the skills possessed by graduates. However, despite numerous policies and programs being implemented, significant challenges remain regarding the effectiveness of VHS education, notably the relatively low wage outcomes and the high unemployment rate among VHS graduates.

Previous studies on the labor market performance of VHS graduates in various countries have offered varied insights. For instance, studies like Ariansyah et al. (2024) in Indonesia, Torun & Tumen (2019) in Turkey, and Hortog et al. (2018) in Portugal discuss wage inequality among VHS graduates. Similarly, Heinesen & Lange (2022) explored these dynamics in Denmark, while Sakellariou (2006) focused on Singapore. These studies generally show that vocational education in developed countries often results in better labor market performance compared to developing countries, such as Turkey and Indonesia. The impact of vocational and general secondary education varies widely, depending on labor market stability and labor absorption conditions in each country. In Indonesia, short-term benefits for VHS graduates, such as higher employment rates and earnings compared to General High School (GHS) graduates, have been highlighted in studies such as Bahl et al. (2021), Choi et al. (2019), Ferri et al. (2022), Hanushek et al. (2017), and Neugebauer and Weiss (2018). Furthermore, the short-term impact of internships on labor market performance has been analyzed in works such as Alp et al. (2022) and Comi et al. (2022). Finally, studies examining the impact of the COVID-19 pandemic on VHS versus GHS graduates, such as Ariansyah et al. (2024) revealed that vocational high school graduates demonstrated greater resilience in maintaining employment and income during the crisis in Indonesia.

According to data from the Indonesian Central Statistics Agency (BPS) in 2023, the unemployment rate for vocational high school graduates was the highest compared to other educational levels, at 9.31%, compared to high school (8%), junior high school (4.78%), and elementary school (2.56%). Despite possessing better skills, VHS graduates face a higher risk of unemployment compared to their peers. This raises critical questions about whether VHS education actually improves graduates' competitiveness in the labor market or exacerbates wage inequality and contributes to persistent unemployment over time. The high unemployment rate among VHS graduates requires a strategic policy evaluation to address underlying issues and improve their employability. Contributing factors include unplanned development, irrelevant curriculum content that fails to meet industry needs, and limited industry engagement (Suharno et al., 2020). Furthermore, the increasing proportion of VHS graduates entering the labor market poses further challenges (Ariansyah et al., 2024).

The Indonesian Constitution mandates vocational education through Law No. 20/2003, Article 3, which regulates the implementation of VHS programs. These programs aim to increase the competitiveness of vocational high school (VHS) graduates, enabling them to enter specific occupations or become self-employed. Various fields, including engineering, automotive, health, and beauty, are offered in the Indonesian VHS curriculum to enhance graduates' skills for the labor

market. The government views VHS education as a solution to bridge the gap between labor market needs and the skills possessed by graduates.

Given the challenges of labor market inclusiveness, this study is crucial in evaluating the extent to which vocational education contributes to labor market transformation in Indonesia. This study aims to analyze the relationship between vocational education, wage attainment, and unemployment rates among vocational graduates, thereby providing a clearer understanding of the effectiveness of vocational education in developing a competent, productive, and competitive workforce. This study addresses the gap in the literature regarding wage attainment and unemployment probability for vocational graduates.

This study adopts a model developed by Ariansyah et al. (2024), which examines the labor market performance of GHS graduates compared to VHS graduates. The primary analytical method used is the Multiple Robust Estimator using Inverse Probability Weighted Regression Adjustment (IPWRA), which addresses potential endogeneity and selection bias in individual decisions to pursue vocational education. This method combines treatment modeling (via propensity scores) and outcome modeling, allowing for consistent estimation of causal effects even when one model is misspecified. By utilizing this approach, this study aims to obtain robust estimates of the effect of VHS education on wage attainment.

In addition to wage analysis, this study also examines the probability of unemployment among VHS graduates using a logit regression model. To account for potential confounding factors at the regional level, a fixed-effects model is applied at the district or city level, controlling for unobserved heterogeneity such as economic infrastructure, labor demand, and regional development. This multi-method approach ensures a comprehensive understanding of how VHS education affects earnings and employment prospects in the Indonesian labor market.

2. LITERATURE REVIEW

Previous studies have examined the labor-market performance of VHS graduates across various countries. For example, a study by Ariansyah et al. (2024) analyzed this issue in the Indonesian context, while Torun and Tumen (2019) examined vocational graduates in Turkey. Hartog et al. (2018) investigated wage disparities among vocational high school graduates in Portugal, Heinesen and Lange (2022) explored similar dynamics in Denmark, and Sakellariou (2006) focused on Singapore. Collectively, these studies provide a broad international perspective on vocational education outcomes, highlighting that the labor market performance of vocational graduates is highly context-dependent and varies substantially across institutional and economic settings.

The labor market performance of vocational high school graduates differs markedly between developed and developing countries. Graduates in advanced economies tend to achieve better employment stability and earnings outcomes, as documented by Heinesen and Lange (2022) in Denmark, whereas outcomes are more mixed or adverse in developing countries such as Turkey and Indonesia (Torun & Tumen, 2019; Ariansyah et al., 2024). These differences suggest that the effectiveness of vocational education depends critically on labor market structures, the degree of labor absorption, and the alignment between education systems and industry demand. In Indonesia,

the position of vocational high school graduates remains particularly challenging. VHS graduates face wage discrimination, skill mismatches between educational outputs and labor market needs (Ssenyonga, 2021; Tentua & Winarko, 2020), and stringent qualification requirements (Allen, 2016), all of which contribute to persistently high unemployment rates relative to other educational groups.

Although vocational education is explicitly designed to prepare graduates for immediate labor market entry, achieving adequate wages and stable employment remains a major challenge. Psacharopoulos (1996) emphasized that vocational education can enhance job readiness relative to general education, but only when curricula are closely aligned with industry needs. Similarly, King (2009) highlighted the complex interactions among vocational education, economic development, and job sustainability, noting that vocational graduates often face difficulties securing long-term, upwardly mobile employment, especially in economies undergoing structural transformation.

Groot and Maassen (2000) found that while vocational education and training can improve employment prospects, graduates remain exposed to unemployment risks and wage gaps in rapidly changing labor markets. In the Indonesian context, Puri and Padang (2023) observed that vocational high school graduates encounter barriers to labor market absorption and often exhibit lower productivity than their non-vocational counterparts, resulting in relatively lower wage returns. These findings suggest that vocational education does not automatically translate into superior labor market outcomes and that its effectiveness depends on deeper institutional and economic mechanisms.

To better understand these mixed empirical findings, it is essential to explicitly articulate the theoretical mechanisms linking vocational education to labor market outcomes. This study draws primarily on Human Capital Theory and Signaling Theory to explain how vocational high school education may affect wages and the probability of unemployment.

According to Human Capital Theory (Becker, 1964; Mincer, 1974), education increases individuals' productive skills, thereby raising their marginal productivity and expected earnings. Vocational education differs from general education by emphasizing occupation-specific and applied skills, such as technical competencies, hands-on training, and practical problem-solving skills directly relevant to specific jobs. Through this mechanism, vocational high school education is expected to enhance productivity, facilitate better job matching, and improve employability, particularly for individuals entering the labor market immediately after graduation.

In labor markets characterized by high informality and skill mismatches, such as Indonesia, the human capital mechanism may be especially salient. Vocational curricula that incorporate internships, apprenticeships, or workplace-based learning can reduce search frictions and accelerate school-to-work transitions. As a result, vocational graduates may face lower unemployment risks than general high school graduates, even if long-term wage growth remains uncertain. Moreover, the productivity gains from vocational skills are likely to be heterogeneous across the wage distribution: returns may be larger among low- and middle-wage workers, while diminishing at higher wage levels where returns depend more on advanced cognitive skills or further education.

At the same time, vocational education may affect labor market outcomes through signaling. Signaling Theory (Spence, 1973) emphasizes that educational credentials convey information about otherwise unobservable worker attributes, such as ability, motivation, discipline, and job readiness. In contexts where employers face significant information asymmetries, vocational high school diplomas may serve as a strong signal of work preparedness and occupation-specific competence. Employers may therefore perceive vocational graduates as more immediately employable, particularly for entry-level technical or operational positions.

This signaling function can reduce hiring uncertainty and increase the probability of employment, even if productivity differences are modest. Importantly, signaling effects may be strongest in the lower segments of the wage distribution, where formal recruitment and screening mechanisms are weaker and educational credentials play a disproportionate role in hiring decisions. This theoretical perspective provides a plausible explanation for why vocational education may reduce unemployment risk and yield positive wage effects for certain groups, while still failing to guarantee higher average wages compared to general education.

Continuing from these theoretical considerations, vocational education provides specialized skills and expertise intended to be directly marketable in the labor force. Compared to general education, vocational education offers distinct advantages by imparting job-specific applied skills that are designed to meet immediate labor market demands. In Indonesia, vocational education spans multiple levels, including vocational high schools (VHS), diploma programs, and applied bachelor's degrees. A growing body of empirical literature—including Astuti and Setyonaluri (2022), Doerr (2022), Pritadrajati (2022), Silliman and Virtanen (2022), Singh and Parida (2022), Bairagya (2021), Choi (2021), and Newhouse and Suryadarma (2011a)—documents substantial variation in wage outcomes among vocational graduates across labor markets and institutional settings.

From a human capital perspective, these heterogeneous outcomes reflect differences in the quality of skill formation, the relevance of vocational curricula, and the degree of alignment between training institutions and employers. When vocational education successfully enhances productivity, wage premiums are expected to emerge, particularly for workers in lower-skilled occupations. However, when curricula lag behind technological change or industry needs, the returns to vocational skills may be limited, resulting in wage stagnation or even penalties relative to general education.

Piopiunik and Ryan (2012) showed that secondary-level vocational graduates often enter the labor market earlier and form higher wage expectations than their peers in general education tracks. Nevertheless, empirical results remain mixed across countries. Heinesen and Lange (2022), for instance, found that vocational upper secondary education in Denmark does not necessarily facilitate direct labor market entry; instead, it serves as a pathway to further education, which may entail income losses and higher educational costs. In contrast, evidence from developing economies suggests that vocational education can provide short-term labor market advantages by enabling faster transitions into employment.

In Indonesia, however, the average wage of vocational high school graduates remains relatively low. In 2023, VHS graduates earned IDR 17,432 per hour, compared to IDR 19,256 per hour for

general high school graduates (BPS, 2024). This wage gap suggests that the skills acquired through vocational education do not automatically guarantee higher earnings than those from general education credentials. This pattern is consistent with a signaling-based interpretation: while vocational credentials may improve employability, especially at labor market entry, they may not sustain long-term wage growth in the absence of continued skill upgrading or career mobility.

Despite these wage disparities, several studies document the short-term labor-market benefits of vocational education. Bahl et al. (2021), Choi et al. (2019), Ferri et al. (2022), Hanushek et al. (2017), and Neugebauer and Weiss (2018) found that vocational graduates tend to experience higher initial employment probabilities and earnings shortly after graduation. Similarly, Alp et al. (2022) and Comi et al. (2022) emphasized the role of internships and workplace-based learning in facilitating school-to-work transitions. During the COVID-19 pandemic, Ariansyah et al. (2024) found that vocational high school graduates in Indonesia demonstrated greater resilience in employment retention and income stability than general high school graduates.

These findings reinforce the theoretical expectation that vocational education may be particularly effective in reducing the risk of unemployment. Under both Human Capital Theory and Signaling Theory, vocational education improves employability by either increasing job-relevant skills or signaling readiness for work to employers. This mechanism is especially relevant in labor markets with high youth unemployment and strong demand for practical skills.

Indonesia's labor market context underscores the importance of this mechanism. In 2023, the unemployment rate among secondary school graduates accounted for 17.46% of total unemployment, with high school graduates experiencing the highest rate at 9.31% (BPS, 2024). Young workers aged 15–29 accounted for over half of total unemployment, highlighting persistent structural challenges in school-to-work transitions. Government interventions, such as certified apprenticeships and skills training programs, have so far yielded limited success in reducing unemployment across educational levels.

The World Bank study by Chen (2009) further noted that attending high school alone does not guarantee improved labor market outcomes or stable employment. Similarly, Suharno et al. (2020) argued that GHS education in Indonesia remains overly theoretical and insufficiently aligned with labor market needs, contributing to weak employability. In contrast, vocational education offers a more applied alternative, though its effectiveness depends critically on curriculum quality, institutional capacity, and industry engagement.

Taken together, the existing literature suggests that vocational education affects labor market outcomes through two main causal pathways: (i) a productivity-enhancing human capital mechanism that raises employability and wages by improving job-relevant skills, and (ii) a signaling mechanism that reduces unemployment risk by conveying information about work readiness and occupational competence. These mechanisms are expected to generate positive but heterogeneous wage effects and a lower probability of unemployment relative to general high school education.

In accordance with the objectives of this study, there are two main hypotheses:

H1 (Wage Effect): Vocational high school (VHS) education has a positive causal effect on wages compared to general high school education, with heterogeneous effects across the wage distribution.

H2 (Unemployment Effect): Vocational high school (VHS) education reduces the probability of unemployment relative to general high school education.

3. METHODOLOGY

3.1. Research Design

This study uses approximately 1.2 million individual observations from the National Labor Force Survey (SAKERNAS) published by the Central Statistics Agency (BPS) for 2021 and 2022. Focusing on individuals with a high school diploma, the study compares labor market outcomes between VHS and GHS graduates. The primary objective is to estimate the causal effect of vocational education on two key outcomes: wage attainment and the probability of unemployment in the Indonesian labor market.

This study uses quantile regression combined with IPWRA method, which is particularly relevant in the context of the Indonesian labor market, where wage dispersion is significant and average treatment effects can mask important distributional differences. The IPWRA method, meanwhile, produces consistent estimates of the average causal effect under selection based on the main observed variables. The use of quantile regression allows for the identification of heterogeneous wage returns to vocational education among low-, middle-, and high-income workers. This approach is theoretically grounded in human capital theory, which posits that unequal returns to skill acquisition depend on labor market segmentation and job-matching quality. This design was inspired by Ariansyah et al. (2024), which explores a similar issue in the Indonesian context.

The IPWRA serves to estimate the average treatment effect (ATE) of vocational education, which offers a reliable basis for assessing its impact on labor market outcomes. However, the average effect can mask significant variation across the earnings distribution, particularly in situations like Indonesia where wage dispersion is high. Therefore, this study extends the analysis by incorporating a quantile regression model to capture distributional heterogeneity in the effect of vocational education on wages.

Next, IPWRA provides robust estimates of the average treatment effect and the quantile regression complements it by estimating the effect at specific points in the wage distribution: the 25th, 50th, and 75th percentiles. This approach allows for a deeper understanding of whether the wage premium associated with vocational education is more pronounced among low-wage earners, median earners, or those at the top of the wage scale. Such granularity is particularly valuable in the context of informal labor markets and unequal wage structures.

The first outcome variable is wage attainment, measured using the natural logarithm of hourly wages. The second outcome is unemployment status, measured as a binary variable indicating whether an individual is unemployed. A binary treatment variable distinguishes VHS graduates (1) from their GHS counterparts (0), and the models control for a range of individual-level covariates, including age, gender, marital status, household size, work experience, and employment type (e.g., self-employed vs. employee).

To ensure internal validity, the study performs covariate balance checks before and after applying inverse probability weights. The covariate balance plot shows a substantial reduction in standardized mean differences for all control variables after weighting, particularly for age and work experience, indicating that the weighting procedure successfully mitigates observable selection bias. This step is crucial to confirm that comparisons between VHS and GHS groups are based on a balanced sample. Finally, to estimate the unemployment outcome, which is binary, this study uses a logit regression model to estimate the probability of an individual being unemployed. Quantile regression is not applicable to this outcome due to its categorical nature. Thus, while quantile regression enriches the wage analysis, the unemployment effect is modelled using a standard binary response framework, consistent with the causal inference literature.

3.2. Wage Return Model

The primary method used in this study is the Multiple Robust Estimator with Inverse Probability Weighted Regression Adjustment (IPWRA). This method combines two components: a treatment model and an outcome model (wage attainment). The treatment model is estimated through propensity scores using logit regression (Equation 1):

$$P(D_i = 1 | X_i) = \text{logit}(X_i) \dots (1)$$

Where $D_i = 1$ if the individual is a graduate of VHS, and X_i represents a set of covariates that include age, gender, work experience, marital status, number of household members, and other relevant factors. The second component used, the outcome model (wage attainment), which uses the IPWRA method to estimate the Average Treatment Effect on the Treated (ATET), namely the difference in the logarithm of wages between VHS graduates in the actual condition and the counterfactual scenario (i.e., if they graduated from general education) (Equation 2).

$$\text{Ln}(\text{wage}_i) = \alpha + \beta D_i + \gamma X_i + \epsilon_i \dots (2)$$

3.3. Quantile Wage Regression Model

The quantile regression model for wages (Koenker, 2005) seeks to analyze wage distributions at the 25th percentile (lowest wages), 50th percentile (median), and 75th percentile (highest wages) among all individuals surveyed in the 2021 and 2022 SAKERNAS data. This analysis provides critical insights into changes in wage percentages across three income strata for individuals with VHS education backgrounds in the labor market (Equation 3).

$$Q(\Gamma | X) = \beta_0 + x\beta_1 + F_u^{-1}(\Gamma) \dots (3)$$

Equation (3) defines the conditional quantile function of the dependent variable (wage) given a set of covariates X . Here, $Q(\Gamma | X)$ represents the Γ -th quantile (e.g., 25th, 50th, or 75th percentile), X is a vector of explanatory variables, β_0 and β_1 are parameters to be estimated, and $F_u^{-1}(\Gamma)$ is the inverse of the cumulative distribution function of the error term.

3.4. Modeling the Impact of VHS Education on Unemployment

The model assessing the impact of VHS vocational education graduates on unemployment employs logit regression techniques. Logit regression is a categorical method with a binary dependent variable coded as 0 or 1. In this study, the dependent variable is a dummy variable for

unemployment, where 1 indicates that the individual is unemployed and 0 indicates that they are employed. The model equation is expressed as follows (Equation 4):

$$\Pr(\text{Unemployment}_i = 1) = \text{logit}(\beta_0 + \beta_1 \text{VHS}_i + X_i + u_i) \dots (4)$$

Here, the dependent variable, unemployment, is binary, indicating whether an individual is unemployed (1) or employed (0). Independent variables include *VHS* and several control variables that affect unemployment, such as work experience, age, gender, marital status, household size, self-employment status, and other unobserved factors, which are accommodated in the residual.

Table 1: Description of Operational Variables in Dataset

Variables	Symbol	Variable Description
Log Wage	<i>wage</i>	Natural logarithm of wage income received by individuals
Unemployment	<i>unemployment</i>	Binary variable indicating employment status, where 1 = unemployed and 0 = employed
Vocational High School Graduate	<i>VHS</i>	Binary variable indicating educational background, where 1 = VHS graduate and 0 = GHS graduate.
Work Experience	<i>exper</i>	Continuous variable measuring the number of years of work experience accumulated by the individual
Age	<i>age</i>	Age of respondent in years
Gender	<i>male</i>	Dummy variable if the respondent is male. 1 = “yes”, 0 = “otherwise”
Marital Status	<i>married</i>	Dummy variable if the respondent is married. 1 = “yes”, 0 = “otherwise”
Number of Household Member	<i>size</i>	The total number of household members living in the same household as the individual.
Self-Employment	<i>self_employed</i>	Dummy variable if the respondent is self-employed/freelancer. 1 = “yes”, 0 = “otherwise”

4. RESULTS AND DISCUSSION

4.1. Descriptive Statistics

The descriptive statistics in this study are presented in Table 2.

Table 2: Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
<i>Wage</i>	687,531	14.15	0.933	0	18.421
<i>Unemployment</i>	1,254,173	0.292	0.455	0	1
<i>VHS</i>	1,209,041	0.093	0.291	0	1
<i>Exper</i>	460,971	12.155	11.383	1	78
<i>Age</i>	1,254,173	44.15	15.70	15	98
<i>Male</i>	1,254,173	0.784	0.411	0	1
<i>Married</i>	1,254,173	0.863	0.343	0	1
<i>Size</i>	1,254,173	4.069	1.668	1	20
<i>Self-Employed</i>	687,531	0.225	0.418	0	1

Source : SAKERNAS (2021-2022)

Furthermore, Table 3 explains the multicollinearity diagnostic test, which shows that there is no significant issue of multicollinearity, as indicated by relatively low values of the Variance Inflation Factor (VIF).

Table 3: Multicollinearity Diagnostic Test

Variables	VIF	Tolerance
<i>VHS</i>	1.049	0.953
<i>Exper</i>	1.422	0.703
<i>Age</i>	1.816	0.551
<i>Male</i>	1.021	0.979
<i>Married</i>	1.307	0.765
<i>Size</i>	1.066	0.938
<i>Self-employed</i>	1.029	0.972

4.2. Wage Return and Unemployment Probability

The estimation results in Table 4 present the findings of the Doubly Robust Estimator using the Inverse Probability Weighted Regression Adjustment (IPWRA) method to evaluate the effect of graduating from Vocational High School (VHS) on wage outcomes. The results show that the Average Treatment Effect on the Treated (ATET) for vocational education is 0.278, meaning that VHS graduates have, on average, 27.8% higher than if they had not attended vocational education, and this effect is statistically significant. This estimate is highly precise, with a standard error of only 0.004 and a 95% confidence interval ranging from 0.269 to 0.286. Additionally, the average counterfactual outcome for the untreated group is 14.074 corresponding to an estimated wage level of approximately 1.30 million¹ (in currency units). This value represents the expected earnings that graduates would have obtained had they not attended vocational education, serving as the baseline wage without treatment.

These findings confirm that vocational education is positively associated with increased earnings, after simultaneously controlling both the selection model and the outcome model through the doubly robust approach. The covariance balance check have ensured that observed differences in labor market outcomes between VHS and GHS graduates, such as wage attainment, are more likely to reflect true treatment effects rather than underlying demographic or socioeconomic differences ([link](#) for detail covariance balance check).

Table 4: Doubly Robust Estimator with Inverse Probability Weighted Regression Adjustment (IPWRA) of VHS Outcome

Ln Wage	Coefficient	Robust Str. Error	Z	P> Z	[95% Conf. Interval]	
					Lower Interval	Upper Interval
ATET	0.278	0.004	63.43	0.000	0.269	0.286
Vocational (1 vs 0)						
P0 Mean	14.074	0.002	6241.01	0.000	14.070	14.079
Vocational = 0						

¹ Wage = $e^{14.074} \approx 1,298,000$

The results from the 25th percentile quantile regression indicate a positive association between VHS graduation and earnings among individuals at the lower end of the income distribution (Table 5). Individuals with a VHS education earn approximately 32% higher wages compared to those with a GHS education. Furthermore, the 50th percentile quantile regression results indicate a positive wage premium for VHS graduates among individuals at the median income level, with earnings estimated to be 25.9% higher than their GHS counterparts.

Table 5: Estimation Results of Quantile Regression (0.25; 0.50; 0.75 Percentile)
from Individual Wages

Log Wage	0.25 Percentile		0.50 Percentile		0.75 Percentile	
	Coef.	p-value	Coef.	p-value	Coef.	p-value
<i>VHS</i>	0.320	0.000	0.320	0.000	0.218	0.000
<i>Exper</i>	-0.003	0.000	-0.003	0.000	0.003	0.000
<i>Age</i>	-0.011	0.000	-0.011	0.000	-0.008	0.000
<i>Male</i>	-0.530	0.000	-0.530	0.000	-0.344	0.000
<i>Married</i>	0.286	0.000	0.286	0.000	0.261	0.000
<i>Size</i>	-0.002	0.241	-0.002	0.241	0.001	0.431
<i>Self-Employed</i>	-0.265	0.000	-0.265	0.000	-0.269	0.000
<i>Constant</i>	14.566	0.000	14.566	0.000	15.217	0.000
Mean dependent var	14.051		14.051		14.051	
SD dependent var	0.902		0.902		0.902	

The 75th percentile quantile regression results indicate a positive wage premium for VHS graduates among individuals at the upper end of the income distribution. However, the magnitude of the wage effect decreases relative to lower quantiles, suggesting diminishing returns to vocational education at higher income levels. Specifically, individuals with a VHS education earn approximately 21.8% higher wages compared to those with a GHS education.

Table 6 presents estimates of the impact of VHS education on the probability of unemployment in Indonesia, using logit regression methods. The results consistently indicate that VHS graduates are significantly less likely to be unemployed than GHS graduates. Specifically, the logit result shows a much larger reduction in the log-odds, at 18.5 percentage points. These findings suggest that the vocational training and job-specific skills acquired in vocational high school programs increase graduates' employability in the Indonesian labor market.

Table 6: Logit Estimation for Unemployment

Variables	Logit (2)
<i>VHS</i>	-0.185*** (0.0191)
<i>Exper</i>	0.000431 (0.000586)
<i>Age</i>	0.00512*** (0.000564)
<i>Male</i>	0.653*** (0.0112)
<i>Married</i>	-0.894*** (0.0166)
<i>Size</i>	0.0345*** (0.00332)
<i>Self-Employed</i>	-0.100*** (0.0139)
<i>Constant</i>	-2.904*** (0.0302)
Observations	867,501
R-squared	
N	867501

Notes: The value inside the bracket represents the standard error. * $p < 0.1$; ** $p < 0.05$; *** $p < 0.0$

4.3. Discussion

The IPWRA estimation findings provide strong evidence that VHS graduates have a positive and statistically significant impact on wage attainment in Indonesia. The estimated Average Treatment Effect on the Treated (ATET) of 0.278 indicates that, on average, vocational high school (VHS) graduates earn approximately 27.8% higher wages than they would have earned if they had completed general high school (SMU), after adjusting for observable characteristics and accounting for potential selection bias. This result highlights the economic value of vocational education in increasing the earning potential of individuals who enter the workforce directly after completing secondary education. Furthermore, quantile regression analysis shows that the positive impact of vocational high school education on wages is most pronounced in low-, middle-, and upper-income groups, suggesting that vocational education benefits individuals in the lowest wage groups.

Furthermore, the estimated impact of VHS graduates on the unemployment rate in the Indonesian labor market indicates that VHS graduates are less likely to be unemployed than GHS) graduates. The negative and statistically significant coefficient on the vocational graduate variable in logit models indicates that vocational high school graduates have a lower probability of being unemployed, even after accounting for age, work experience, gender, marital status, household size, and employment status. This finding suggests that vocational education in Indonesia may play a more effective role in facilitating labor market entry than previously thought. The emphasis on practical and job-specific skills in vocational schools can improve graduates' readiness for work, particularly in sectors that value technical expertise. However, to maintain and expand this advantage, continued improvement in curriculum alignment with industry needs and stronger school-to-work transition mechanisms remain essential.

These findings are consistent with previous empirical studies emphasizing the short-term labor market advantages of vocational education. Studies by Hanushek et al. (2017) and Carlo & Dwyer (2018) demonstrate that vocational graduates tend to experience stronger early career outcomes, including faster employment transitions and higher initial earnings compared to general education graduates, although such advantages may decline over the long term due to skill specificity. Similarly, Neugebauer and Weiss (2018) highlight the role of vocational education in facilitating smoother school-to-work transitions and reducing early unemployment risks. Evidence from Choi et al. (2019) further supports the existence of wage premiums and higher employment probabilities among vocational track graduates during the initial stages of labor market participation. In addition, Ferri et al. (2022) emphasize that vocational systems enhance employability by aligning technical competencies with industry needs, while Bahl et al. (2021) and Chamadia & Mubarik (2021) document positive early economic returns to vocational education in developing country contexts. The Indonesian evidence presented in this study therefore reinforces the broader international literature suggesting that vocational education provides substantial short-term labor market benefits.

4.4. Policy Implications and Limitations

These findings suggest that vocational education in Indonesia can be an effective policy instrument for increasing wages and reducing unemployment, particularly among low-income workers. To strengthen the contribution of vocational high school education to the Indonesian labor market, policymakers should focus on strengthening curriculum relevance, expanding industry-to-educational institution partnerships, and enhancing school-to-work transition programs through industry internships. Efforts to enhance the adaptability of vocational skills through lifelong learning initiatives are also crucial to ensuring long-term labor market resilience.

This study has several limitations. First, due to data availability, the analysis relies on pooled cross-sectional data, which limits its ability to capture the long-term dynamic effects of vocational education. Future research, with panel data available to capture longitudinal effects, would provide deeper insights into career trajectories and wage mobility resulting from vocational education outcomes. Second, unobserved factors such as individual ability and school quality may still influence the results even with robust methods.

5. CONCLUSION

This study analyzes the impact of vocational high school (VHS) graduates in Indonesia on labor market conditions, focusing on wage attainment and unemployment rates. Using a robust quantitative approach, complemented by inverse probability weighted regression (IPWRA) methods, as well as quantile and logit regressions, the study finds that vocational education contributes positively to the earnings attainment of vocational high school graduates at various income levels. On average, vocational high school graduates earn higher wages than their peers who attended General High Schools (GHS). The wage premium is most pronounced among low- and middle-wage earners, confirming the role of vocational training in improving economic outcomes for individuals with lower earning potential.

Contrary to the common perception that vocational high school graduates face higher unemployment rates, this study found the opposite. Logit models indicate that vocational high school graduates are less likely to be unemployed than high school graduates, even after accounting for age, work experience, gender, marital status, family size, and type of employment. These results suggest that vocational education may offer a more direct pathway to the workforce due to its emphasis on practical, job-specific training. These findings support the relevance of vocational high school (VHS) programs in addressing youth unemployment and underscore the effectiveness of vocational pathways in improving the school-to-work transition.

However, despite these positive findings, ongoing challenges remain related to wage inequality and the long-term adaptability of vocational high school graduates in a rapidly evolving labor market. The relatively low average wages of vocational high school graduates compared to general education graduates, as reported in national statistics, suggest that vocational credentials alone may not fully protect workers from wage stagnation. Therefore, the effectiveness of vocational high school education should not be measured solely by initial employment, but also by career sustainability and upward mobility.

Overall, these findings contribute to the achievement of Sustainable Development Goal (SDG) 4 (quality education) by demonstrating the importance of vocational education in equipping students with relevant skills in the labor market. Furthermore, by improving wage outcomes and reducing the likelihood of unemployment, vocational high school education also supports SDG 8 (decent work and economic growth), particularly in promoting productive employment and preparing a smoother school-to-work transition for young workers in Indonesia.

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