

# Unveiling the Effect of School and District Factors on Vocational High School National Exam in Indonesia

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## ABSTRACT

In the last ten years, Indonesia has shifted the development of secondary schools from general secondary education to vocational secondary education. The presidential decree of 2022 strengthened the government's commitment to developing vocational high schools. The number of vocational schools and student participation has increased significantly. However, despite the increased student participation in vocational high schools and the government policy toward empowering vocational education, the graduates of vocational high schools are less employed than graduates of public secondary schools in the country. This study examines how school and district characteristics affect the national exam scores of vocational high school students. Applying a cross-sectional regression of around 12,000 public and private vocational high schools in Indonesia, the study shows that the national exam scores, both general and specific competency scores, of the students in vocational high schools are positively affected by the share of vocational teachers in the school and the accreditation status of the schools. Moreover, students in public vocational schools in information and communication technology and engineering, located in urban areas and the western part of Indonesia, have relatively higher average national exam scores. Several issues that hinder the enhancement of vocational high schools in Indonesia, among others, are an insufficient number and competency of vocational teachers, inadequate facilities to support practical teaching, and a mismatch between students' competency and demand in the labor market.

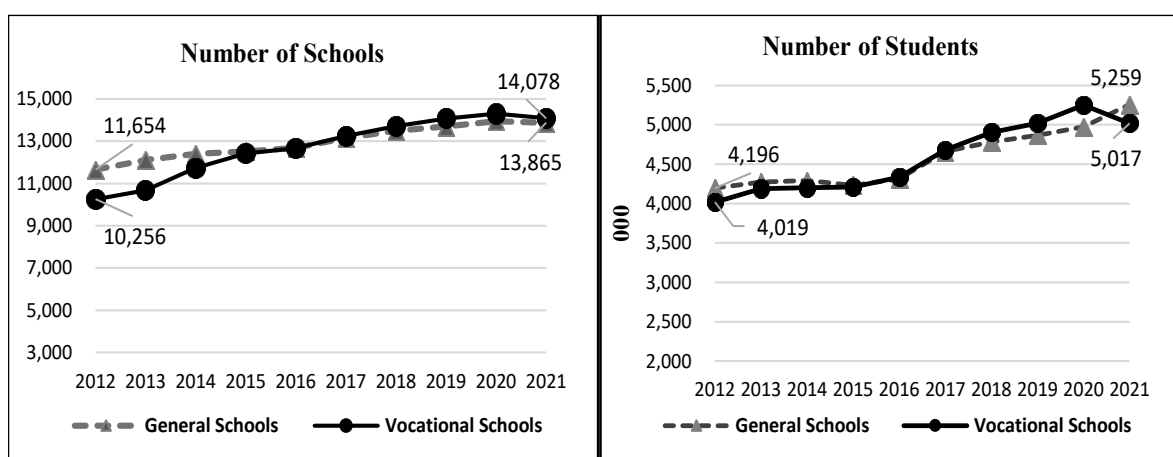
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## Introduction

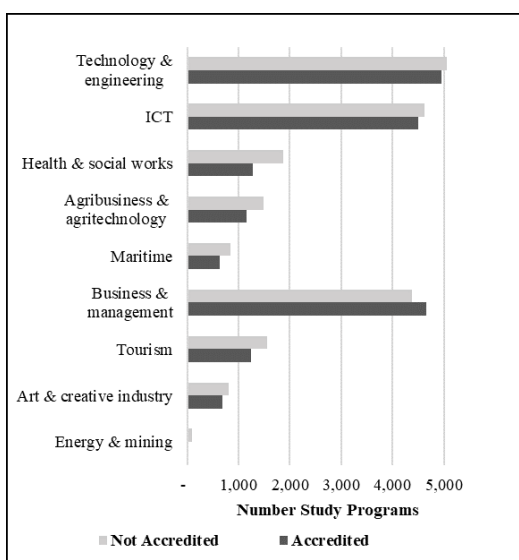
In the last decade, the number of vocational high schools in Indonesia has significantly increased, surpassing the number of general high schools. Since 2012, compared to the general high schools, the number of schools and students at vocational high schools in Indonesia has increased

significantly. As shown in Figure 1, from 2012 to 2021, vocational high schools increased by 27.1 percent to 14,078, whereas the general high schools only increased by 15.9 percent to 13,865. The number of vocational high school students increased from approximately 4 million in 2012 to around 5 million in 2021, an increase of 19.9 percent. In 2016, the number of schools and students in vocational high schools surpassed the number of schools and students in general high schools. Data General High Schools vs. Vocational High Schools in Indonesia, 2012-2021 in Figure 1 and Figure 2 for accreditation status.



Source: calculated from <http://publikasi.data.kemendikbud.go.id>;  
<https://dapo.dikdasmen.kemendikbud.go.id/> ; <http://datapokok.ditpsmk.net/>

**Fig 1:** General High Schools vs. Vocational High Schools in Indonesia, 2012-2021



Source: calculated from <http://datapokok.ditpsmk.net/>

**Fig 2:** Study Programs of Vocational High Schools by Accreditation Status, 2021

To enhance the quality and competitiveness of technical and vocational education and training, the Government of Indonesia issued Presidential Regulation No. 9 of 2016, primarily to improve the quality of vocational high schools in Indonesia. However, limited improvements have been made. In 2020, the Ministry of Education, Culture, Research, and Technology (MoEC) established a specific directorate for vocational education. Furthermore, the most recent regulation, Presidential Regulation No. 68 of 2022, was launched as a stepping stone to comprehensively revitalize Indonesia's labor-demand-oriented vocational education and training system.

Despite the increased number of vocational high schools in Indonesia, a prominent issue hinders the school-to-work transition of vocational high school graduates. There is a mismatch between the supply and demand of labor as the graduates' skills and competencies are not relevant to the needs of the labor market (Badan Perencanaan Pembangunan Nasional, 2019; Jasmina, 2020). The main challenges of vocational schools are the low quality of their graduates and the inability to meet demand in the labor market. Moreover, there are challenges to good quality vocational school establishment, teacher availability in number and competence, facilities and infrastructure, vocational learning, cost, and industry involvement Suharno et al., (2020).

With the increased student participation in vocational high schools and the government policy to focus on vocational education in Indonesia, the paradox is why the graduates of vocational high schools are less employed than graduates of general high schools. This study raises the question of how the characteristics of vocational high schools and the districts in which they are located might affect the quality of their graduates, which is proxied by national exam scores. This study distinguishes itself by combining school data from around 12,000 vocational high schools in Indonesia in 2019 and the district data of the schools.

Several cross-country studies have compared vocational high schools to general high schools, which implies a favorable perception of students or graduates from general high schools compared to those who graduate from vocational high schools. Studies that have examined the return on education for both types of schools have shown that graduates of vocational high schools did not significantly perform better in the labor market than graduates of general high schools Bennell, (2016). Some studies showed that vocational high schools are not as favorable a substitute for general high schools. Vocational education in the Netherlands is not beneficial for the labor market allocation of young people (Forster and Bol, 2018). In India, there is a public perception that vocational education is an option for those who cannot pursue higher formal education (Nayana and Kumar, 2019). Students in vocational schools in China have poor math and computer skills. The

dropout rate in vocational schools was higher, especially among low-income students, as most students were dissatisfied with the vocational high schools (Loyalka et al., 2015; Yi et al., 2018). The massive establishment of upper-secondary vocational education and training in China was challenged by a lack of funding, teachers, curriculum, teaching methods, and imbalanced development of vocational education and training between urban and rural areas (Zhao and Liu, 2019). Countries such as Tanzania and South Korea failed in policies to expand vocational education to address the shortage of skilled workers, primarily because parents prefer general to vocational education (Newhouse and Suryadarma, 2011).

Some studies show a favorable argument for vocational education in certain conditions. A cross-country study of selected industrialized countries indicates a strong correlation between vocational education and employment in Germany and Japan (Ryan, 2001). In Turkey, vocational high school graduates are more likely to be employed than general high school graduates (Torun and Tumen, 2017). A cross-country study shows graduates from vocational education are more likely to work from an early age than graduates from general education (Hanushek et al., 2017). However, their employment advantage will reduce over time. The study posits that graduates of vocational high schools have a higher employment probability related to their qualifications. Unfortunately, having specific skills makes vocational graduates less adaptive in the changing working environment. There is an advantage to apprenticeship training programs in vocational education, but it depends on how the curriculum and teaching methods adapt to the changes in the labor market Muehlemann and Wolter, (2020).

There are some previous studies on vocational high schools in Indonesia focused on the outcomes of graduates in comparison to the general high schools, for example, Clark (1983), Quarina and Pasay (2007), Chen (2009), Newhouse and Suryadarma (2011), Purnastuti et al. (2015), Mahirda and Wahyuni (2016), Pritadrajati (2018), Suharno et al. (2020), Qurniawan and Jasmina (2021), and Astuti and Setyonaluri (2022). Most studies comparing the return rate of education between general and vocational high school graduates in Indonesia found that high school graduates are more highly paid than vocational high school graduates, particularly in urban areas. However, vocational high school graduates can sometimes get jobs faster and have shorter waiting times after school. Qurniawan and Jasmina (2021) showed that a better quality of vocational high schools increased the number of years of schooling of their graduates, as they could access tertiary education and increased their performance in the labor market.

Other studies show that there was no significant difference in the employment opportunities

and earnings between graduates of general and vocational high schools in Indonesia (Chen, 2009; Newhouse and Suryadarma, 2020; Mahirda and Wahyuni, 2016; Astuti and Setyonaluri, 2022). Graduates of public schools, both general and vocational, earn higher wages than private ones (Newhouse and Suryadarma, 2020). Though public vocational schools increase the possibility of obtaining jobs, this advantage diminishes in the younger cohort. The choice of high school type mostly depends on the student's academic ability and level of parental education. The return on investment in vocational education was higher than the return on investment in high school; however, the initial wage advantage then declined with age (Astuti and Setyonaluri, 2022).

The transformation of economic structure in Indonesia changes the composition of labor demand; hence, there should be changes in the education system as a human capital investment (Indrawati and Kuncoro, 2021). The vocational education system has been addressed to overcome youth unemployment and yet has been lagging behind the rapid structural transformation of the labor market. Several factors have to be considered for a successful vocational education system, which are a relevant curriculum, close engagement with the labor market, high-quality schooling, incentive for training providers and competition among training providers, high standard of training, and ability to switch between general and vocational tracks (Eichhorst et al., 2012). A supply-side solid policy in the vocational education system in Indonesia has led to significant numbers of vocational high schools and graduates.

## Method

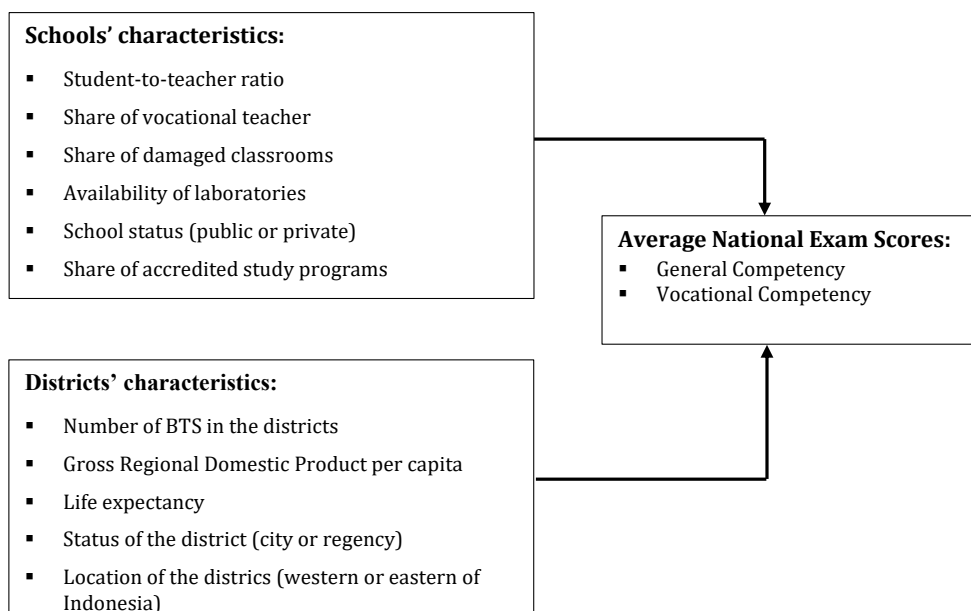
This study applies the education production function, first developed by Hanushek (1979), and describes how educational inputs produce educational outcomes. The level and quality of education can be improved by increasing the amount and quality of inputs, including teacher training, class size, technology, and parental involvement. The function assumes that these inputs are combined to affect the educational outcomes. The education production function is presented as follows:

$$A_{it} = f(B_{it}, P_{it}, S_{it}, I_i)$$

$A_{it}$  shows that the achievement of the  $i$ -th student at time  $t$  is affected by family background ( $B_{it}$ ), peers ( $P_{it}$ ), school inputs ( $S_{it}$ ), and the student's innate abilities or characteristics ( $I_i$ ). Community inputs, such as socioeconomic conditions, might also affect educational outputs. This study focuses on the school and community inputs as factors that might affect educational outcomes at the school level. It is acknowledged that other factors are important, especially for analysis at the individual student level. Though the function is better applied at a student level, it can also be

applied at aggregated units, such as at the school or study programs level Hanushek, (1987).

This study applies a cross-sectional regression with the vocational high school as the unit of analysis. The sample of this study is a vocational high school  $i$  located in district  $j$  in Indonesia in 2019. The student education achievements are an average of the national exam scores for vocational high schools, both for the general competency score exam and the vocational competency score exam in 2019. The school's average student achievement is affected by the school inputs and socioeconomic conditions of the districts/regencies where the school is located. Therefore, for the independent variable, this study applies the student-teacher ratio, share of vocational teachers, share of damaged classrooms, availability of laboratories, the status of the school, either public school or private school, and the share of study programs accredited in respective schools. To better know the characteristics based on the field studies, control variables of the field of the school are also included, which consist of three majority of the field of study in vocational high schools, namely: (1) information communication and technology (ICT); (2) engineering and technology; (3) business and management. For control variables of socioeconomic status of the district where the schools are located, the variables included are the number of Base Transceiver Stations (BTS), per capita Gross Regional Domestic Product (GRDP), life expectancy, dummy regional variable, and dummy location in Western Indonesia. The research framework of the study is presented in the following Figure 3.



Source: authors

**Fig 3:** Research Framework of the Study

The cross-section regression of school  $i$ , located in district  $j$ , is as follows:

$$EXAM_{ij} = \alpha + \beta' SCHOOL_{ij} + \gamma' DISTRICT_j + \varepsilon_{ij} \quad (2)$$

where:

$EXAM_{ij}$  : average national exam scores of school  $i$  in district  $j$

$SCHOOL_{ij}$  : vector variables of characteristics of school  $i$ , which consist of:

STR : student-to-teacher ratio;

Teach : share of vocational teacher;

Class : share of damaged classrooms;

Lab : number of laboratories;

Stat : dummy variable of school status (1 = public; 0 = private);

Acc : share of accredited study programs;

Study : dummy variable of study programs of the schools

(ICT, technology & engineering, business & management).

$DISTRICT_j$  : vector variables of characteristics of district  $j$ , which consist of:

BTS : number of Base Transceiver Stations in the districts;

GRDP : Gross Regional Domestic Product per capita (nominal value in ln);

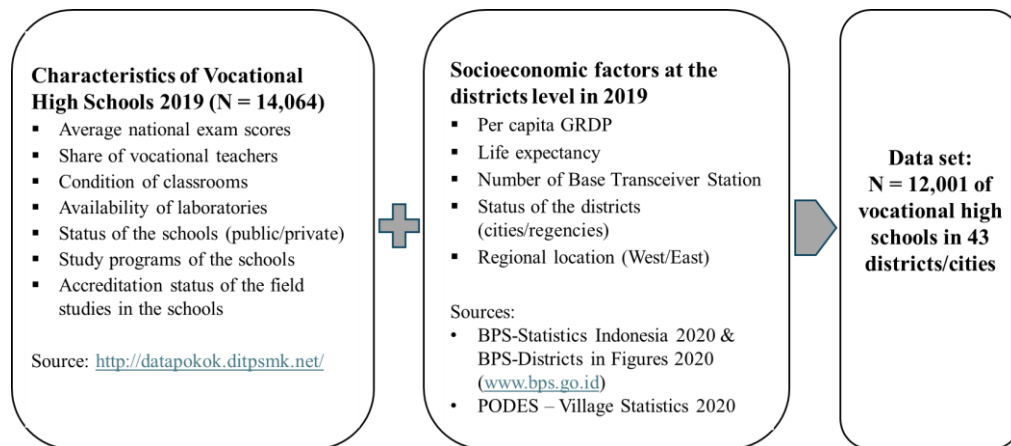
Life : life expectancy;

Region : dummy variable of the status of the districts (1= cities; 0 = districts);

West : dummy variable of the region in western Indonesia

(West = 1 of Java, Sumatera, Kalimantan, Bali; others = 0).

The data applied is secondary data from vocational schools in Indonesia in 2019, with a total of 14,064 vocational high schools. Merging the data on characteristics of vocational high schools into socioeconomic factors at the district level gives 12,001 vocational high schools for the sample of this study in 43 districts, which accounted for 85.3 percent of the total number of vocational high schools in Indonesia. The secondary data is collected from several sources and managed, as depicted in Figure 4. The data on characteristics of vocational high schools is collected from <http://datapokok.ditpsmk.net/> of the MoEC, which is then merged with the regional socioeconomic characteristics of the districts where the vocational high schools are located. These socioeconomic factors are collected from secondary sources of the National Statistical Agency (BPS), which are Statistics Indonesia, Districts in Figures (*Kabupaten Dalam Angka*), and Village Statistics (*Potensi Desa-PODES*).



Source: authors

**Fig 4:** Data Management of the Study

## Results and Discussion

Table 1 shows descriptive summary statistics of the data for this study of 12,628 vocational high schools in Indonesia in 2019. The data shows that the average score for the general national exam of vocational high school students was 44.34, slightly higher than the average score for the vocational exam of 41.94. The student-teacher ratio was around 6, with an extreme minimum and maximum ratio. There was a school with a minimal student-teacher ratio, in contrast to a school with a student-teacher ratio of 270. The share of vocational teachers was also relatively low, at 32.71 percent of the total school teachers. Some schools do not have vocational teachers.

On average, the damaged classrooms of the schools were 40.86 percent, and some schools had all classes classified as damaged classrooms. Only 26 percent of the vocational high schools are public schools, which shows on Table 2 that most of the vocational high schools are private schools. Based on the study programs, most are in technology and engineering (30 percent) and business management (27 percent). Interestingly, only 47.85 percent of the study programs were accredited. Based on the district's characteristics, 25 percent of the schools are in the city, and 84 percent are in the Western part of Indonesia.

To answer the research question, a cross-sectional ordinary least squares (OLS) regression of equation (2) is performed, and the results are presented in Table 3. There are two regressions: regression (1) with the dependent variable of the national exam score of general competency and regression (2) with the dependent variable of the national exam score of vocational competencies.

**Table 1.** Summary of the Descriptive Statistics

Variables	Obs	Mean	Std. Dev.	Min	Max
Avg. National Exam Score (General): 0-100	12.628	44.34	6.45	24.56	81.21
Avg. National Exam Score (Vocational): 0-100	12.626	41.94	7.50	10.00	97.82
Student-teacher ratio (ratio)	12.628	6.06	7.57	0.08	270.00
Share of vocational teachers (%)	12.628	32.71	17.76	0.00	100.00
Share of damaged classroom (%)	12.001	40.86	42.84	0.00	100.00
No. of laboratories (dummy 1=Yes)	12.628	0.18	NA	0.00	1.00
Dummy public/private schools (public = 1)	12.628	0.27	NA	0.00	1.00
Share of accredited study programs (%)	12.628	47.85	36.59	0.00	100.00
Dummy of the study program: ICT	12.628	0.22	NA	0.00	1.00
Dummy of the study program: Technology & Engineering	12.628	0.30	NA	0.00	1.00
Dummy of the study program: Business & Management	12.628	0.27	NA	0.00	1.00
Number of Base Transceiver Stations (BTS)	12.628	17.47	15.95	0.00	199.00
Dummy City/District (City = 1)	12.628	0.25	NA	0.00	1.00
Dummy Region (West of Indonesia = 1)	12.628	0.84	NA	0.00	1.00
GDP capita (IDR billion per person) 2019	12.628	61.34	72.79	6.42	760.97
Life expectancy 2019 (years)	12.628	71.04	2.99	55.12	77.55

Source: calculated from <http://datapokok.ditpsmk.net/> and BPS, 2019

The regression shows that the national exam scores, both for general and vocational competency scores, of the students in vocational high schools are positively affected by the share of vocational teachers in the school and the share of the accreditation status of study programs in the schools, at a one percent level of confidence. On the other hand, the share of damaged classrooms negatively affects the national exam scores. The student-teacher ratio and the availability of laboratories do not significantly affect the national exam scores.

An increase of one percent in the number of vocational teachers in schools can increase the average general exam scores and the average vocational competency exam score by 0.031 and 0.042 points, respectively. Though the magnitude effect of a one percent increase in the share of vocational teachers on the national exam scores was relatively small, the result shows that increasing the share of vocational teachers will increase the national exam scores of vocational students.

**Table 2.** Regression Results of School and District Characteristics on the National Exam Scores

Variables	Regression 1 National Exam Score (General Competency)	Regression 2 National Exam Score (Vocational Competency)
Student-Teacher Ratio	-0.00302 (0.00636)	0.00523 (0.00787)
Share of vocational teachers	0.0313*** (0.00302)	0.0402*** (0.00373)
Share of damaged classroom	-0.0181*** (0.00114)	-0.0186*** (0.00139)
No. of laboratories	0.179 (0.133)	0.222 (0.154)
Dummy variable of public/private schools (Public = 1)	2.602*** (0.140)	2.815*** (0.156)
Share of accredited study programs	0.00995*** (0.00140)	0.0113*** (0.00170)
Dummy variable of the program (ICT = 1)	-2.404*** (0.158)	-6.021*** (0.195)
Dummy variable of the program (Technology and Engineering = 1)	-3.977*** (0.148)	-7.108*** (0.186)
Dummy variable of the program (Business and Management = 1)	-1.519*** (0.162)	-3.529*** (0.195)
Number of Base Transceiver Station (BTS)	0.0153*** (0.00372)	0.0161*** (0.00397)
Dummy variable of urban/rural (urban = 1)	-0.111 (0.139)	-0.614*** (0.156)
Dummy variable of the region (western of Indonesia = 1)	2.772*** (0.151)	2.376*** (0.189)
Per capita GRDP	0.00499*** (0.00108)	0.00200** (0.00100)
Life expectancy	0.822*** (0.0213)	0.777*** (0.0237)
Constant	-16.27*** (1.492)	-13.03*** (1.628)
<b>Observations</b>	<b>12,001</b>	<b>11,999</b>
<b>R-squared</b>	<b>0.310</b>	<b>0.287</b>

Robust standard errors in the parentheses. \*\*\*p<0.01; \*\*p<0.05; \*p<0.1

Source: authors

There is a shortage of vocational teachers in these schools, as they lack updated and relevant practical knowledge and skills to teach their students. Vocational high schools have limited teachers, especially those who teach groups of vocational subjects. In 2015, only 22.3 percent of vocational teachers taught according to their field of competence, and the public vocational schools experienced a shortage of vocational teachers by around 40,000, while private vocational schools lacked 50,000 teachers Ministry of Education and Culture, (2016). Vocational teachers lack updated and relevant practical skills to teach in vocational high schools. Teachers' competency focuses more on the teachers who teach basic knowledge and skills such as math, literature, social sciences, religious affairs, etc. Badan Perencanaan Pembangunan Nasional, (2019). The quality of teaching of vocational teachers, among others, can be improved by applying digital technology in the teaching environment and managing the psychological well-being of teachers Kholifah, (2023).

The accreditation ensures the quality of the study programs in vocational high schools. This finding shows that a one percent increase in the school's accreditation status can increase the national exam score by 0.010 and 0.011 points. Based on the quality of schools, as indicated by the accreditation status of the study programs, from the total of 14.379 vocational high schools in 2021, 60.6 percent have no accreditation, and most are private schools. Only 14 percent are accredited as the most qualified vocational high school. There is a significant share of small and non-accredited vocational high schools. Nearly 60 percent of vocational high schools, mostly private schools, have low-quality teaching due to the establishment of vocational high schools during 2010-2015 (di Gropello, 2013; Badan Perencanaan Pembangunan Nasional, 2019; Jasmina, 2020).

Adequate facilities and infrastructure are prominent in enhancing the practical skills of vocational high school graduates. The result in Table 3 shows that the quality of the classroom has a statistically significant effect on the average national exam scores. An increase of one percent in damaged classrooms in the schools decreases the average national exam scores by nearly 0.02 points. The results show no significant impact of the student-teacher ratio and availability of laboratories on the average national exam scores.

This finding confirms previous studies showing that a shortage of qualified teachers and inadequate equipment and infrastructure in vocational high schools hinder proper practical skills training (Badan Perencanaan Pembangunan Nasional, 2019; Suharno et al., 2020; Jasmina, 2020). As in Eichhorst et al. (2012), the successful vocational education system, among others, required high-quality schooling, which is reflected in the accreditation status of the study programs, sufficient qualified teachers, and well-equipped classrooms. Low-quality teaching in vocational high schools

might result in inadequate knowledge and skills among graduates. It may disadvantage the graduates as they might have lower wages and limit their ability to find jobs that match their qualifications. Figure 2 shows that there is a significant share of vocational high schools' study programs that are not accredited, which reflects a low quality of teaching. The accreditation status of the study programs shows quality assurance of inputs and the teaching process, including curriculum and teaching methods in the schools. Better inputs, such as teachers, school facilities, curriculum, and teaching methods, increase the quality of graduates. Indonesia must improve the quality and relevance of vocational education and allocate resources towards improving the schools di Gropello et al., (2011).

The average national exam scores are relatively higher in public vocational schools compared to private vocational schools by 2.60 points for general competency and 2.82 points for vocational competency. Public vocational high schools, which only accounted for 26 percent of vocational high schools, seem to produce higher national exam scores. In addition, comparing the three main study programs, the average national exam scores of students in technology and engineering are relatively lower than those in ICT and business management by 3.98 points for general competency and 7.11 points for vocational competency. Students in the technology and engineering study program require practical skills from qualified vocational teachers and practical equipment.

For control variables of socioeconomic characteristics of the district, the results show that GRDP per capita and life expectancy in the districts positively affect the exam scores of vocational high school students. Interestingly, increasing the number of BTS in the district of vocational high schools can significantly increase the average exam scores of the students. Socioeconomic conditions are essential in supporting the students' well-being and the schools' learning environments. In addition, looking at the results based on location, it is shown that vocational high school graduates located in the western part of Indonesia have higher national exam scores than those in the eastern part by 2.72 and 2.38. The finding shows that vocational high school graduates from more developed districts in Indonesia and western Indonesia perform better in the national exams.

Table 3 shows further findings by making subsamples of schools located in the district with the per capita GRDP below and above the mean of the sample. Regression 1a and 2a provide regression for the schools located in the district with relatively lower per capita GDRP, whereas regression 1b and 2b show regression for schools located in the district with higher per capita GRDP.

The findings show consistent results that a higher share of vocational teachers, a higher share of accredited study programs, and a lower damaged classroom might lead to better national exam

scores, both general and vocational competencies. The effect of the share of vocational teachers on the national exam scores is higher for the students attending schools in the district with lower per capita GRDP. An increase of one percent in the number of vocational teachers in these schools can increase the average general exam scores and the average vocational competency exam score by 0.033 and 0.041 points, respectively. Whereas, the ones located in the district with higher per capita GRDP, an increase of one percent number of vocational teachers can increase the average general scores and vocational scores by 0.026 and 0.037 points.

**Table 3.** Regression Results based on the Location of the Schools.

Variables	Schools located in the districts with lower per capita GRDP		Schools located in the districts with higher per capita GRDP	
	Reg. 1a	Reg. 2a	Reg. 1b	Reg. 2b
	General Competency	Vocational Competency	General Competency	Vocational Competency
Student-Teacher Ratio	-0.0017 (0.0065)	0.0084 (0.0082)	0.0028 (0.0208)	-0.0038 (0.0248)
Share of Vocational Teachers	<b>0.0325***</b> (0.0033)	<b>0.0408***</b> (0.0042)	<b>0.0255***</b> (0.0069)	<b>0.0365***</b> (0.0080)
Share of damaged classroom	<b>-0.0160***</b> (0.0012)	<b>-0.0160***</b> (0.0016)	<b>-0.0247***</b> (0.0026)	<b>-0.0263***</b> (0.0028)
Number of laboratories	0.2423 (0.1430)	0.3365* (0.1706)	0.1502 (0.3085)	-0.0334 (0.3415)
Dummy public/private schools (Public = 1)	2.2724*** (0.1479)	2.4691*** (0.1730)	4.0279*** (0.3309)	4.1327*** (0.3444)
Share of accredited study programs	<b>0.0084***</b> (0.0015)	<b>0.0103***</b> (0.0019)	<b>0.0150***</b> (0.0032)	<b>0.0143***</b> (0.0036)
Dummy variable of the program (ICT = 1)	-2.2691*** (0.1711)	-5.7110*** (0.2180)	-2.6382*** (0.3706)	-6.8745*** (0.4249)
Dummy variable of the program (Tech & Engineering = 1)	-3.5059*** (0.1599)	-6.4306*** (0.2089)	-4.8401*** (0.3295)	-8.6132*** (0.3873)
Dummy variable of the program (Business & Management = 1)	-1.2878*** (0.1756)	-3.2825*** (0.2200)	-1.9316*** (0.3563)	-4.1074*** (0.3995)
Number of Base Transceiver Stations (BTS)	<b>0.0250***</b> (0.0046)	<b>0.0254***</b> (0.0050)	<b>0.0068</b> (0.0063)	<b>0.0061</b> (0.0067)
Dummy variable of urban/rural (urban = 1)	-0.3270 (0.1698)	-0.5507* (0.2038)	0.8111** (0.2507)	-0.1066 (0.2870)
Dummy variable of the region (western of Indonesia = 1)	2.4080*** (0.1639)	2.0393*** (0.2114)	4.0321*** (0.3601)	3.3254*** (0.4175)
Per capita GRDP	-0.0369*** (0.0053)	-0.0274*** (0.0068)	0.0058*** (0.0013)	0.0033** (0.0012)
Life expectancy	0.8154*** (0.0227)	0.7755*** (0.0255)	0.9025*** (0.0591)	0.8167*** (0.0662)
Constant	-14.3506*** (1.5793)	-12.0577*** (1.7453)	-23.6098*** (4.1782)	-16.4021*** (4.6412)
<b>R-squared</b>	<b>0.2987</b>	<b>0.2704</b>	<b>0.3172</b>	<b>0.3300</b>
<b>Observations</b>	<b>8818</b>	<b>8817</b>	<b>3183</b>	<b>3182</b>

Table 4 shows a comparison of the average exam scores and selected input variables of the vocational high schools based on the GRDP per capita of the districts. The average score of national exam scores is lower in schools located in districts with lower per capita GDP, for both general and vocational competencies. For example, the general competency exam score was 43,77, whereas the other schools were 45,93. The input of schools located in the districts with lower per capita GRDP is

also worse compared to the ones located in the districts with higher per capita GRDP. Providing more vocational teachers and accrediting more study programs has a higher effect in the schools located in the lower per capita GRDP.

The allocated government budget for the vocational high school is the same, regardless of the condition and location of the schools. In 2020, most vocational high schools received school operational assistance (*Bantuan Operasional Sekolah-BOS*) of IDR 1.6 million (approximately USD 114) per student per year, which was slightly higher than the funding received by general high schools (IDR 1.4 million, approximately USD 100) per student per year. However, this amount falls short of the estimated IDR 6.8 million (approximately USD 486) per student per year for vocational high schools and IDR 5.8 million (approximately USD 414) per student per year for general high schools (di Gropello, 2013).

**Table 4.** Summary Statistics of Selected Variables by the District’s Per Capita GRDP

Variables	Schools in the districts with lower per capita GRDP	Schools in the districts with higher per capita GRDP
General competency average score (0-100)	43.77	45.93
Vocational competency average score (0-100)	41.55	43.04
Share of vocational teachers (%)	32.00	34.72
Share of damaged classrooms (%)	42.45	35.9
Share of accredited study programs (%)	45.75	53.69
<b>No. of observation</b>	<b>8,818</b>	<b>3,183</b>

Source: authors

At the national level, the regulatory framework for enhancing vocational education in Indonesia is governed by Presidential Regulation No. 68 of 2022 on the Revitalization of Technical and Vocational Education and Training (TVET). In addition, the implementation of tax deduction incentives for private sector entities that support internship programs and other contributions to TVET, initiated in 2019, requires more effective enforcement Bappenas et al., (2019). Given that the administration of vocational high schools has been decentralized to provincial governments, funding is primarily allocated through the General Allocation Fund (Dana Alokasi Umum-DAU) and the Special Allocation Fund (Dana Alokasi Khusus-DAK). To enhance the effectiveness of this funding mechanism, it must be supported by capacity-building initiatives aimed at strengthening the ability of regional governments to develop and implement vocational education plans and budgets. Furthermore, it is essential to explore alternative funding mechanisms beyond central government transfers, such as the creation of a dedicated skills development fund.

## Conclusion

This study shows that the national exam scores, both general and vocational competency scores, of the students in vocational high schools are affected by the share of vocational teachers, the share of the accreditation status of study programs, and the share of damaged classrooms. The findings imply that sufficient vocational teachers, quality of schools, and adequate facilities to support practical teaching might positively affect students' performance. The positive effect is higher in the schools located in relatively lower per capita GRDP. This study suggests that it is not necessary to have a large number of vocational high schools, but more importantly, to have a sufficient number of qualified vocational high schools that can produce good quality graduates.

Vocational high school students in the public vocational schools have relatively higher average national exam scores than private school students. Moreover, students in the study programs in technology and engineering have lower national exam scores than those from ICT and business management. Students enrolled in technology and engineering vocational programs require both highly qualified instructors and access to up-to-date, industry-relevant equipment. Examining regional socioeconomic characteristics where the vocational high schools are located, the study shows that the national exam scores of vocational high school graduates in urban areas in the western part of Indonesia and more developed districts are relatively higher.

The availability of adequate and modern practical resources is essential to support effective teaching and learning processes. Furthermore, the implementation of a dual system that integrates strong industry partnerships and apprenticeship opportunities can significantly enhance student performance. The private sector plays a critical role in supporting vocational education by providing apprenticeship opportunities to students at both secondary and tertiary levels.

There are some limitations of this study. The analysis of this study is at the school level; hence, it overlooks other factors related to individual students' characteristics and grades. If data allows, analysis at the students' level is recommended. Further studies specifically for field studies in vocational high schools should be conducted to analyze what factors affect the quality of graduates of these study programs.

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