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Research Paper

Labor Market Outcomes of Vocational High Schools (SMK) and General High Schools (SMA) during the COVID-19 Pandemic

Nurul Fajri Vidi Astuti [1], Diahhadi Setyonaluri [2]

Master Program in Economic Planning and Development Policy, Faculty of Economics and Business, University of Indonesia [1,2]

***) Corresponding author:** nurul.fajri01@ui.ac.id

Abstract

The fourth Sustainable Development Goals (SDGs) adopts a lifelong learning approach to education and introduces vocational and tertiary education into the global agenda. While Vocational Education and Training (VET) was almost absent in previous international development frameworks, the agenda 2030 and its SDGs highlight greater importance to it. Consequently, many governments in developing countries promote vocational secondary education to improve labor market outcomes. This study aimed to determine the development of return on investment for Vocational High Schools (SMK) and Senior High Schools (SMA) in 2020. The data used the August 2020 National Labor Force Survey (SAKERNAS) data with Two-Step Heckman and the Mincer Revenue Function. As a result, in 2020, the return on investment in vocational education was 16.82% higher than the rate of return on investment in high school education. However, observed by the age group, the results show that SMK only provides an initial wage advantage for men, which then declines with age. Although male SMK graduates experienced poorer results, female SMK graduates did not experience the same decline.

Keywords: Vocational High School (SMK), Income, Two-Step Heckman, Mincer Income Function

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Address: Jalan Proklamasi 70,
Central Jakarta, Indonesia 10320
Phone: +62 21 31928280/31928285
Fax: +62 21 31928281
E-mail:
journal.pusbindiklatren@bappenas.go.id

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1. Introduction

Vocational Education and Training (VET) is an integral part of the education SDG (SDG 4) as referred to in the targets SDG 4.3. It is reaffirmed in the 4th SDGs, focusing on inclusive and quality education for all, that education is a means to enhance the quality of human capital and increase economic growth. Secondary education, both vocational and general education, is a critical level of education in increasing human capital since the graduates of this education level can either work or enter tertiary education. Indonesia is committed to improving the quality and competitiveness of human capital, following the commitment to achieving SDG 4. In enhancing human capital, one main strategic program is improving technical and vocational training (TVET), as stated in Presidential Regulation No. 18 of 2020 concerning the Medium-Term Development Plan of 2020—2024 (2020).

Indonesia is a country with a large working-age population (15—64 years) of 181.7 million people in 2019. It is due to changes in the age structure where the growth of children (under 15 years old) and parents (65 years old) and above) grows more slowly than the working-age population. This demographic situation is advantageous because the population of productive age (working age) is more than the population of dependent age (children and the elderly) (Morris, 2022). Indonesia's current demographic condition is also an opportunity to create a demographic bonus through the contribution of the productive population who work to accelerate economic growth (Hayes & Setyonaluri, 2015).

Although the productive age continues to increase, Indonesia's productivity level remains stagnant. Increased productivity is needed to avoid the middle-class income trap characterized by a low productivity level. Labor productivity is an essential economic variable closely related to economic growth, competitiveness, and living standards. Labor productivity can be calculated based on the number of workers, working hours, and total factor productivity. The Asia Productivity Organization (APO) calculates the productivity of countries in the world using the productivity index, which shows the movement of labor productivity based on the number of workers, working hours, and total factor productivity.

APO data shows Indonesia's productivity level is still far below China, India, and several other ASEAN countries. Indonesia's productivity indexes regarding the number of workers and working hours are 1.27 and 1.30, respectively. Indonesia is in the bottom three after Myanmar and Malaysia. The low productivity of Indonesia is partly due to the level of education and training of Indonesian workers, where there are still many unskilled workers that affect productivity levels (APO, 2019).

Expanding access to vocational education is the choice of policymakers in developing countries, primarily to increase employment. Vocational education is preferred, as it is considered to provide better technical skills than general education and can bridge the transition to the world of work (Zimmermann et al., 2013). Vocational education provides certain subjects in a specific curriculum to produce skilled workers ready to work in the labor market. Because it targets a specific job, the workforce skills must follow the work type to increase the income. Vocational education is said to prepare particular resources for specific jobs, allowing the workforce to be more productive (Tilak, 2002). Thus, it expects that graduates of vocational secondary education will have more advantages and competitiveness than graduates of general schools.

Senior secondary education is a crucial level of education for Indonesia's economic development. The government prioritizes SMK to prepare a competent workforce to be absorbed by the labor market. In 2019, the government began transforming vocational development through the Vocational Revitalization program aimed at 300 schools. In 2021, the government launched the Center of Excellence Vocational School program. Expanding access to vocational education is the choice of policymakers in developing countries, primarily to increase employment. The expansion of SMKs carried out by the government since 2019 has implications for the increasing number of SMK graduates in the labor market.

The debate about the relative benefits of senior secondary vocational education and general education remains discussed in the literature. The government's policy on vocational education in secondary schools has been going on for the last two decades due to the difficulty of young people getting jobs, especially those who did not graduate from university. It prompted the government to advocate for vocational education, to encourage positive expectations for vocational high school graduates to find decent jobs, to help tackle youth unemployment, and to expand employment opportunities for high school graduates.

Vocational secondary education is often used as a last resort for individuals in their choice of school. On the other hand, vocational secondary education can equip students with specific technical skills considered essential for jobs requiring specific jobs. The basic assumption of vocational education is that training the skills that match the demands of the labor market will increase worker productivity, thereby contributing to national economic development. Many believe that vocational secondary education can reduce unemployment.

Based on previous research on the rate of return, there are studies showing that the income of vocational high school graduates is higher than that of general high school graduates (Arum & Shavit, 1995; Pasay & Quarina, 2015). Regarding age, Pasay & Quarina (Pasay & Quarina, 2015) found that the older the age, the higher the probability for individuals to work and earn wages. However, after reaching a certain point, the working probability of individuals will decrease. Graduates with low education will also find it more difficult to compete in the labor market because their productivity rate and abilities will decline faster than workers with higher education.

Meanwhile, other studies reveal that the rate of return for general high school graduates is higher than for vocational high school graduates (Newhouse & Suryadarma, 2011). Newhouse & Suryadarma argued that the increase in the service sector in the structure of the Indonesian economy compared to the manufacturing sector could also affect the rate of return earned between men and women. Women benefit more from the service sector development in Indonesia since they prefer to major in business and tourism, compared to men, who tend to choose more technical sectors.

However, an economic recession can also contribute to job losses, lower incomes, and increased poverty. Job loss due to recession will affect future income, lost productivity, or decreased skills due to prolonged unemployment. Based on human capital theory, educated workers will be better able to cope with the impact of an economic crisis because they will be able to adapt to changing needs of employers and new technologies. The Asian Development Bank (Asian Development Bank, 2021) documents changes in rates of return before, during, and after the crisis. In Argentina, during the 1992-2002 crisis, the incomes of educated workers were less affected by the crisis than less educated workers. Sparrow, Dartanto, and Hartwig (Sparrow et al., 2020) stated that the COVID-19 crisis and restrictions on distance and mobility severely impacted economic growth. In Q2 2020, GDP fell by 5.3% compared to the previous year's same quarter.

This paper aimed to analyze the difference in income received between vocational secondary education (SMK) and general secondary education (SMA) in Indonesia. Using the Mincer equation, we estimated the contribution of schooling and skills to earnings. This study argues that SMK provides an initial wage advantage for males, which declines with age, while women graduates did not experience a similar setback. However, understanding the changes profitability of vocational education might contribute to policy recommendations to improve vocational education and enhance human capital. In other words, it would support SDG 4 to ensure quality education and promote lifelong learning opportunities for all.

The difference between this research and previous research is that the latest focuses on the secondary education level of SMA and SMK and their development in 2020. Another difference is the use of data from the 2020 National Labor Force Survey (Sakernas) using the Two-Step Heckman method. Heckman's two-step approach (Heckman, 1979) was adopted to detect selectivity bias and to correct if such potential bias is present. Initially, a probit model of labor force participation is estimated. Afterward, the derived inversed mills ratio was included in the human capital earnings function (wage equation) as an additional regressor.

2. Methodology

Human Capital Investment and Rate of Return to Education

The rate of return on education investment concept compares the costs incurred to invest in education and the potential benefits (Borjas, 2015). An individual's decision to invest in higher education is affected by considerations of comparing the costs and benefits of education. Rationally, individuals will choose to invest in education to a higher level if the rate of return obtained is also high (McConnell et al., 2016).

The benefits of investment in education are observed through the rate of return on education. At the individual level, the costs incurred by individuals are an opportunity or alternative costs of the total costs paid when taking education. Alternative costs consist of two, i.e., direct (forgone earnings) and indirect costs. Indirect costs are due to the loss of individual data if they skip school or enter the labor market. Direct costs (out-of-pocket expenses) include tuition, books, stationery, and other necessities, which are expenses to finance their education.

On the other hand, the benefits of investment in education can be seen from the increase in income earned by individuals while working. Benefits received by individuals from education are divided into direct and indirect benefits of a long-term nature. The direct benefit that individuals get when investing in education is in the form of lifetime earnings, where individuals with a higher educational level will get a higher income than other individuals who do not invest. The productivity of workers with higher education will be higher to increase the income of the community as a whole.

Becker (Becker, 1964) also developed a theory about the effect of education on income. Becker applies the on-the-job training model to see how education affects income. Becker divides training into general and specific training. General training is training provided by the company where workers pay for the training because then the company will compensate them in the future. Instead, specialized training is provided and paid for by the company to increase its production of the company.

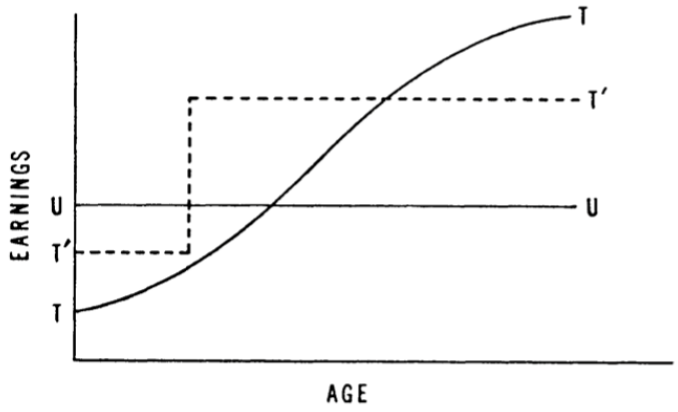

Figure 2: Relationship Between Individual Income and Training

Source: K. Becker (1964)

In Figure 2, training has a positive effect on income. The law outlines the relationship between income and age of individuals without training. It shows that without training, individual income will stagnate. On the other hand, income is higher when individuals are trained, where the TT line represents when individuals are trained, while the TT' line represents marginal productivity. The concave form describes "the rate of increase in income is influenced more by younger than older age." The income of individuals who attend training will be below those who do not attend training, but the income level will eventually increase for individuals who receive training. It concludes that skilled workers will enjoy higher profits than unskilled workers.

Data and Sample

The data used in this study were secondary data from the August 2020 National Labor Force Survey (SAKERNAS) collected from Household Members (ART) aged five years and over by the Central Statistics Agency (BPS). The samples for the August 2020 Sakernas were 300,000 households. The information contained in the Sakernas data includes, among others, gender, age, marital status, education level, major in education/field of study, place of residence, activities a week and a month ago, activities to find work/preparing for a business, main job, additional work, working hours throughout the job, and work experience. The August 2020 Sakernas data survey was conducted during the COVID-19 pandemic crisis.

Concerning COVID-19, Sakernas August 2020 has data on changes in wages or income and working hours received by workers during the COVID-19 pandemic.

The unit of analysis in this study were high school, vocational, and university graduates comprising five age groups, i.e., 15-24 years, 25-34 years, 35-44 years, 45-54 years, and 55-64 years. The samples used were secondary school and higher education graduates with jobs. It aimed to observe the rate of return to education among high school graduates.

Table 2: Two-Step Heckman Variable Based on Sakernas August 2020

Variable Name	Symbol	Definition Operational	Question Code	Scale/ Category
Probability Model Working				
Probability Working	*p_work*	Probability of individual work choice	r9a, r9b, r9c, r10a	p_work =1, work p_work =0, not in the workforce or currently unemployed
Education	*educ*	The highest level of education that an individual has taken	r6a	educ=1, Vocational High School (SMK) educ=2, Senior High School (SMA) educ=0, SMA/SMK to lower (elementary and junior high)
Type of Gender	*sex*	Individual Gender	k4	sex=1, male sex=0, female
Age	*age*	Age on birthday last birthday	k6	Numeric
Age Square	*age2*	Age squared	k6	Numeric
Marital Status	*mar*	Individual marital status	r4	married =1, married or once married married =0, not married yet
Educational Return on Investment Model with Mincer's Income Function				
Revenue Log	*income*	Monthly wages divided by a month's working hours, then formed in logarithms (ln)	r14a1, r14a2	Numeric
Education	*educ*	The highest level of education attained by an individual	r6a	educ=1, SMK educ=2, high school educ=0, SMA/SMK to lower (elementary and junior high)
Work Type	*collar*	The main types of work of workers, namely white collar, gray collar, and blue collar	r13b_kbji2	Collar=1, white collar Collar=2, blue collar Collar=0, gray collar
Work Sector	*sector*	Workers based on their field of business	sector9	Sector 1= Agriculture, Plantation, Forestry, Hunting and Fisheries Sector 2= Mining and Quarry Sector 3= Electricity, Gas, and Water

				Sector 4= Construction Sector 5= Trade, Home Meals, and Accommodation Services Sector 6= Transportation, Warehousing, and Services Communication Sector 7= Finance, Leasing, Real Estate, and Corporate Services Sector 8= Social Services and Individual Services
Training	*train*	Getting training/courses/training and obtaining certificates	r6d & r6e	Train=1, training Train=0, no training
Age Group	*age group*	Respondent's age category	k6	Age group =0, 15-25 Age group =1, 25-35 Age group =2, 35-45 Age group =3, 45-55 Age group =4, 55-65 Age group =5, >65
Sex	*sex*	Individual Gender	k4	sex=1, male sex=0, female
Marital Status	*mar*	Individual marital status	r4	married =1, married or once married married =0, not yet married
Living Area	*urban*	Respondents' living area	classification	Urban=1, urban Urban=0, rural
Island Territory	*island*	Classification of big islands in Indonesia	Code_prov	Java =1 Sumatra =2 Borneo =3 Sulawesi=4 Nusa Southeast /Bali=5 Maluku/Papua=6
Change of Working Hours	*hours*	Have decreased or increased working hours during Covid-19	R16b	Working Hours Increase / Fixed=0 Working Hours Decrease=1

Methods and Estimation Model

This research used Heckman's Two-Step Model. This model consists of two stages, where the analysis uses a different model at each stage. The first stage, estimation, was performed using the probit model. This stage aimed to select a selectivity bias that appears and can affect the estimation results. The selection bias is because vocational and high school graduates who participate as workers were selected as samples. The selection of the sample indicates that the sample used is not a random subset of the population. Based on Heckman (Heckman, 1977), the first step is to estimate the probability of vocational and high school graduates working and having an income. The form of the probit equation used is as follows:

$$EMP_i = \gamma o + \gamma_1 Edu_i + \gamma_2 Sex_i + \gamma_3 Age_1 + \gamma_4 Age2_1 + \gamma_5 Married_1 + u_i$$

Then, the above equation will form the Inverse Mills' Ratio. Inverse Mills' Ratio (λ_i) is a variable that corrects selection bias when estimating Mincer's income function.

$$\lambda_i = \frac{\phi\left(\gamma_i Z'_{ij}\right)}{[1 - \Phi\left(\gamma Z'_i\right)\}}$$

where ϕ and Φ are the probability density functions and the cumulative probability density functions for the standard normal distribution of variables. The equation would be inserted into Mincer's income equation as an additional independent variable. Mincer equation has been used in various previous literature to estimate how much influence the educational level has on the average level of income earned by individuals (Patrinos, 2016). The form of the Mincer equation is as follows:

$$lnWage_i = \beta_0 + \beta_1 Edu_i + \beta_2 Exp_i + \beta_3 Exp_{2i} + \varepsilon i$$

where:

$lnWage_i$	=	natural logarithm of the average net income of individuals per month
i	=	individual
β_0	=	constant
Edu_i	=	last higher education level (number of years of schooling)
Exp_i	=	work experience (in a unit year)
Exp_{2i}	=	square form of work experience
ε	=	error term

The form of the above equation is expanded in this study with the following equation:

$$lnWage_i = \beta_0 + \beta_1 educ + \beta_2 sex + \beta_3 agegroup + \beta_4 mar + \beta_5 urban + \beta_7 train + + \beta_8 sector + \beta_9 collar + \beta_{10} island + \beta_{11} whours + \varepsilon$$

where:

$\ln Wage_i$	=	natural logarithm of the average net income of individuals per month
β_0	=	constant
Edu_i	=	secondary high school education
Sex	=	sex
Agegroup	=	age groups
Mar	=	marital status
Urban	=	classification of a residential area
Train	=	training program participation
Island	=	island territory
Sector	=	field of business
Collar	=	types of occupation
Island	=	classification of big islands in Indonesia
Whours	=	increased or decreased working hours due to COVID-19
ε	=	error term

The Mincer equation was estimated in the second stage of the Two Step Heckman model using the Ordinary Least Square (OLS), where the results of the estimated average rate of return to education and differences in income levels between age categories were analyzed in this study. After the bias correction from the first step of Two-Step Heckman was obtained and substituted into the Mincer income function, the final form of the equation is:

$$lnWage_i = \beta_0 + \beta_1 educ + \beta_2 sex + \beta_3 agegroup + \beta_4 mar + \beta_5 urban + \beta_7 train + + \beta_8 sector + \beta_9 collar + \beta_{10} island + \beta_{11} whours + \lambda_i + \varepsilon$$

3. Results and Discussions

The study's main objective was to estimate the rate of return on investment in secondary education. The rate of return on investment in secondary education was calculated by estimating the Mincer Income Function. The analysis was carried out with Sakernas data in August 2020 during the COVID-19 pandemic. Table 4 below shows the estimation result from the Mincer Income Function using the Two-Step Heckman method.

Table 3 below describes the individual characteristics of general and vocational high school graduates with income. Both SMK and SMA graduates were majority male at 68% and 64%, while the women were 32% and 36%, respectively. Furthermore, most vocational and high school graduates also worked in the trade, restaurant, and accommodation services sectors, with a percentage of 32% and 29%, respectively. Most high school and vocational graduates did not attend training. Vocational high school graduates participated in training by 27%, higher than high school graduates at 18%. The type of work with many high school and vocational graduates was blue-collar work, amounting to 50%. The socio-demographic characteristics of SMK graduates were male, married, and living in urban areas. Meanwhile, high school graduates were dominated by married men living in rural areas.

Table 3: Characteristics of Working Population Based on High School Education

		Education				Total	
		SENIOR HIGH SCHOOL		VOCATIONAL HIGH SCHOOL			
		N	Percent (%)	N	Percent (%)	N	Percent (%)
(1)		(4)	(5)	(6)	(7)	(8)	(9)
Type Gender	Woman	32,804	35.62%	13,428	31.98%	46,232	34.48%
	Man	59,301	64.38%	28,565	68.02%	87,866	65.52%
		92,105	**100%**	**41,993**	**100%**	**134,098**	**100%**
Work Sector	Agriculture, Plantation, Forestry, Hunting, and Fishery	22,888	24.85%	6,986	16.64%	29,874	22.28%
	Mining and excavation	1,611	1.75%	689	1.64%	2,300	1.72%
	Manufacture	10,326	11.21%	7,215	17.18%	17,541	13.08%
	Electricity, Gas, and Water	621	0.67%	463	1.10%	1.084	0.81%
	Construction	4,307	4.68%	2,278	5.42%	6.585	4.91%
	Trade, Restaurant, and Accommodation Services	27,216	29.55%	13,565	32.30%	40,781	30.41%
	Transportation, Warehousing, and Communication Services	5,621	6.10%	2,863	6.82%	8,484	6.33%
	Finance, Leasing, Real Estate, and Corporate Services	1,421	1.54%	809	1.93%	2,230	1.66%
	Community, Social, and Individual Services	18,094	19.64%	7,125	16.97%	25,219	18.81%
		92,105	**100%**	**41,993**	**100%**	**134,098**	**100%**
Training	Not Once Training	75,305	81.76%	30,684	73.07%	105,989	79.04%
	Once Training	16,800	18.24%	11,309	26.93%	28.109	20.96%
		92,105	**100%**	**41,993**	**100%**	**134.098**	**100%**
Age Group	15-24 years old	16,427	17.84%	10,832	25.79%	27,259	20.33%
	25-34 years old	22,120	24.02%	10,486	24.97%	32,606	24.32%
	35-44 years old	24,664	26.78%	10,561	25.15%	35,225	26.27%
	45-54 years old	21.313	23.14%	7,074	16.85%	28,387	21.17%
	55-64 years old	6,297	6.84%	2,400	5.72%	8,697	6.49%
	>65 years old	1,284	1.39%	640	1.52%	1,924	1.433%
		92,105	**100%**	**41,993**	**100%**	**134,098**	**100%**
Marital Status	Single	21,661	23.52%	13,279	31.62%	34,940	26.06%
	Married/ Ever Married	70,444	76.48%	28,714	68.38%	99.158	73.94%
		92,105	**100%**	**41,993**	**100%**	**134,098**	**100%**
Residence	rural	46,981	51.01%	16,272	38.75%	65,253	47.17%
	Urban	45,124	48.99%	25.721	61.25%	70.845	52.83%
		92,105	**100%**	**41,993**	**100%**	**134,098**	**100%**
Type Work	Blue Collar	46,020	49.96%	21.148	50.36%	67,168	50.09%
	White Collar	10,145	11.01%	4,669	11.12%	14,814	11.05%
	Gray Collar	35,940	39.02%	16,176	38.52%	52,116	38.86%
		92,105	**100%**	**41,993**	**100%**	**134,098**	**100%**
Region	Java	22,185	24.77%	17,526	41.74%	40,341	30.08%
	Sumatra	31.541	34.24%	11,881	28.29%	43,422	32.38%
	Borneo	9,329	10.13%	3,465	8.25%	12.794	9.54%
	Sulawesi	12.744	13.84%	4,359	10.38%	17,103	12.75%
	Nusa Tenggara/Bali	7,179	7.79%	2,824	6.72%	10.003	7.46%

		Education				Total	
		SENIOR HIGH SCHOOL		VOCATIONAL HIGH SCHOOL			
		N	Percent (%)	N	Percent (%)	N	Percent (%)
(1)		(4)	(5)	(6)	(7)	(8)	(9)
	Maluku/Papua	8,497	9.23%	1,938	4.62%	10,435	7.78%
		92,105	**100%**	**41,993**	**100%**	**134,098**	**100%**
Change of Working Hours	Fixed/Incremental Working Hours	68,198	74.04%	30,475	72.57%	98,673	73.58%
	Working Hours Down	23.907	25.96%	11,518	27.43%	35,425	26.42%
		92,105	**100%**	**41,993**	**100%**	**134,098**	**100%**

Source : BPS, Sakernas August 2020. Processed by author.

Based on the demographic characteristics shown in Figure 3, male wages were consistently higher than female workers for both senior high school graduates and vocational high school graduates. The relationship between age and monthly wages for high school graduates and vocational high school graduates is presented in Figure 3. Workers in the 15-25 year age group tended to have lower wages than other age groups. Investment in human capital for education tended to be conducted at young ages, resulting in increasing wages along with the increasing age of workers. In total, the peak monthly wage for SMK graduates was in the 44-55 year age group, while the peak salary for high school graduates was IDR 1,665,574. The similarity between the monthly wage pattern for SMA and SMK graduates was that both formed an inverted U pattern.

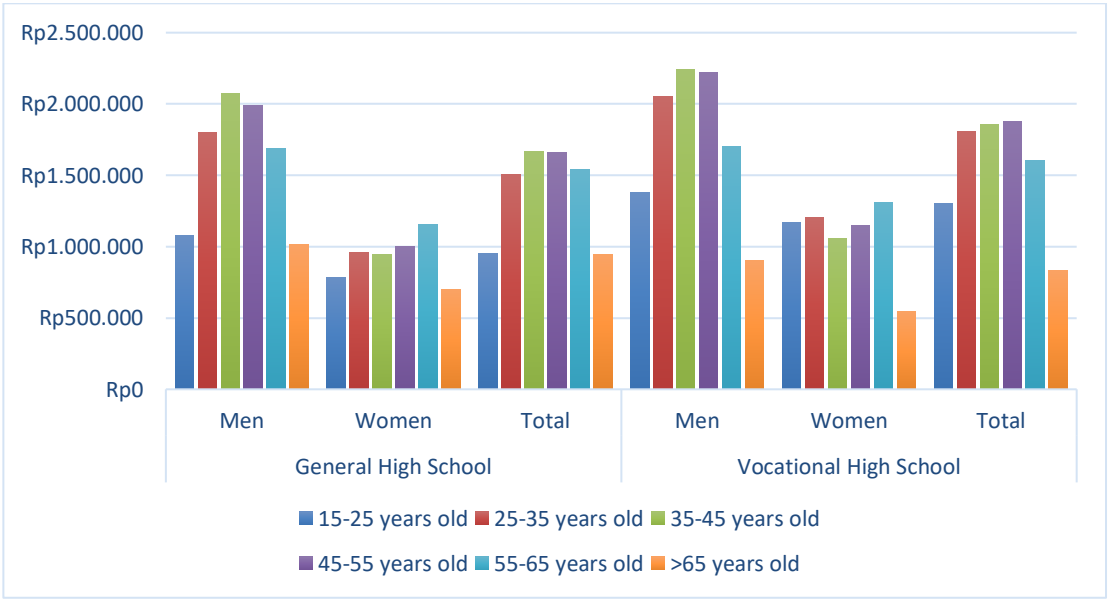

Figure 1 Average Wages of Workers by Age Group, Gender, and Last Education

Source : BPS, Sakernas August 2020. Processed by author

Table 4: Estimated Results of Individual Income Levels in the Second Stage of the Heckman Two Step-Model

Variable Independent	Variable Dependent: Income Individual	Standard Error
Vocational education	0.1682***	0.015
Individual Characteristics		
Type Gender	0.3916***	0.016
Age Group		
25-34	0.0867***	0.138
35-44	0.1403***	0.016
45-54	0.1569***	0.016
55-64	0.1392***	0.170
65+	-0.1494***	0.034
Marital Status	0.1231***	0.008
Urban	0.1975***	0.005
Training	0.0924***	0.006
Type of Work		
White Collar	0.3679***	0.010
Gray Collar	0.2773***	0.008
Sector Work		
Mining and excavation	0.7048***	0.180
Manufacture	0.4340***	0.010
Electricity, G, and Water	0.3241***	0.025
Construction	0.2887***	0.122
Trade, Restaur, ant and Accommodation Services	0.1230***	0.010
Transportation, Warehousing, and Communication Services	0.1627***	0.011
Finance, Leasing, Real Estate, and Corporate Services	0.3992***	0.188
Community, Social, and Individual Services	0.0737***	0.010
Island Territory		
Sumatra	-0.0564***	0.006
Borneo	0.1298***	0.009
Sulawesi	-0.1076***	0.008
Nusa Tenggara/Bali	-0.1937***	0.010
Maluku/Papua	0.1103***	0.010
Change of Working Hours	-0.2036***	0.005

Variable Independent	Variable Dependent: Income Individual	Standard Error
Variable Interaction		
Age Group#Education		
SMK#25-34	-0.0393*	0.015
SMK#35-44	-0.7147***	0.015
SMK#45-54	-0.0757***	0.017
SMK#55-64	-0.1199***	0.025
SMK#65+	-0.2031***	0.054
Type of Gender#Education		
boy#high school	0.1041***	0.012
Type of Job#Education		
Collar White#SMK	0.0208	0.016
Collar Gray#SMK	-0.0497***	0.011
Lambda	-0.1054***	0.030
Observations	**134.098**	
R2	**0.1915**	
Number of Observations	**90,696**	

Standard errors in parentheses

*** p<0.01, **p<0.05, *p<0.1

Source: BPS, Sakernas August 2020 (processed)

From the Mincer Income Function results, SMK graduates had a higher wage of 16.8% compared to SMA graduates. As for gender, men had 39.1% higher wages than women. In addition to gender, age, marital status, urban and rural areas, and island areas were other variables used to represent the demographic characteristics of each individual. The age variable used in the income model acted as a proxy or estimate of a person's experience other than years of service (Rahayu, 2010). The older the workers age, there is the accumulation of increased productivity or experience. In the age variable, the highest increase in income was in the 45-54 age category by 15.6% compared to the 15-24 year age group. Income in the age group 65 and over decreased by 14.9% compared to those aged 15-24.

In the marital status variable, married working individuals would have increased income by 12.3% compared to single workers. Meanwhile, individuals living in urban areas had 19% higher income or wages than those in rural areas. Farahnasy's research (Farahnasy, 2006) demonstrated that workers in urban areas are more productive than rural ones. The quality of workers in urban areas was also higher than in rural areas due to higher levels of education in urban than in rural areas. As for the island areas, workers in Kalimantan and Maluku/Papua had a higher income of 12% and 11% compared to workers in Java.

The coefficients related to the characteristics in this study are the employment, training, and type of work sectors. People who work in the mining, quarrying, and manufacturing sectors increased their income by 70% compared to the agricultural sector. Although all sectors experienced an increase compared to the agricultural sector, the COVID-19 pandemic affected several employment sectors. Based on LPEM (LPEM, 2020), Indonesia's GDP in Quarter III was recorded at -3.49% (y.o.y), putting Indonesia into the definition of recession. By employment sector, the four main sectors of the Indonesian economy that contribute more than half of the GDP, such as manufacturing, wholesale and retail trade, construction, mining, and quarrying, experienced negative growth in Q3 2020. These sectors experienced a heavy contraction due to the policy of physical and social restrictions as the daily number of COVID-19 cases continues.

Regarding training, the sample who had attended training received 9.24% higher income than those who had never attended the training. By participating in the training, individuals will have a higher ability to work optimally and productively than individuals who do not participate in job training. The collar variable shows that the sample working in the white collar had the highest income compared to the gray-collar and blue-collar workers.

Variable changes in working hours showed a significant negative result of 20%. It means that a decrease in working hours will impact a 20% decrease in income compared to increased and fixed working hours. Job loss due to the COVID-19 recession in 2020 is said to affect future incomes, lost productivity, and a decline in skills due to prolonged periods of unemployment (ILO, 2021).

Regarding the correction of selection bias, the value of the lambda variable or Inverse Mills' Ratio for secondary education graduates (SMA and SMK) is significant and negative, ceteris paribus. This significant result means that selection bias is found when entering the labor market (Taniguchi & Tuwo, 2014). Therefore, self-selection, i.e., the cause of different rates of return to education between women and men in this study, is relevant. The negative coefficient value of the lambda variable shows that the unobserved variable negatively affected the monthly income earned by high school (SMA) and vocational high school (SMK) graduates.

The rate of return on vocational education may decline over time. It can happen if the special skills taught in vocational schools do not experience renewal compared to general skills. The specialized skills of vocational graduates allow graduates to immediately work and earn wages upon graduation, while graduates from general or senior high schools need to be further trained by the companies that employ them. However, over time high school graduates may find it easier to upgrade their skills to meet job demands. In both cases, vocational education provides an initial advantage that will decline over time.

Results for SMK graduates, particularly those between the ages of 25 and 35, show that returns to vocational schools have declined sharply with age. Figure 4 shows that at the age of 15-24 years, the income of SMK graduates was higher than that of SMA graduates. However, with increasing age, the income level of SMK graduates decreases, thereby reducing the gap between the incomes of SMA and SMK graduates. The highest income for vocational high school graduates was in the 45-54-year-old age group. From 55 years and over, the income level of SMK graduates is lower than that of SMA graduates. It indicates that the benefits of vocational education income do not last long in the long term. The policy to continue to a higher level is critical since vocational education will only provide job benefits at the beginning before experiencing diminishing with age.

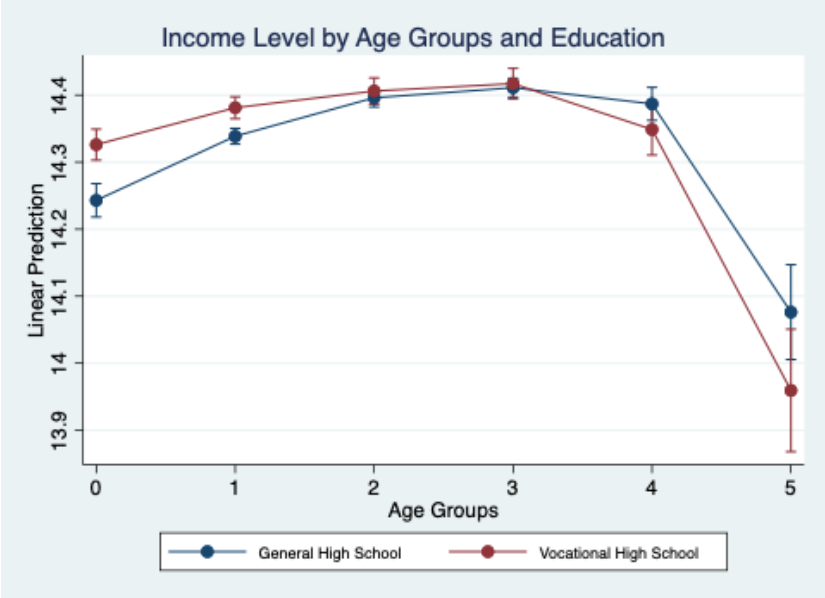

Figure 2 Income Level of High School and Vocational High School Graduates by Age Group and Education

Source : BPS, Sakernas August 2020. Processed by author

Figure 5 shows the differences in income levels of SMA and SMK by gender and age group. For men, the income of SMK is higher than that of SMA, only in the 15-24 year age group. Furthermore, starting at the age of 25 to 65 years and over, male graduates of SMK experienced a decrease in income compared to men who are high school graduates. It did not happen to women who graduated from SMK. The income gains obtained by women graduating from SMK compared to SMA occurred in all age groups except those aged 55 to 65 years and over. The income of female high school graduates also experienced an increase in the 45-54 year age group.

The decline in men's rates of return could be related to changes in Indonesia's economic structure. From 2003 to 2007, employment in the service sector grew by about four percent per year, while employment in the industrial sector grew by 2.5 percent per year (World Bank, 2011). The increasing prominence of the service sector may disproportionately affect vocationally trained men as they tend to choose engineering majors. Women, on the other hand, tend to choose to study business management or tourism skills, the demand for which may remain strong. In an increasingly service-oriented economy, there is likely to be a decline in demand for the industrial and engineering majors that most men choose in vocational schools. Another potential explanation for the recent decline in male vocational returns is the decline in the quality of vocational training for males. For example, technical vocational training may require more investment to stay relevant to new advances in technology (Newhouse & Suryadarma, 2011).

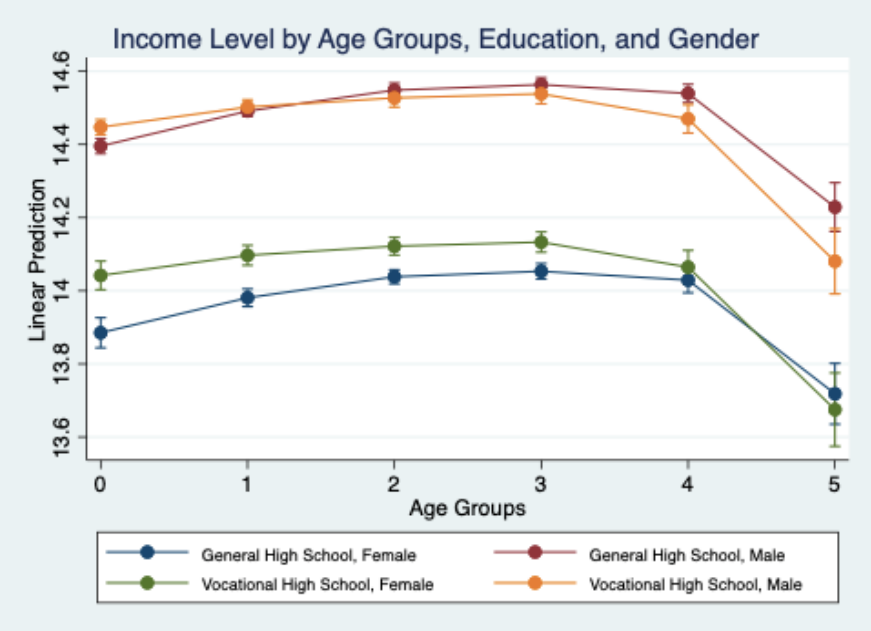

Figure 3 Income Level of High School and Vocational High School Graduates by Age Group, Education, and Gender

Source : BPS, Sakernas August 2020. Processed by author.

Figure 6 shows that vocational graduates who work in white-collar jobs had higher incomes than high-school graduates who work in gray-collar jobs. Meanwhile, SMK graduates who work in blue-collar jobs had higher incomes than high-school graduates in gray-collar jobs. Figure 6 also shows that white-collar SMK graduates had higher incomes than white-collar high school graduates before age 65. It was also discovered in SMK graduates in blue collars. For the gray collar there is a trend of initial gains for SMK graduates in the 15-24 age group but continue to decline until age 65 years and over.

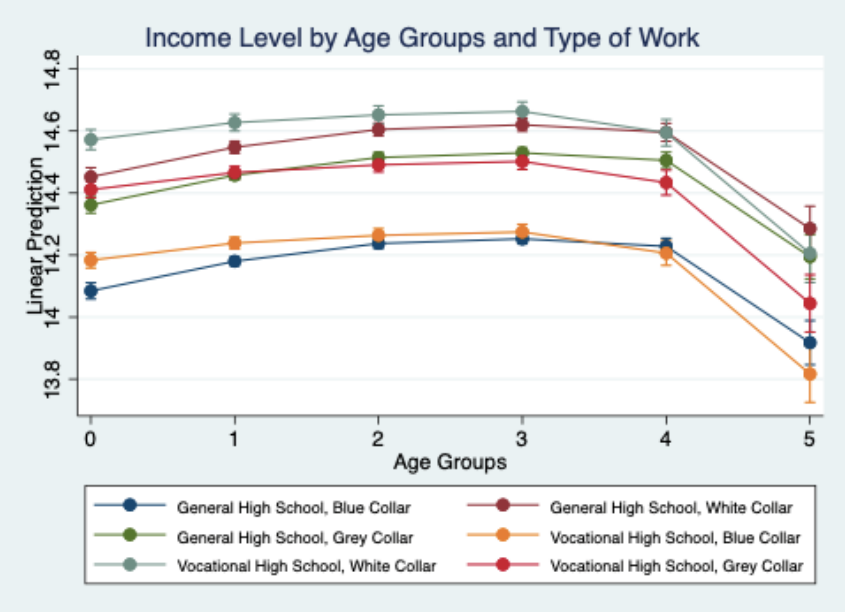

Figure 4. Income Level of High School and Vocational High School Graduates by Age Group and Type of Work

Source : BPS, Sakernas August 2020. Processed by author.

Conclusions

This study seeks to estimate and compare the difference in income between SMK and SMA. The analysis that becomes the bottom line of this research is the result of the interaction between the age group of high school graduates and vocational high school graduates with the gender on income. SMK provides an initial wage advantage for men, which declines with age. Although male secondary school graduates experienced worse outcomes, similar declines were not experienced by female vocational high school graduates. As for age groups, this empirical study also shows that for women, SMK will provide a higher return on income than male SMK graduates.

Based on these findings, this study recommends encouraging training programs by re-skilling and up-skilling for high school (SMA) and vocational high school (SMK) graduates. The demand for new skills and skill upgrades will continue to grow as individuals must undergo several job transitions throughout their working life. If workers do not have access to re-skilling or up-skilling, workers will likely experience stagnant skills that impact productivity and innovation. As most workers have left formal education on the job, re-skilling and up-skilling programs for the adult age group play an important role in ensuring opportunities for skills upgrading, responding to skills changes, and preventing skills imbalances.

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