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FROM SCHOOL TO WORK: DOES VOCATIONAL EDUCATION IMPROVE LABOUR MARKET OUTCOMES? AN EMPIRICAL ANALYSIS OF INDONESIA

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ABSTRACT

The Indonesian government has been introducing revitalisation programmes for vocational schools, particularly during the period 2007 and 2011. It has targeted 7 out of 10 senior-secondary schools to be vocational schools by 2025 through new establishment or conversion of established general schools into vocational schools. To evaluate the government policy on the expansion of vocational education, this paper analyses the effects of enrolment in vocational senior-secondary schools on four labour market outcomes; namely, labour force participation, risk of unemployment, job formality, and income. Using a rich socioeconomic survey from the Indonesian Family Life Survey, we find that public vocational education provides better labour outcomes for females than public general schools. However, no such difference is found for males. Moreover, our results suggest that many vocational schools, especially private ones, performed poorly in terms of their graduate's job formality and income.

Keywords: Vocational education; General education; Senior-secondary school; Labour market outcomes.
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I. INTRODUCTION

Increasing the provision of vocational education is often an appealing option for policymakers in developing countries, primarily to raise employment. Vocational education allows students to learn specific job-relevant skills making them more work ready (Tilak, 2002). However, government-sponsored pre-employment vocational education and training programs have been especially controversial. On the one hand, the government attempts to solve the market or institutional failure by filling the gap in the current low level of investment in training (Friedlander *et al*., 1997). On the other hand, investment in training is deemed to be more suitable if it is provided by the industry which is more aware of the skills needed (Hashimoto, 1994).

The supporters of vocational education argue that instilling technological knowledge based on what happened during the British industrial revolution, followed by Germany and Japan, is an instance that economic progress heavily depends on technical know-how (Psacharopoulos, 1997). Moreover, Arum and Shavit (1995) argue that vocational education is a safety net that reduces the risk of falling to the bottom of the labour queue, especially when students are unlikely to continue to college. Nonetheless, general education is seen as creating 'general human capital' that may carry the advantage of flexibility and transferability over one's life and from one job to another, and to some extent, from one country to another. Meanwhile, the stigma that vocational education is less selective, less competitive, and less prestigious than other upper-secondary school, entail a certain degree of negative presumption, leading to discrimination when candidates compete for limited access to higher education (Chen, 2009).

For fast-growing developing countries like Indonesia, the significance of workers with middle-level skills – those that have more education and training than a senior-secondary school diploma but less than a four-year college degree – is widely recognised. There is a critical need for workers to fill these middle-level-skill jobs, but there is a severe shortage of workers with the right skills and training to fill them. As a result, the government initiated the expansion program of vocational education to provide education and training to increase students' qualifications for entry-level jobs. These revitalisation programmes for vocational schools (*Sekolah Menengah Kejuruan or SMK*) have been initiatives of the Ministry of National Education and Culture (MNEC), which have schools seen an increase in the number of new vocational schools, often at the expense of new general school projects. In addition, some already established general schools were converted into vocational schools. From 2009 to 2014, approximately 3,000 new SMK were built. In early 2017, the number of SMK in Indonesia reached 13,710 schools (3,557 were public and 10,153 were private). The number of students enrolled in SMK nearly doubled from that in 2007 to approximately 5 million students in 2018. In general, the proportion of SMK to total senior-secondary schools reached 44 percent in 2018 (MNEC, 2018).

This paper examines the effects of the type of senior-secondary school on student's labour outcomes, including odds of participating in the labour force, being in employment, working in the formal sector, and increasing worker income. From policy perspective, this paper explains the benefits, if any, of vocational education initiatives of the Indonesian government.

Discussion on vocational education outcomes as part of the mainstream education system, especially in developing countries, is still lacking. Moreover, empirical evidence on the benefit of vocational education is far from conclusive. Brunello and Rocco (2015) find that vocational education graduates, for both genders, earn a wage premium in the US and Canada. Using microdata for 11 countries from International Adult Literacy Survey (IALS), Hanushek *et al*. (2017) show that although individuals completing a vocational education are more likely to be employed when young, this employment advantage diminishes with age. As for developing countries, a study by Chakravarty *et al*. (2019) finds that vocational training programs in Nepal generate an increase in non-farm employment and monthly earnings, particularly for females who start self-employment activities. Popescu and Roman (2018) find that, in Romania, vocational training has a positive, but modest impact on employability.

In Indonesia's context, research conducted by Chen (2009) suggests that attending vocational schools is significantly correlated with low academic achievement, which lowers the likelihood of entering university. Besides, research by Newhouse and Suryadarma (2011) states that the type of school – whether it is public or private – strongly influences labour market outcomes.

Building on the earlier works, our study adds a further understanding of how government investment in the nationwide vocational school expansion program improves its graduates' labour outcomes by focusing on Indonesia. It also considers the role of SMK as part of the mainstream education system but also checks the effects of other types of upper secondary school on labour market outcomes. Our study examines primary data from the Indonesia Family Life Survey (IFLS) using a probit model. Moreover, this paper carefully tackles the problem of selection bias and endogeneity. These problems cause biased and inconsistent parameter estimates and were unaccounted for in previous studies. Instrumental variable estimation is used to correct the possible downward bias on labour outcomes among vocational school graduates.

Foreshadowing the main findings, this paper shows that public vocational education provides better labour outcomes for females, relative to public general schools. However, public vocational school education did not provide a clear advantage for male graduates when entering the workforce. This paper also finds that vocational education premium gradually declines over time, even at a faster rate than general education.

The rest of this paper is structured as follows. Section II discusses the data and methodology. Subsequently, Section III provides the analysis of the effects of senior-secondary school type on labour market outcomes, while Section IV discusses the heterogeneity effect of senior-secondary school type, by age and academic ability. Section V provides concluding remarks.

II. DATA AND METHODOLOGY

A. Data Characteristics

The Indonesia Family Life Survey (IFLS), a rich continuing longitudinal socioeconomic survey, provides a unique opportunity to explore the effect of school type on labour outcomes. This study's primary data are sourced from IFLS

waves 3, 4, and 5, which were fielded in 2000, 2007, and 2014, respectively. Not all observations from all three waves were used; instead, the sample is selected using several criteria. First, individuals who have completed senior-secondary school were identified. Next, employment information for the individual in the first step was obtained. Here, individuals who did not provide answers to interview questions after they graduated from senior-secondary schools are dropped. Moreover, individuals who were currently enrolled in school or university when interviewed are not included in our analysis.

The final sample consisting of 6047 labour market observations for males and 6023 observations for females were derived and grouped into three cohorts. Those who are born anytime between 1947 to 1969 are categorised in the old cohort, those who were born during the period 1970 to 1979 are categorised in the middle cohort, and those born over the period 1980 to 1987 are categorised in the young cohort. The IFLS collected information on national final examination at primary school, junior secondary school, and senior-secondary school for the middle and young cohort. Therefore, for these two recent cohorts, a direct measure of academic ability using the national final examination score is available.

The dependent variables are the four different labour outcomes, including labour force participation, employment, job formality, and income. Information on labour outcomes is obtained from one's primary job, which consumes most working hours. The definition of labour force participation, employment, and job classification align with those of Indonesia's Central Bureau of Statistics. Labour force participation is defined as individuals who have jobs, are actively looking for jobs, or are temporarily not working or unemployed. Meanwhile, employment is specified as those who work, try to work, or help to earn income for pay for at least one hour during the past weeks. Concerning job classification, as presented in Table 1, the study differentiates between formal and informal employment. This paper uses income per month, instead of per hour, as there is no direct question on the number of hours worked in the IFLS survey.

Table 1.
Classification between Formal and Informal Employment

This table summarises the classification between formal and informal employment based on Indonesia's Central Bureau of Statistics definition in Indonesia Labour Market Reports (World Bank, 2010).

Work Category	Industry	
	Agriculture	Non-Agriculture
Unpaid family workers	Informal	Informal
Self-employed	Informal	Informal
Self-employed with unpaid family worker/temporary worker	Informal	Formal
Self-employed with a permanent worker	Formal	Formal
Government worker	Formal	Formal
Private worker	Formal	Formal
Casual worker	Informal	Informal

Among the explanatory variables used to explain labour outcomes, the variable of interest in this paper is the type of senior-secondary school, which includes public general, public vocational, private general, and private vocational. Besides, IFLS collects a rich set of socioeconomic information, which enables the author to use a set of explanatory variables to control for non-random selection more carefully. This information is very crucial because the inability to control for unobserved determinants of school choice and labour outcomes may confound the estimates through spurious correlations to outcomes. The explanatory variables include personal characteristics (gender, age, location of residence, marital status, university attendance, and examination scores), parents' educational background, and community characteristics.

B. Methodology

Analysis of labour market outcomes is prone to sample selection problems as the observed sample based on school choice is non-random. Failure to consider this problem may lead to biased and inconsistent estimates of the parameters of interest. Determination of labour outcomes generally causes a high correlation between the non-observable characteristics affecting labour outcomes and those that simultaneously determine the school choice in which the individuals attended. For example, this could be due to parents' decision or entrance selection criteria implemented by some schools. Also, differences in the type of school selected can indicate students' abilities in which those with higher ability will be more likely to attend public general schools. In addition to selection bias due to school choice, there is another potential bias coming from non-random selection into labour force participation and employment, which may affect the estimates of school type on job formality and income. For example, the ability may be correlated with the likelihood of each type of school graduates chooses to work. Therefore, this paper controls as many pre-determined or exogenous characteristics as possible. Analogous to the randomised trial study by Attanasio *et al*. (2011) on vocational training subsidies in Columbia, including pre-treatment characteristics, increases the estimates' precision and helps control any remaining baseline imbalances. Instrumental variable analysis is also used to correct for endogeneity bias, which potentially to be a downward bias on labour outcomes among vocational school graduates.

This study uses a probit model to estimate the conditional probability of a binary outcome. Moreover, multivariate linear regression is used to model the continuous dependent variable to analyse different school types of effects on labour market outcomes. The probit and linear regression model take the following form:

$$labour\_outcome_{i,t} = \beta_0 + \beta_1 schl\_choice_{i,t} + X'_{i,t}\gamma_1 + X'_{h,t}\gamma_2 + X'_{j,t}\gamma_3 + \alpha_j + \delta_t + \varepsilon_{i,t} \quad (1)$$

The dependent variable $labour\_outcome_{i,t}$ consists of four different labour outcomes. The first three variables – labour force participation, employment, and job formality – are dummy variables that take the value of 1 if an individual i participates in the labour force, has employment, works at the formal sector, and 0 if otherwise. The

fourth labour outcome, monthly income, is a continuous dependent variable. The variable of interest is $schl\_choice_{i,t}$ of individual i at time t. $X'_{i,t}$; $X'_{h,t}$; $X'_{j,t}$ are vectors of individual-, household-, and province-specific control variables, respectively. In addition, α_j is the provincial fixed effect, whereas δ_t is the time dummy used to capture structural change over time. Regarding diagnostic checking, for the probit regression, we examine for model sensitivity and specificity, as well as for outliers and influential observations. Meanwhile, for the multivariate linear regression, diagnostic analysis includes a test for linearity, normality, homoscedasticity, multicollinearity, independence, model specification, and influential observations.

Table A1 (in the Appendix) shows summary statistics for the variables included in this analysis. Aside from the four different school types, this paper's empirical model also controls for some explanatory variables, including age, location of residency (urban/rural), gender, marital status, cognitive score, university attendance, and cohort dummy. This set of explanatory variables is also used in many other studies analysing the effect of education on labour outcomes, such as Newhouse and Suryadarma (2011), Korber and Oesch (2019), Choi *et al*. (2019). According to human capital theory, educational attainment increases cognitive skills and hence improves labour market outcomes, such as productivity and earnings (Becker, 1964; Mincer, 1974; Blinder and Weiss, 1976; Heckman, 1976; Rosen, 1976; Bartel and Borjas, 1977).

III. MAIN FINDINGS

This section provides a discussion on main findings of our empirical analysis. We use probit and multivariate linear regression models to estimate the effects of the type of upper-secondary school on labour market outcomes. We also use instrumental variable analysis to correct for endogeneity bias, which has a potential downward bias on labour outcomes among vocational school graduates. Additionally, for robustness check we estimate regressions among samples that have information test scores, both by involving and omitting test scores, to see whether leaving out test score may cause significant bias.

A. The Effect of School Types on Labour Outcome

Table 2 summarizes how different types of schools, relative to public general schools, affect labour outcomes.

Table 2.
The Effect of School Types on Labour Outcome, Male and Female

This table reports how different types of schools, relative to public general schools, affect labour outcomes. Standard errors robust to heteroscedasticity are in parentheses; *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively. Public General acts as a baseline among the four school types. Results are presented for selected variables, as school choice is the main interest of this study. Pseudo R^2 is reported for probit, while R^2 is reported for OLS.

	Marginal Effect (at the Mean)							
School Choice	Male				Female			
	LFP	Employment	Formal	Income	LFP	Employment	Formal	Income
	Probit	Probit	Probit	OLS	Probit	Probit	Probit	OLS
Public Vocational	0.007	0.013	0.003	-0.020	0.034*	0.042**	0.050**	0.056
	(0.008)	(0.010)	(0.019)	(0.051)	(0.018)	(0.019)	(0.022)	(0.076)
Private General	0.008	0.007	-0.044***	-0.206***	-0.026*	-0.023	-0.018	-0.078
	(0.007)	(0.009)	(0.015)	(0.042)	(0.015)	(0.015)	(0.019)	(0.067)
Private Vocational	0.013*	0.006	-0.017	-0.137***	0.026	0.0248	-0.007	-0.129*
	(0.007)	(0.009)	(0.016)	(0.046)	(0.016)	(0.017)	(0.020)	(0.069)
Observations	5997	6047	5481	5104	6023	6023	3685	3087
R2 or Pseudo R2	0.21	0.24	0.069	0.3818	0.09	0.07	0.11	0.2675

There is no significant difference in the four labour market outcomes between those who graduated from public vocational schools and public general schools among males. Students who graduated from private general schools are the most disadvantaged groups, followed by those who graduated from private vocational schools. Regarding the likelihood of job formality, those who attended private general schools have the least probability of working at formal sectors relative to the other three school types, accounting for 4.4 percentage points lower. Those who graduated from private general and private vocational receive a significantly lower wage than those from public general schools, on average 20.6 percent and 13.7 percent, respectively. Therefore, for males, graduates' success is more dependent on whether they graduate from public or private schools than whether they are studying in general or vocational schools.

The finding that those who graduated from private schools, either general or vocational, have the worst performance is in accordance with the study by Dilas *et al.* (2019) stating that many private providers for secondary schools in Indonesia are smaller and of lesser quality. Even though student-to-teacher ratios in private secondary schools are lower, they tend to have lower-qualified teachers and inadequate facilities than public secondary schools. Newhouse and Beegle (2006), using data from Indonesia Family Life Survey (Wave 1 to Wave 3), seconds the argument and indicates that graduate from public junior secondary schools, controlling for a variety of other characteristics, score 0.15 to 0.3 standard deviations higher on the national exit exam than comparable privately schooled peers. Moreover, the lower outcomes among private school graduates are also likely to be influenced by employers' perspectives on their graduates' quality. Di Gropello *et al.* (2011) suggest that in Indonesia, employers display a clear preference for public school graduates and report high levels of dissatisfaction with students

of private secondary institutions. Over 27 percent receive "poor" ratings according to the Employer and Employee Skill Surveys in 2008.

Females who attended public vocational schools, on the other hand, have about 3.4 percentage points higher probability of being in the labour force. In comparison, those who attended private general schools have 2.6 percentage points lower probability. Moreover, those who graduated from public vocational schools have 4.2 percentage points higher probability of employment and a 5.0 percentage point higher probability of working in formal sectors. Nevertheless, females who graduated from private vocational education programs receive about a 12.9 percent wage penalty. Hence, in general, enrolling in public vocational schools provide better prospects of labour outcomes for females. The study conducted by the World Bank (2010) also shows similar patterns in which employment rate is 62.9 percent among female who graduated from vocational schools, 2.2 percentage points higher compared to those graduated from general schools. Nevertheless, the proportion of casual workers is higher among females who graduated from vocational schools at 11.7 percent, relative to 8.7 percent of those who graduated from general schools. This study suggests that although female vocational graduates are slightly more likely to be employed, they are also more likely to have an inferior job.

The higher outcomes for employment and job formality among female public-vocational graduates are also likely to be promoted by Indonesia's growth in the service sector. Many of its components, such as communication, hotel, and tourism, also have a high share of female workers. According to BPS, the GDP share of the service sector reached more than 40 percent in 2019, and its contribution grew at an average of 7 percent between 2010 and 2019. Based on the ILO data, female employment in the Indonesian service sector accounts for almost 60 percent of female employment in 2019, more than double of those working in industry and agriculture sectors, which is at 17 percent and 26 percent, respectively. Over the period 2010 to 2019, the proportion of females working in the service sector experienced faster growth (nearly 10 percent), while industrial sector grew by 2 percent and the agricultural sector, on the other hand, experienced a decline in growth by 11 percent. However, these positive results do not provide a complete picture of the quality of employment among females. Although access to jobs is easier, females often receive lower wages, minimal job security, and find themselves clustered at the lower echelons (ILO, 2016).

B. Instrumental Variable Estimates of Labour Outcomes

Instrumental variable estimations are carried out to correct for endogeneity bias. The results obtained using the Two-Stage Least Squares (2SLS) are presented in Table 3.

The estimation of labour outcomes reflects unobserved factors correlated with the school choice variable, such as workers' ability, motivation, or other systematic differences that may affect the labour outcomes. For instance, those who attended vocational schools relatively have less favourable conditions than those who attended general schools. Therefore, when the level of labour outcomes between the general and vocational schools are on average the same, this may indicate

that vocational schools can improve the labour outcomes of their students (Chen, 2009). In other words, there is a possibility of downward bias or underestimating the positive effect of attendance at vocational schools.

Table 3.
Instrumental Variable Estimates of Labour Outcomes, Male and Female

This table reports the results of instrumental variable estimation using the Two-Stage Least Squares (2SLS). Standard errors robust to heteroscedasticity are in parentheses; *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively. Public General acts as a baseline among the four school types. Results are presented for selected variables, as school choice is the main interest of this study. The sample size is reduced to 4966 for males and 4481 for females since only samples with non-missing values for the instrumental variables are included in the analysis.

2SLS								
School Choice	**Male**				**Female**			
	LFP	**Employment**	**Formal**	**Income**	**LFP**	**Employment**	**Formal**	**Income**
Public Vocational	0.272	0.464	0.479	2.649	0.744**	0.574*	0.599	-0.789
	(0.404)	(0.433)	(0.493)	(3.228)	(0.339)	(0.342)	(0.507)	(1.404)
Private General	-0.200	-0.139	-0.334	-2.768	0.0521	0.0801	-0.327	0.263
	(0.268)	(0.287)	(0.398)	(2.400)	(0.230)	(0.232)	(0.368)	(1.035)
Private Vocational	-0.238	-0.306	-0.510	-6.428***	-0.198*	-0.202*	-0.262	-1.692***
	(0.224)	(0.240)	(0.379)	(2.159)	(0.116)	(0.117)	(0.180)	(0.546)
Observations	4966	4966	3046	2566	4481	4481	4016	3729
Overidentification test (*p*-value)	0.3126	0.2389	0.6667	0.5717	0.3748	0.1482	0.6942	0.9254

This paper uses multiple instrumental variables to correct for endogeneity bias, including parents' educational backgrounds and other individual characteristics that are not directly correlated with labour outcomes such as "ever failed" or "repeated grade" and "ever worked" during primary or junior secondary school. One of the significant factors important in explaining school choice is the parents' educational background. Students whose parents have a high level of educational attainment are more likely to attend public general schools. Academic ability is also an essential factor influencing school choice, which can be seen from the students' past academic ability during primary or junior secondary school. Newhouse and Suryadarma (2011) find that students who have never failed or repeated grades during primary or junior secondary school have a higher probability of attending public senior-secondary schools, either general or vocational schools. Moreover, it is also argued that students who had previously worked during primary or junior secondary schools were more likely to choose vocational senior-secondary schools because these types of school teach them skills that can be used immediately to find employment.

The selected instruments should have no direct influence on labour outcomes and have a strong relationship with school choice (relevance). The instruments can also not be correlated with the error term in the structural equation (exogeneity or validity). The null hypothesis that the instruments are not correlated with the endogenous variable is rejected; this shows that the instruments satisfy the relevance assumption. Moreover, *F*-test indicates that the instruments are jointly

significant in explaining school choice. Although the validity assumption cannot be tested, a test on whether the estimates change depending on which subset of instruments is used can be conducted because more instruments are available than needed. This test's basic intuition is that if all instruments are valid, then the different estimates should be similar. The Sargan-Hansen tests on overidentifying restrictions show a failure to reject the null hypothesis that the instruments are valid, i.e., uncorrelated with the error term. Hence, in this case, the excluded instruments are correctly excluded from the estimated model.

IV estimations in Table 3 indicates positive outcomes among female public-vocational-school graduates, particularly on labour force participation. However, it is very difficult to be sure on the instrument's validity test (although in this case Sargan-Hansen tests on overidentifying restrictions is used) and there might still be endogeneity in the instruments. There is still possible correlation between the instruments and the structural error term. For example, the availability of a particular type of school may be correlated with other unobservable community characteristics, which also could affect labour outcomes. Even when the instruments are valid, there is still a problem of weak instruments. The weak identification tests using *F*-statistics version of the Kleibergen and Paap (2006) indicate weak instruments. In addition, we use the Angrist and Pischke (2008) procedure to check for weak instruments by comparing the 2SLS with the Limited Information Maximum Likelihood (LIML), where the outcomes of the later are not presented considering the limited space. The *F*-statistics on the excluded instruments are 29.86 for males and 34.35 for females in the safe region (the rule-of-thumb is that *F*-statistics above 10 are in the safe region). Using the same set of instruments, the overidentified 2SLS estimates are quite different from those of median-unbiased LIML estimates. Therefore, weak instruments are probably a problem and may lead to several negative consequences, including considerable inconsistency even in only small violations of instruments validity, finite sample bias that can be substantial even in a large sample, high standard errors, and change in the asymptotic distribution of the IV estimators that impedes inferences.

C. Robustness to Test Scores

Table 4.
The Effect of School Types on Labour Outcomes, With and Without Test Scores

This table reports the regression results that involve test scores and those that do not to check for the robustness when omitting test scores in the estimation. Standard errors robust to heteroscedasticity are in parentheses; *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively. Public General acts as a baseline among the four school types. Results are presented for selected variables, as school choice is the main interest of this study. Pseudo R^2 is reported for probit, while R^2 is reported for OLS.

	Marginal Effect (at the Mean)							
	With Test Scores				Without Test Scores			
School Choice	LFP	Employment	Formal	Income	LFP	Employment	Formal	Income
	Probit	Probit	Probit	OLS	Probit	Probit	Probit	OLS
Public Vocational	0.029	0.040	-0.003	-0.055	0.0294	0.0399	-0.00561	-0.0543
	(1.03)	(0.032)	(0.039)	(0.126)	(0.029)	(0.0322)	(0.039)	(0.127)
Private General	-0.027	-0.014	-0.062*	-0.098	-0.0263	-0.0138	-0.0553*	-0.152
	(-1.11)	(0.028)	(0.033)	(0.117)	(0.024)	(0.0273)	(0.033)	(0.117)
Private Vocational	0.049*	0.034	-0.074**	-0.108	0.0491**	0.0325	-0.0635*	-0.170
	(1.92)	(0.028)	(0.033)	(0.113)	(0.029)	(0.040)	(-0.006)	(-0.054)
Observations	1875	1875	1312	1124	1875	1875	1312	1124
R^2 or Pseudo R^2	0.15	0.11	0.11	0.40	0.15	0.11	0.11	0.40

Not involving main variables explaining the variation in labour outcomes, such as academic ability, may lead to an estimation bias. Since the data on test scores is only available to those born after 1975, to find out how severe the exclusion of this variable affects estimation bias, the regressions are re-estimated among samples that have information on this variable, both by involving and omitting test scores. These results are reported in Table 4. We find no significant difference between the regression results that involve test scores and those that do not. This implies a weak correlation between test scores and the four labour outcomes, conditional on other explanatory variables included in the regression. Therefore, leaving out the test score from the estimation is not the primary source of bias.

IV. HETEROGENEOUS EFFECTS OF LABOUR OUTCOMES

A. Heterogeneous Effects of Labour Outcomes by Age

This section will discuss the heterogeneity aspect that occurs across time during the careers between students from public general schools and public vocational schools.

Figure 1.
Estimated Probability of Labour Force Participation

This figure compares the predicted probability of labour force participation between public general and public vocational school graduates. This information is sourced from the author's estimation.

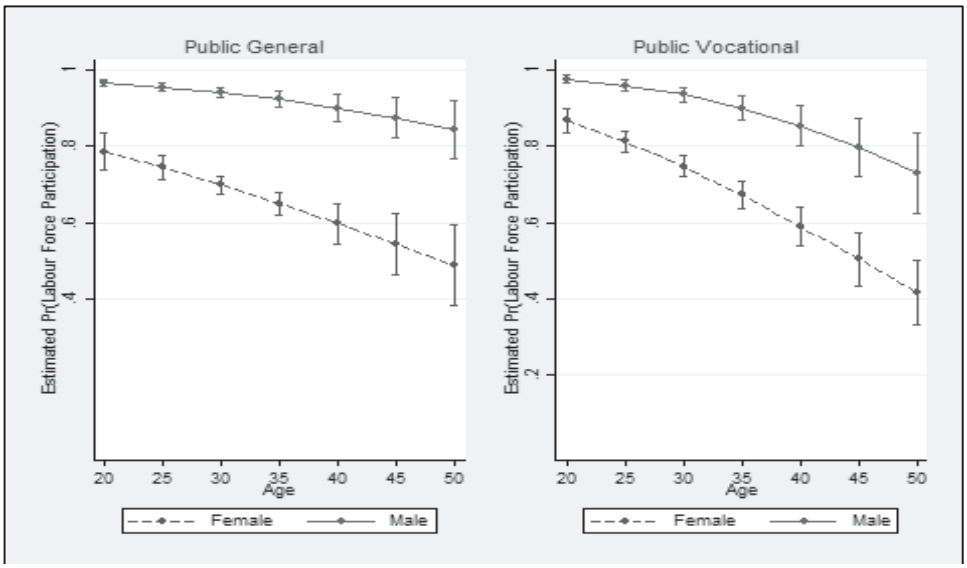
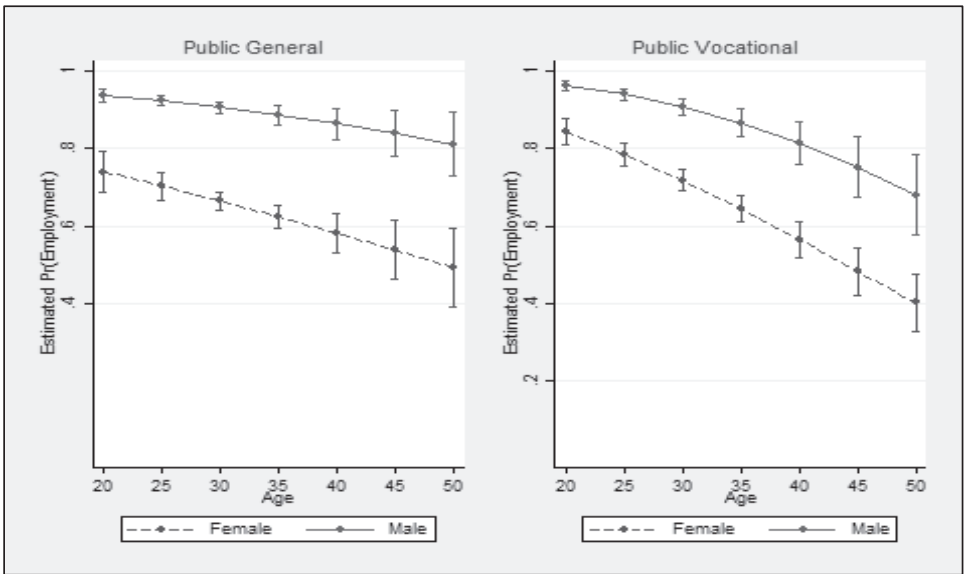


Figure 2 shows the predicted probability of labour force participation. Overall, males have a higher predicted probability of participating in the labour force than females, both for those who have attended public general and public vocational schools. Early in their career age, males who have graduated from both public general and public vocational schools have the same predicted probability of participating in the labour force, which is around 0.9. Nonetheless, males who have graduated from public vocational schools experience a steeper decline in the predicted probability of being in the workforce, especially starting at the age of 35. The predicted probability of being in the labour force for females is similar to that for males. However, compared to males, a decreasing effect in the predicted probability of labour force participation for females is higher, seen from its steeper slope. This finding could suggest that due to breadwinner role models or other reasons, males may be more receptive to substantial employment hardships before accepting nonemployment during their prime age, relative to females. This result is consistent with the finding by Forster *et al.* (2016) that the early-career advantage of vocational education reverses faster into a disadvantage for females than males.

Figure 2.
Estimated Probability of Employment

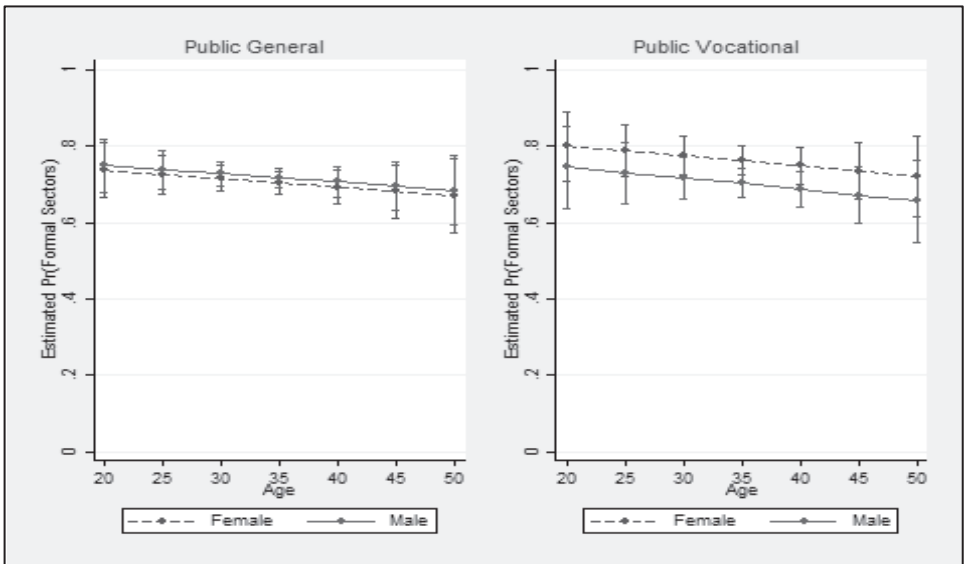
This figure compares the predicted probability of employment between graduates of public general and public vocational schools. This information is sourced from the author's estimation.



The predicted probability of employment (Figure 3) has almost the same pattern as that of labour force participation. In general, males have a higher predicted probability of getting a job than females. When males are at age of 20, the predicted probability of employment of those who have graduated from public vocational school is slightly above than those who have graduated from public general schools. Nevertheless, males who have graduated from public general schools experience a slower decline along with their age in terms of probability of employment than those who have graduated from private general school, when they are 50 years old. Meanwhile, females with vocational education have higher predicted probability of employment compared to those with general education. However, as females get older, those who have graduated from public vocational schools have a more rapid decline in the predicted probability of employment. This trend is consistent with Hanushek et al. (2017) study, which finds that individuals completing a vocational education are more likely to be employed when young. Still, this employment advantage diminishes with age as skill-specific demand will drop for some specific vocational skills at any given time.

Figure 3.
Estimated Probability of Job Formality

This figure compares the predicted probability of job formality between graduates of public general and public vocational schools. This information is sourced from the author's estimation.



In general, the predicted probability of job formality (Figure 4) has a declining pattern throughout someone's life, for both males and females. A steeper decline in job formality's predicted probability is experienced by those who have graduated from public vocational schools. The difference in the predicted probability of job formality between males and females who have graduated from public general schools is insignificant. Interestingly, for graduates from public vocational schools, females have a higher predicted probability of working in the formal sector than males who have graduated from the same school type. This can be explained by the rapid growth of Indonesia's service sector (Findlay and Pangestu, 2016). Accordingly, most females who attended vocational school choose majors related to the sectors, such as finance, business management, and hospitality. Nevertheless, although female vocational-school graduates are more likely to secure formal employment, there is still a severe gender gap in employment and job quality, meaning that females have limited access to employment-related social protection. This includes lower rates of formal wage and salaried employment, together with fewer hours and fewer years in insured employment for females (ILO, 2016).

Figure 4.
Marginal Effect on Log Income

This figure compares the marginal effect on log income between graduates of public general and public vocational schools. This information is sourced from the author's estimation.

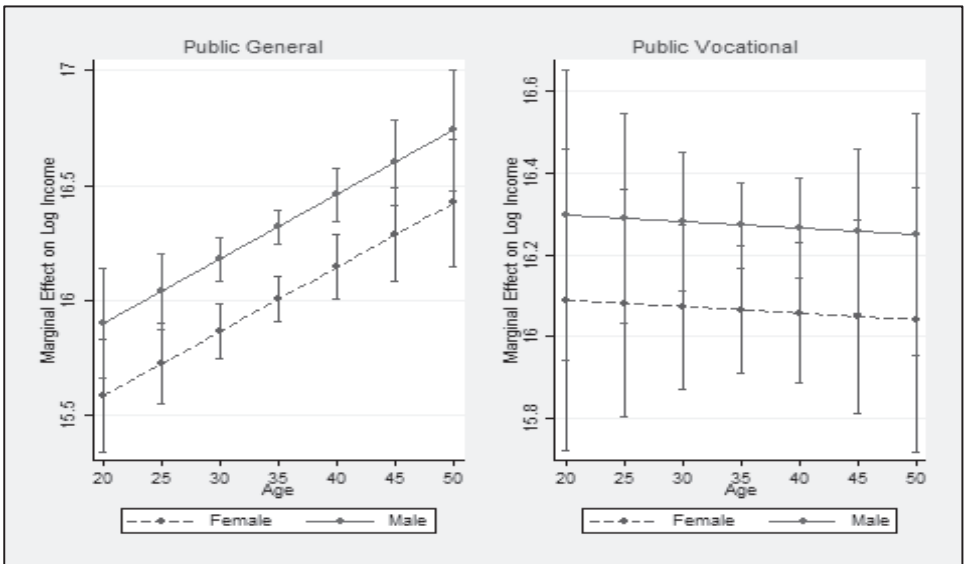


Figure 5 displays the marginal effect of log income, the difference in the marginal effect of log income between public general and public vocational graduates. Regardless of the school types, males, in general, enjoy a higher income effect than females. However, both males and females show similar patterns with respect to the change in log income across their lifetime. At the beginning of a career, the marginal effect on log income is higher for those who have graduated from public vocational schools than those who have graduated from public general schools. However, as individuals get older, those who have graduated from public general schools receive an increasing marginal effect on their log income. Meanwhile, individuals who attended public vocational schools experience a decline in the marginal effect on log income over their lifetime. Like in the employment case, a similar pattern of these findings on earning is also found in a study by Hanushek *et al*. (2015), in which general-education individuals earn initially less and later more than vocational-education individuals. This pattern is also supported by Korber and Oesch (2019), who find that vocational education is associated with substantially lower earnings once workers enter their thirties, and this disadvantage is larger among females.

B. Heterogeneous Effects of Labour Outcomes by Academic Ability

Here we will discuss the heterogeneity of labour outcomes based on students' academic ability differences. This is conducted by comparing students with below- and above average test scores, either on junior or senior-secondary examinations.

Most of the results reported in Table 5 are insignificant at least at the 5 percent level. The insignificance of results could be due to the low sample size as data on test scores, for junior- and senior-secondary, is only available for 3835 and 3313 samples, respectively. The sample size is then reduced to 2211 for males and 2351 for females given only variables with non-missing values are included in the analysis. Despite the insignificance, the results can still provide useful inference on the heterogeneity of labour outcomes based on students' academic ability differences.

Table 5.
Test Scores and the Effect of School Types on Labour Outcomes, Male

This table presents the heterogeneous effects of labour outcomes by academic ability observed from the test scores among male graduates. Standard errors robust to heteroscedasticity are in parentheses; *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively. Results are presented for selected variables, as school choice is the main interest of this study.

	Marginal Effect (at the Mean)							
	Below Average Test Score				Above Average Test Score			
School Choice	LFP	Employment	Formal	Income	LFP	Employment	Formal	Income
	Probit	Probit	Probit	OLS	Probit	Probit	Probit	OLS
Public Vocational	0.0342	0.0966*	0.00405	0.224	0.0305	0.0469	-0.0277	0.0446
	(0.0408)	(0.0519)	(0.0665)	(0.195)	(0.0228)	(0.0289)	(0.0386)	(0.118)
Private General	-0.0144	0.0108	-0.0307	-0.00335	-0.00588	-0.0175	-0.0403	-0.123
	(0.0247)	(0.0327)	(0.0479)	(0.150)	(0.0170)	(0.0234)	(0.0339)	(0.108)
Private Vocational	0.0336	0.0337	-0.0321	-0.0308	0.0323*	0.000879	-0.0462	0.0387
	(0.0239)	(0.0311)	(0.0463)	(0.142)	(0.0196)	(0.0237)	(0.0342)	(0.110)
Observations	834	880	710	609	1224	1331	1122	1004
R^2 or Pseudo R^2	0.1890	0.2322	0.1107	0.4825	0.1922	0.2070	0.1334	0.4449

According to Table 5, male public-vocational school graduates with below-average test scores have higher employment opportunities than public general graduates. On the other hand, among public vocational graduates, males who scored above average in the national final examination receive a lower increase in employment opportunities than those with below-average scores. Moreover, when they are already employed, male vocational-school graduates with high test scores have a lower probability of working in the formal sector. This could suggest that being enrolled in a public vocational school is more beneficial for males with low academic ability. This finding has a similar pattern to that of Rose (2006) – although the study does not incorporate the effect of school type – it finds that test score gains positively affect the probability of employment for low-scoring male-students.

The results for females are presented in Table 6. Among graduates with low test scores, attending public or private vocational schools provide a lower opportunity to work in formal sectors with a significant wage penalty. This result could suggest that females with below-average test scores are the most disadvantaged by enrolling at public vocational schools, followed by those enrolling at private vocational schools. Meanwhile, unlike males, females with higher academic ability

are more likely to benefit from attending public vocational schools regarding job formality.

Table 6.
Test Scores and the Effect of School Types on Labour Outcomes, Female

This table presents the heterogeneous effects of labour outcomes by academic ability observed from the test scores among female graduates. Standard errors robust to heteroscedasticity are in parentheses; *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively. Results are presented for selected variables, as school choice is the main interest of this study.

	Marginal Effect (at the Mean)							
	Below Average Test Score				Above Average Test Score			
School Choice	LFP	Employment	Formal	Income	LFP	Employment	Formal	Income
	Probit	Probit	Probit	OLS	Probit	Probit	Probit	OLS
Public Vocational	0.0249	0.0229	-0.224***	-0.600**	0.0125	0.0144	0.0681*	0.156
	(0.0567)	-0.0583	(0.0676)	(0.237)	(0.0341)	(0.0356)	(0.0409)	(0.152)
Private General	-0.0417	-0.0327	-0.0824	-0.0695	-0.0148	-0.0141	-0.0236	-0.111
	(0.0424)	-0.0444	(0.0503)	(0.195)	(0.0315)	(0.0329)	(0.0350)	(0.134)
Private Vocational	-0.0105	0.0215	-0.112**	-0.125	0.0333	0.0317	-0.00834	-0.217
	(0.0420)	-0.0438	(0.0518)	(0.197)	(0.0321)	(0.0335)	(0.0362)	(0.133)
Observations	856	856	476	404	1,495	1,495	915	777
R^2 or Pseudo R^2	0.1372	0.1060	0.1831	0.3932	0.1202	0.0926	0.1941	0.3459

The benefit of vocational education among females with high academic ability indicates that they face a higher opportunity cost of staying at home, hence, they choose to work or look for jobs actively. Moreover, our results may suggest that the positive outcomes among female public-vocational graduates presented in Table 2 are likely to be driven by females with above-average test scores. In that light, although the study does not directly control for different school types, Rose (2006) finds that for females, test score gains have strong positive effects on the probability of being employed and on earnings once employed. Curie and Thomas (1999) also show that, among females, those who scored in the top quartile of the reading distribution have wages 26 percent higher than those who scored in the bottom quartile.

V. CONCLUSION

The results obtained in this study suggest that public vocational education provides better labour outcomes for females relative to public general schools. The higher outcomes for employment and job formality among female public-vocational graduates are also likely to be promoted by Indonesia's growth in the service sector. Female employment in the Indonesian service sector accounts for almost 60 percent of female employment in 2019. However, these positive results do not provide a complete picture of the quality of employment among females. Although female vocational graduates are more likely to be employed, they are also more likely to have an inferior job. Meanwhile, public vocational school education did not provide a clear advantage for male graduates when entering the workforce. For males, graduates' success was more dependent on whether

they graduate from public or private schools than whether they studied in general or vocational schools. Students who have graduated from private schools, either general or vocational, are the most disadvantaged groups.

This paper also finds that the advantage of enrolling in a vocational education gradually declines over time due to outdated skills possess and limited opportunity for continuous training. The diminishing return is worse among females, consistent with Forster *et al.* (2016) that the early-career advantage of vocational education reverses faster into a disadvantage for females compared with males. This issue demands labour market policies that provide continuous learning opportunities for better skills to vulnerable workers, including females. A comprehensive approach through empowerment and capacity building strategy could be adopted based on lifelong investment in education and training. In addition, the results indicate that the vocational education expansion policy is likely to hurt male students with higher academic ability. It is imperative to review this policy as these students are the most vulnerable to losses, especially when current economic conditions are increasingly valuing employers with general cognitive expertise.

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APPENDIX

Table A1: Summary Statistics

Variable Name	Description	Obs	Mean	Std. Dev.	Min	Max
	Dependent Variables					
LFP (Labour Force Participation)	1 = Participate in the labour force	12,070	0.8133	0.3897	0	1
Employment	1 = Employed	12,070	0.7895	0.4077	0	1
Formality	1 = Work in formal sector	12,070	0.7084	0.4545	0	1
Log (Earning)	Log of yearly income (salary and profit gained)	12,070	15.8278	1.5757	8.6995	27.1202
	Control Variables					
Senior Secondary School Type	Reference group: Public General					
Public Vocational	1 = Graduate from public vocational SSS	12,070	0.166	0.372	0	1
Private General	1 = Graduate from private general SSS	12,070	0.284	0.451	0	1
Private Vocational	1 = Graduate from private vocational SSS	12,070	0.209	0.407	0	1
Female	1 = Female, 0 = Male	12,070	0.465	0.499	0	1
Age	Age	12,070	34.502	9.659	15	68
Urban	1 = Urban, 0 = Rural	12,070	0.719	0.449	0	1
Married	1 = Married, 0 = Single	12,070	0.187	0.390	0	1
JSS Score	JSS national test score (Mathematics, Bahasa Indonesia, English)	3,835	16.964	3.319	5.880	29.995
SSS Score	SSS national test score (Mathematics, Bahasa Indonesia, English)	3,313	15.916	4.459	4.980	29.994
Cognitive Score	IFLS cognitive score (standardised z-score)	12,070	0.000	1.000	-2.947	1.840
University	1 = Attend university	12,070	0.188	0.391	0	1
Cohort dummy	Reference group: born in 1947-1969					
Middle Cohort	1 = Born in 1970-1979	12,070	0.385	0.487	0	1
Young Cohort	1 = Born in 1980-1987	12,070	0.304	0.460	0	1
Mother's highest level of education	Reference group: Did not attend any education					
Mother Elementary	1 = Mother has attained elementary school	12,070	0.532	0.499	0	1
Mother JSS	1 = Mother has attained JSS education	12,070	0.143	0.350	0	1
Mother SSS	1 = Mother has attained SSS education	12,070	0.107	0.310	0	1
Mother University	1 = Mother has attained university level ed.	12,070	0.023	0.151	0	1

Table A1: Summary Statistics (Continued)

Variable Name	Description	Obs	Mean	Std. Dev.	Min	Max
Father's highest level of education	Reference group: Did not attend any education					
Father Elementary	1 = Father has attained elementary school	12,070	0.472	0.499	0	1
Father JSS	1 = Father has attained JSS education	12,070	0.157	0.364	0	1
Father SSS	1 = Father has attained SSS education	12,070	0.178	0.383	0	1
Father University	1 = Father has attained university level ed.	12,070	0.064	0.246	0	1
Mother Vocational Education	1 = Mother attended vocational education	12,070	0.013	0.112	0	1
Father Vocational Education	1 = Father attended vocational education	12,070	0.014	0.118	0	1