Ariansyah *et al.*
*Empirical Research in Vocational Education and Training* (2024) 16:5
https://doi.org/10.1186/s40461-024-00160-6

Empirical Research in Vocational Education and Training

RESEARCH Open Access

# Comparing labor market performance of vocational and general school graduates in Indonesia: insights from stable and crisis conditions

Kasmad Ariansyah[1*], Yanuar Farida Wismayanti[1], Renny Savitri[1], Virgiawan Listanto[2], Azwar Aswin[1], Madya Putra Yaumil Ahad[1] and Benedicta Retna Cahyarini[1]

*Correspondence:
Kasmad Ariansyah
ariansyah.kasmad@gmail.com;
kasmad.ariansyah@brin.go.id
[1]Research Center for Public Policy, National Research and Innovation Agency, Gatot Subroto 10, Jakarta 12710, Indonesia
[2]Research Center for Education, National Research and Innovation Agency, Gatot Subroto 10, Jakarta 12710, Indonesia

**Abstract**
This study seeks to investigate the association between distinct tracks of secondary education—namely, vocational school (Sekolah Menengah Kejuruan, SMK) and general school (Sekolah Menengah Atas, SMA)—and two key labor market outcomes: the duration required for graduates to attain their initial employment and their resilience in the face of pandemic, as measured by changes in average monthly income. While the former sheds light on the outcome under typical circumstances, the latter offers valuable insights into the outcome during periods of crisis. Focused on Indonesia, this research employs Heckman two-step model alongside ordinary least square (OLS) for the first outcome and ordered probit regression for the second. The research draws upon data extracted from the 2021 National Labor Force Survey (Survey Angkatan Kerja Nasional, SAKERNAS). Our results suggest that SMK provides an advantage in securing initial employment compared to SMA, with SMK graduates entering the workforce earlier than their counterparts. Moreover, in terms of resilience during the pandemic, as evidenced by changes in income, SMK graduates exhibit greater resilience, with a higher likelihood of maintaining or even increasing their income compared to SMA graduates. These findings offer valuable implications for both theoretical understanding and practical considerations.

**Keywords** Vocational school, General school, Employability, Resilience, Indonesia
**JEL** I26

## Introduction

The discussion surrounding general versus vocational education has been a significant topic for policymakers and scholars. Given the merits of both approaches, a recognized trade-off between general and vocational education exists (Zilic 2018). In recent years, there has been an increasing emphasis on vocational education as a strategy to address unemployment. Vocational education, also known as technical or career-focused

education, aims to equip students with knowledge, practical skills, competentcies and directly relevant knowledge for the workforce and personal development in society (Calero López and Rodríguez-López 2020; OECD 2020). This education type is often viewed as a practical choice for students aiming for swift job market entry and industry-specific careers (Cedefop 2017; Kuczera and Jeon 2019).

Indonesia has a long history of vocational education, with its origins dating back to pre-independence times, particularly marked by the introduction of the Ethics Politics (Etische Politic) in 1901 (Kurniawan 2016). This initiative, occurring during Dutch colonial rule, primarily aimed to address the needs of the colonial government. Since the reform era, the government acknowledged more the significance of vocational education (Finlay et al. 1998) and aimed to invert the ratio of vocational schools (Sekolah Menengah Kejuruan, SMK) to general schools (Sekolah Menengah Atas, SMA) from 30%:70–70%:30%. This initiative was driven by the considerable number of high school graduates who opted not to pursue further education. Many of these graduates aimed to enter the workforce, but lacked even basic skills (Suharno et al., 2020a), which is believed to contribute to youth unemployment. Despite some progress, youth unemployment rates in Indonesia remain high. For instance, between 2019 (before COVID-19 pandemic) and 2022 (post COVID-19 pandemic), among individuals aged 15 to 19 and 20 to 24, the unemployment rates increased from 26.12 to 29.08% and from 15.64 to 17.02%, respectively (BPS 2023). This challenge is intensified by Indonesia's demographic composition, which will be predominantly characterized by a labor-age population (15–64 years) from 2012 to 2045, reaching its peak between 2020 and 2030 (BPS 2022a). In response to this figure, it is imperative to implement effective interventions and policies to prevent the potential worsening of youth unemployment. Recognizing this demographic pattern, the government is emphasizing the enhancement of human resources, specifically emphasizing vocational education, as a key strategy (Novrizaldi 2023).

Unfortunately, despite extensive discussions and research, the existing literature lacks a definitive conclusion on the advantages of vocational education compared to general education. While Silliman and Virtanen (2022) and Zimmermann (2021) find sustained favorable impacts of vocational education over general education, Golsteyn and Stenberg (2017) identify short-term vocational education advantage, yet trade-offs in the long term. Meanwhile, Korber and Oesch's (2019) study suggests that vocational education provides steady job prospects but reduced earnings in the thirties, particularly for women. Other studies by Choi (2021) and Wang et al. (2023) indicate geographical variability in the outcomes of vocational education, with rural areas experiencing more favorable effects. This uncertainty is concerning as promoting vocational education, as seen in Indonesia, aims to enhance employability and reduce unemployment (Kemendikbudristek 2021). Various factors, including research methods, scope of questions, and data availability, contribute to diverse findings, highlighting the need for more research to assess vocational education's true value (Torun and Tumen 2019).

This present study aims to make a meaningful contribution to this realm by examining whether vocational school provides an edge over general school concerning two pivotal labor market consequences: the duration taken by graduates to secure their initial employment post-schooling and the change in income endured during the COVID-19 pandemic. These two outcomes share a similarity as both reflect critical phases in the employment cycle. The first outcome, the time it takes for graduates to secure their

first job, is a crucial phase for young individuals as they enter the job market and make career-related decisions that can have long-term implications for their career trajectories (Richards 1984; Savickas 1999). Graduates from vocational and general tracks may experience different job-seeking readiness and have distinct career pathways upon graduation (Stevens 1973). The second outcome, changes in income experienced during the COVID-19 pandemic, reflects a critical phase in employment during times of crisis. The outbreak of the pandemic in 2020 had significant ramifications on the global economy, causing widespread disruptions in various industries and leading to job losses and income reductions (ILO 2020). Graduates from different types of upper secondary school education may have varied experiences in maintaining or improving their income levels during this challenging period.

By shedding light on these two outcomes, we make significant contributions to the existing body of literature in several significant ways. Firstly, examining the speed at which vocational education graduates secure their first jobs compared to general education graduates contributes to a better understanding of the school-to-work transition (STWT) process. Despite its crucial role in shaping individuals' career trajectories, the school-to-work transition (STWT) process remains inadequately understood due to fragmented and limited information regarding its duration and determinants (Pastore et al. 2022). While previous research has recognized the short-term advantages of vocational education over general education, existing studies predominantly emphasize benefits related to employability and earnings (Bahl et al. 2021; Choi et al. 2019; Ferri et al. 2022; Forster et al. 2016; Golsteyn and Stenberg 2017; Hanushek et al. 2017; Neugebauer and Weiss 2018). Other studies examine the duration required to secure employment, focusing on factors such as educational level and length of education (Manacorda et al. 2017; Morris 2023; Zamfir et al. 2020), as well as the impact of extending the duration of internship duration and the short vocational track (Alp et al. 2022; Comi et al. 2022). The studies by Wolbers (2007) and Pastore et al. (2022) are closely related to this present study. However, thesir studies do not directly compare vocational and general track graduates but utilize primary and lower secondary education as the base case. This methodological approach renders all findings relative to this base case, thereby limiting the ability to draw statistically significant conclusions regarding the comparison between vocational and general education. Meanwhile, a study conducted by Pritadrajati (2022) contrasts the impact of enrolling in vocational senior-secondary schools with that of general schools. However, instead of focusing on job search duration, the study investigates labor force participation, unemployment risk, job formality, and income levels. Secondly, our research delves into the earnings changes for vocational school graduates in comparison to general school graduates during the COVID-19 pandemic. Previous research often focuses on investigating the impact of vocational education on economic outcomes, such as income or earnings, in various countries (Astuti and Setyonaluri 2022; Bairagya 2021; Choi 2021; Corbett et al. 2002; Doerr 2022; Golsteyn and Stenberg 2017; Korber and Oesch 2019; Lukesch and Zwick 2020; Newhouse and Suryadarma 2011a; Pritadrajati 2022; Redfering and Cook 1980; Silliman and Virtanen 2022; Singh and Parida 2022; Wang et al. 2023; Zimmermann 2021), rather than examining changes in income. In times of crises, such as the COVID-19 pandemic, assessing changes in income gains paramount importance as it reflects the level of resilience. While Liang et al. (2022) undertook a similar analysis on income changes in the context of the pandemic

in China, their study exclusively focused on vocational education graduates, omitting the crucial comparison with general education graduates. Our study aims to bridge this gap and provide insights into the distinct effects of the pandemic on both groups within the labor market. Thirdly, our study enriches our understanding of whether vocational education offers substantial advantages, particularly when compared to general education, within both contexts: stable or normal economic conditions and times of crises. The extensive restrictions imposed during the COVID-19 pandemic considerably curtailed job prospects, resulting in severe impact on employment opportunities during this timeframe. Therefore, it's reasonable to perceive the first outcome as a measure of labor market performance before the pandemic, effectively capturing the scenario under normal conditions. Meanwhile, the change in income during the pandemic serves as a reflection of outcomes in times of crisis.

To achieve our research objective, we conducted quantitative analyses using data from a nationally representative labor force survey. This dataset includes details about educational background, employment history, and income changes during the pandemic. Through this data, we examined variations in labor market outcomes between graduates of vocational and academic secondary education. We employed ordinary least square (OLS) regression and ordinal probit regression to investigate the first and second outcomes, respectively. Our findings indicate that vocational education offers a faster initial employment advantage compared to general education, with SMK graduates entering the workforce than their counterparts. Likewise, SMK graduates demonstrate greater resilience, with an increased chance of maintaining or boosting their income levels in comparison to SMA graduates.

The rest of this manuscript is structured as follows: Sect. 2 provides the literature review, Sect. 3 outlines the methodology, Sect. 4 presents the results, Sect. 5 offers the discussions and the implications, and Sect. 6 concludes the study.

## Indonesian national education system and employment

The Indonesian educational system is vast and diversified (Organisation for Economic Co-operation and Development and Asian Development Bank 2015). Indonesia's educational system is the third biggest in Asia and the fourth largest worldwide, behind China, India, and the United States. The education system in Indonesia is characterized by a strong and centralized governance structure, which imposes a hierarchical approach to achieving desired outcomes (Harris and Jones 2018).

As delineated in Education Law 20 of 2003, the Indonesian education system encompasses formal, non-formal, and informal pathways, each mutually complementing and enriching the others. Formally structured education, illustrated in Fig. 1, is divided into three tiers: primary education, secondary education, and higher education. Within primary and secondary education, two types of schools exist in Indonesia, distinguished by their curricula: Public schools and Islamic schools. These encompass both state and private institutions. Presently, Islamic schools fall under the purview of the Ministry of Religious Affairs, while public schools are overseen by the Ministry of Education, Culture, Research, and Technology.

Primary education comprises elementary school, typically spanning a duration of six years, followed by junior high school, which commonly extends over three years.

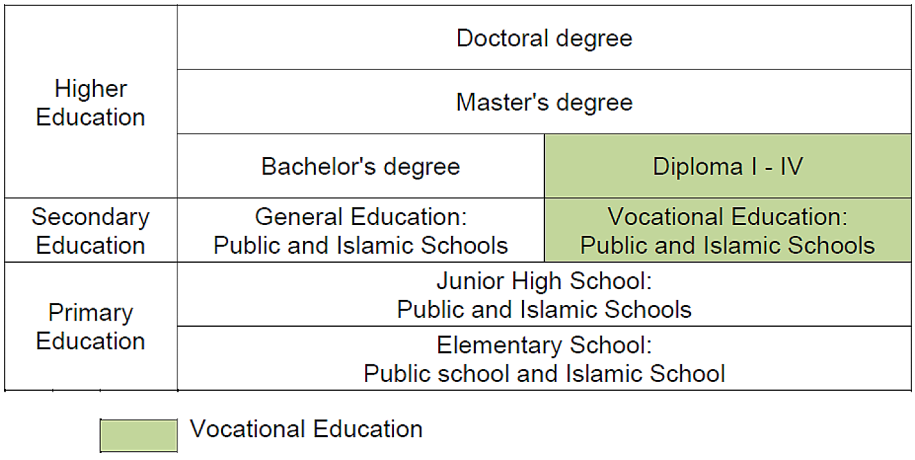


**Fig. 1** The Indonesian education system. Source: created by Authors based on Education Law 20 of 2023

Secondary education encompasses a three-year duration. Higher education encompasses a range of programs, including diploma programs, bachelor's degrees, master's degrees, and doctoral degrees. Within these educational tiers, vocational education is available at both secondary and tertiary levels. At the secondary level, vocational education includes vocational schools (Sekolah Menengah Kejuruan, or SMK) and Islamic vocational schools (Madrasah Aliyah Kejuruan, MAK), in contrast to general education, which comprises high schools (Sekolah Menengah Atas, or SMA) and Islamic high schools (Madrasah Aliyah, or MA). Meanwhile, at the higher level, vocational education is referred to as Diploma I to Diploma IV, typically completed within 1 to 4 years.

Focusing on secondary education, vocational high schools in Indonesia forge close partnerships with industries, tailor curricula, and offer internships to bolster graduates' employability (Cholik et al. 2021; di Gropello 2013). This hands-on approach enables students to acquire practical knowledge and relevant skills directly applicable in the workforce. Vocational schools provide specialized programs in areas like business management, technical fields, agriculture, tourism, arts, healthcare, and community welfare (Newhouse and Suryadarma 2011b). Upon graduation, students are expected to attain a competency level of 2 out of 9 on the Indonesian Qualification Framework (IQF), equivalent to level 3 on the European Qualification Framework (Misbah et al. 2020). Meanwhile, general schools prioritize equipping students with foundational skills for further academic pursuits rather than immediate workforce integration (Ali et al. 2018).

While they may differ in several aspects, both general high schools and vocational high schools face a common issue in the labor market: a high unemployment rate for graduates from these schools. The issue of a mismatch between the outcomes of the education system (supply) and the expectations and demand for skilled workers in Indonesian society has long been recognized as a concern (Ssenyonga 2021; Tentua and Winarko 2020). According to the 2016 Asian Development Bank research, job mismatches in Indonesia are mostly caused by the inadequate educational qualifications of workers (Allen 2016). Based on education level, the highest unemployment rate is found in secondary level education (general and vocational high school), which amounted to 8.89% in August 2022 (BPS 2022c).

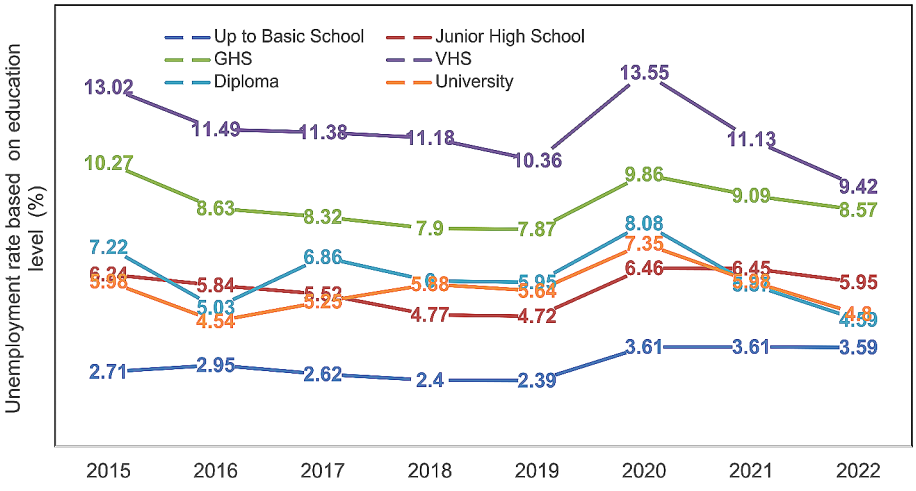


**Fig. 2** Unemployment rate based on education level. Source: BPS (2023)

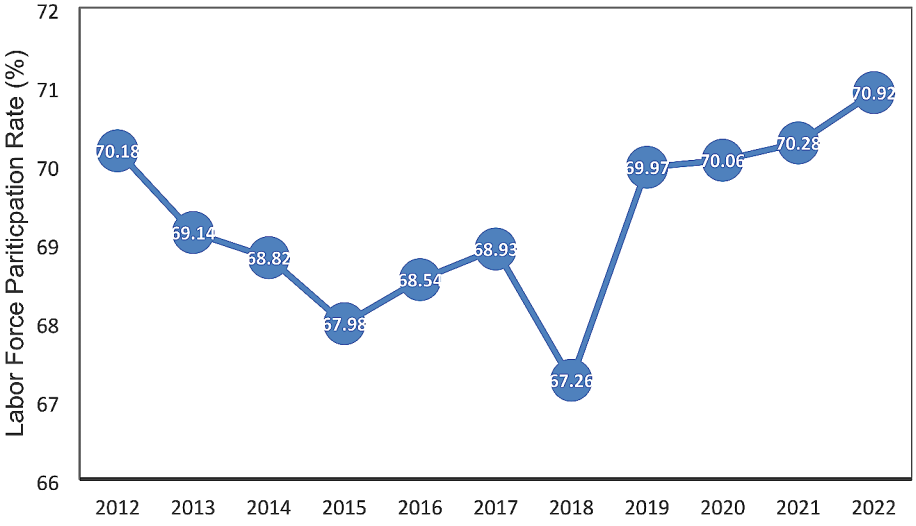


**Fig. 3** Indonesia's Labor Force Participation Rate of Productive-Age Citizens (between the ages 15 and 64). Source: (BPS 2022b, 2022c)

In general, as seen in Fig. 2, the trend in the last eight years shows that the highest unemployment rate is held by secondary level education, with vocational high school ranked first. The high unemployment rate among vocational school students is most likely caused by several reasons. First, the present condition of vocational high schools is concerning, as it is characterized by a negative image of unemployment and inadequately skilled graduates as a result of unplanned development, mismatched learning, and the limited involvement of the industry (Suharno et al., 2020b). Another reason is that there has been a growing proportion of adults in the workforce, particularly those with a high school education. Unfortunately, the increase in the number of educated individuals in Indonesia has not been paralleled by the rise in occupations (Sukanti and Sulistyaningrum 2022).

As demonstrated in Fig. 3, from 2012 to 2015, there has been a small decline in the Indonesia's Labor Force Participation Rate over the past decade. Between 2015 and 2017,

there was a slight increase. In 2018, there was a substantial decrease. In 2019, there was a significant rising trend. Between 2020 and 2022, there was a gradual upward trend. The Labor Force Participation Rate indicates the percentage of the working-age population that is economically active in a country/region. Indonesia's Labor Force Participation Rate has continued to increase in the last three years. Compared to before the COVID-19 pandemic. The strengthening economic condition is followed by an increase in the Labor Force Participation Rate.

Furthermore, a significant portion of the Indonesian labor market is still dominated by those with a low level of educational achievement. In 2022, almost 36% of workers had attained a primary school education or lower, while an additional 18% had barely completed junior high school (BPS 2022d). Indonesia's inadequate education levels among its workforce raise concerns about the country's capacity to adequately equip its human resources to confront the ongoing changes in the economic structure, particularly the transition towards dominance in advanced technologies of the Fourth Industrial Revolution (Indrawati and Kuncoro 2021).

## Literature review

Human Capital Theory is the prevailing viewpoint in the economics of education.This theoretical construct postulates that the decision to invest in education is comparable to a firm's investment in capital, which serves to heighten productivity and ultimately leads to augmented earnings (Becker 1962). The net gain in lifetime earnings resulting from investing in education or training can measure the private economic return for individuals (Carneiro et al. 2010). This notion aligns with the prevailing assumption among policymakers worldwide that investing in education and training is inherently beneficial, often accepted without further scrutiny. They prioritize investing in human capital as a means of achieving national prosperity, economic growth, and equity goals (Wößmann 2008). Human capital theory clasifies human capital into two types: general and specific. General human capital refers to knowledge and skills that can be applied to various jobs and contexts, thereby increasing the likelihood of success in different employment opportunities. On the other hand, specific human capital refers to knowledge and skills that are directly applicable to a particular job and immediately enhance productivity. The former is typically gained through general education, while the latter is acquired through vocational education and training (VET). Therefore, the differentiation between general and vocational education is rooted in their distinct educational objectives. Vocational education focuses on developing job-related skills to prepare students for specific industries and occupations, while general academic education prioritizes foundational academic skills to equip individuals with the capacity for future learning and greater adaptability (Hanushek et al. 2017). Consequently, graduates from vocational and general academic education tracks often pursue distinct career pathways upon graduation.

Previous research focusing on Asian countries investigates vocational education and labor market outcomes, revealing nuanced insights. In the Philippines, Choi's (2021) research underscores the wage potential of vocational education, particularly in rural areas, though limited accessibility is noted. Moving to India, Singh and Parida (2022) identify challenges in quality job attainment for vocationally trained youth due to skill gaps and gender and social inequalities. Bairagya (2021) in India examines self-employed individuals and their formal vocational training, highlighting the income benefits but

also the need for increased participation. In China, Liang et al. (2022) study pandemic impacts on vocational school graduates, while Wang et al. (2023) find positive long-term effects of vocational education on labor market outcomes and social mobility. Additionally, Hao et al. (2023) emphasize the role of education and skills in income determination. Shifting to Indonesia, Pritadrajati (2022) demonstrates the better employment prospects of vocational education in public schools, especially for females. Newhouse and Suryadarma's (2011a) study underscore the importance of education quality in influencing employment outcomes in Indonesia. Torun and Tumen' (2019) study in Turkey find that SMK graduates had a 5% higher employment likelihood than GHS graduates, but this effect waned with town-level controls, suggesting limited impact on employment. Likewise, numerous European studies have investigated the interplay between vocational and general education, analyzing aspects like earnings, labor outcomes, gender wage gaps, and social class disparities. In Germany, Lukesch and Zwick (2020) found vocational-tertiary combo resulted in higher early career earnings. Zimmermann's (2021) research indicated positive impacts of vocational higher track secondary (HTS) education on young workers' earnings. Sweden's Golsteyn and Stenberg (2017) noted short-term vocational advantages and long-term general benefits. Switzerland's Korber and Oesch (2019) observed good mid-career prospects for both, but lower vocational earnings in thirties, particularly affecting women. Findings in Romania, Finland, Germany, and Russia also highlighted various facets of the vocational-general education relationship. These studies collectively enhance our understanding of these educational paths in Europe. Furthermore, Attanasio et al.'s (2011) research in Colombia highlights the potential benefits of comprehensive vocational programs for disadvantaged youth. In Washington State, Azari (1996) notes that Native American vocational education participants achieve high employment and related field salaries, yet gender pay gaps persist. Redfering and Cook's (1980) Florida study shows vocational training correlates with higher income and job complexity. Corbett et al. (2002) analyze vocational education's impact on earnings, dropout rates, and public assistance for students with emotional or behavioral disorders in Florida, with on-the-job training and generic vocational education positively influencing earnings. Cross-country studies have also illuminated the impact of general versus vocational education on employment outcomes. Hanushek et al. (2011) found varied vocational effects, with Switzerland favoring earnings and Denmark and Germany favoring general education. Aizenman et al. (2018) explored vocational training's role in addressing manufacturing employment challenges across Germany, USA, Thailand, and Barcucci et al. (2017) underscored the importance of effective vocational education and training (VET) systems for smooth transitions into employment while highlighting job mismatches among VET graduates. These previous studies unveil diverse insights into vocational education's impacts on labor outcomes, highlighting challenges, gender disparities, and potential policy directions.

Our study delves into two critical labor market outcomes of education, specifically by contrasting the experiences of SMK graduates with those of SMA graduates. We investigate the speed at which these two groups secure their first job after completing their education and assess their income resilience during the pandemic period. This analysis sheds light on the distinct impact of vocational education in comparison to general education in terms of early job entry and income stability. Each outcome will be discussed comperehensively, and a corresponding hypothesis will be proposed for both aspects.

The transition from education to the workforce carries substantial significance for young individuals, as it necessitates navigating critical career decisions that will inevitably impact their future accomplishments (Richards 1984; Savickas 1999). Upon reaching the culmination of their compulsory education, adolescents are presented with the formidable task of identifying a vocation that harmonizes with their passions, proficiencies, and values (Lent and Brown 2013). This juncture of change is brimming with pivotal choices that wield considerable power over their professional trajectory. It entails the deliberation of a myriad of factors, including personal inclinations, aptitudes, and aspirations, all in the pursuit of discerning the most fitting career avenues.

Furthermore, there is a significant concern regarding the ease of young workers' transition from school to work, as youth unemployment rates consistently surpass those of the overall economy, contributing to various social issues (Hanushek et al. 2017). The notion of transitioning from school to work has evolved, encompassing change, anticipation, and unpredictability—a departure from the straightforward paths assumed for previous generations (Ryan 2001). One promising strategy to effectively tackle these transitional issues is forging stronger connections between students and employment opportunities through the implementation of vocational education programs and structured apprenticeships with businesses (Ryan 2001; Zimmermann et al. 2013).

Highlighting the efficacy of vocational education during the early stages of a career, Forster (2016) underscores the positive impact of vocational education compared to general education. This effect is primarily attributed to the acquisition of occupation-specific skills by vocational students, rendering them more appealing to potential employers. On the other hand, the exposure of general education students to a broad curriculum in high school may make it challenging for them to identify a stable career path early on in their labor market experience. As a result, expanding the SMK education capacity in a country is often viewed as a feasible policy option to enhance the employability of high school graduates, particularly in developing nations (Torun and Tumen 2019). Based on the literature presented, we put forth the following first hypothesis:

*H1*. Vocational school graduates experience a faster job placement compared to graduates from general schools.

Regarding the impact of the COVID-19 pandemic on labor outcomes, there was a perspective suggesting that COVID-19 functions as an equalizing factor that affects all social groups (Jones and Jones, 2020). However, emerging evidence contradicts this notion, unveiling that certain population segments are more susceptible to the economic shock caused by the pandemic (Abdel-Rahman et al. 2023; Arceo-Gomez et al. 2023; Guven et al. 2023; Honoré and Hu 2023; Yu et al. 2023). While numerous studies highlight the importance of education levels during times of crises (Honoré and Hu 2023; Männasoo et al. 2023; Putra et al. 2023; Tsai et al. 2023), our present research specifically delves into the differentiation between various educational paths within the same tier, specifically vocational school and general school. Individuals following different educational paths may have varying experiences in maintaining their income levels during such challenging periods. Vocational education equips graduates with job-specific skills that match employer demands, emphasizing practical experience (Korber and Oesch 2019). It offers hands-on training, aiding quick entry into specialized careers (Cedefop 2017; Kuczera and Jeon 2019). These job-specific skills provide advantages to graduates as it facilitate a seamless transition from school to work (Korber and Oesch 2019).

Similarly, Müller (2005) underscores that vocational qualifications at the secondary education level are strongly linked to improved job access and reduced unemployment risks compared to general qualifications. On the contrary, general education or training entails a slower adaptation to the job market during early career stages; nonetheless, it offers greater resilience to ongoing technological disruptions in labor markets (Torun and Tumen 2019). However, in this study, the disruption does not stem from technological advancements but rather from the pandemic. This study also focuses on resilience, as measured by changes in income, among graduates who remain in the same occupation or do not transition to another company, thus rendering technological advancement less relevant. Furthermore, in terms of labor outcome which is measured by earnings, the Mincer earnings function (Mincer 1974), a pivotal theory in evaluating human capital investments, delineates salary as a function of education and professional experience. Notably, this function emphasizes the significance of specialized human capital over general expertise as professional experience connotes individuals' specialization, highlighting the cultivation of particular skills essential for specific roles (Kuzminov et al. 2019). These competencies are typically cultivated through specialized education, as well as on-the-job learning and years of accumulated experience. In relation to this study, vocational school is the specialized education system to gain specific human capital that is directly applicable to a particular job and immediately enhance productivity, which related to the earnings received by the employee. According to these pieces of literature, we put forth the following second hypothesis:

*H2.* Vocational school graduates have higher levels of resilience during the COVID-19 pandemic in comparison to graduates from general school.

In this study, we use income stability as a measure to evaluate employee resilience. Amid the pandemic, one group's greater resilience is evident if their income stays steady or increases, while other groups experience income declines or stability.

## Methodology

### Data and data source

In this study, a cross-sectional design is employed to investigate the relationship between types of secondary level education (general and vocational) and educational outcomes in Indonesia. The study focuses on two educational outcomes, namely the duration of time required to secure the first job and the changes in monthly earnings during the COVID-19 pandemic.

Data for this study come from the 2021 National Labor Force Survey (SAKERNAS) conducted by Badan Pusat Statistik (BPS) Indonesia, which contains extensive information on labor market characteristics, including education, employment status, and earnings, etc. To address the research objective, we narrow down the sample from the entire SAKERNAS 2021 dataset to individuals whose highest completed education level falls under either general school (Madrasah Aliyah (MA) and Sekolah Menengah Atas (SMA)) or vocational school (Madrasah Aliyah Kejuruan (MAK) and Sekolah Menengah Kejuruan (SMK)). In this study, we use "SMK" to collectively refer to both SMK and MAK, and "SMA" to collectively refer to both SMA and MA.

### Measures

This study examines two outcome variables, namely the duration of time required to secure the first job and the resilience during the COVID-19 pandemic.

The first outcome will be approximated by subtracting the year and month of graduation from either SMK or SMA from the year and month the sample obtained their first job. The year and month of graduation corresponds to the response to the query: " When did you graduate from the highest level of education you completed?" while the time of securing the first job aligns with the answer to the question: "When did you gain the first employment after finishing your highest level of education?" This first outcome is quantified in terms of months.

The second outcome is the resilience during the COVID-19 pandemic. Resilience denotes a constructive adaptation process during which an individual faces and overcomes obstacles or challenges (Luthar et al. 2000). In this study, resilience is assessed through changes in income, categorized as decreased, unchanged, or increased. This is indicated by the respondents' response to a question: "In comparison to February 2020, is there any change in your average monthly income/salary?" The survey includes four response options for this question: (1) "yes, my income/salary increases," (2) "yes, my income/salary decreases," (3) "no change" and (4) "not in the current job in February 2020." Respondents who selected the fourth option are excluded from the analysis, as their income changes could be the result from a change in occupation. The remaining responses were recoded into an ordinal scale for ease of analysis, with 0 representing "yes, my income/salary decreases" 1 representing "no change," and 2 representing "yes, my income/salary increases." Considering that the survey was conducted in 2021 and the onset of COVID-19 in Indonesia was officially recognized on March 2, 2020, with its rapid dissemination across all provinces by April 2020 (Ministry of Health 2021), it is reasonable to infer that the investigation focuses on the fluctuation of income amid the crisis, particularly during the COVID-19 pandemic. In this study, we focused solely on whether respondents experienced a decrease, no change, or an increase in income during the pandemic, without considering the income levels before and after the change, as well as the magnitude of the change.

The primary explanatory variable examined in this study is a binary dummy variable that indicates the type of secondary school completed by the respondents. This variable distinguishes whether the respondents' highest formal education was general school (assigned a binary value of 0) or vocational school (assigned a binary value of 1).

In addition to the core variables, we include several control variables. Table 1 provides a comprehensive inventory of all variables, including their descriptions and corresponding means or proportions. However, since we utilize a single dataset for both outcome variables, we only incorporate the control variables that are less likely to change from the time individuals secure their first job until the survey is conducted. Meanwhile, we include all control variables for the second outcome.

### Estimation method

This study aims to investigate the labor market outcomes of individuals with different types of secondary education, namely general (SMA) and vocational (SMK) education. Specifically, we examine two key outcome variables: the length of time required to secure the first job and changes in income during the COVID-19 pandemic. Thus, we

**Table 1** Outcome and explanatory variables

| Variable | Description | Value | Mean/Proportion | | |
|---|---|---|---|---|---|
| | | | All samples | SMA samples | SMK samples |
| **Outcome variables** | | | | | |
| Required time for finding first job (T) | The time taken to secure the initial job post-graduation. | in Months | 33.4 | 36.4 | 27.7 |
| Income changes during the COVID-19 pandemic (C) | The change in monthly income during the COVID-19 pandemic | (0) Decrease | 46.3% | 46.9% | 45.2% |
| | | (1) No change | 45.9% | 45.6% | 46.4% |
| | | (2) Increase | 7.8% | 7.5% | 8.3% |
| **The primary explanatory variable** | | | | | |
| Secondary school type | The types of secondary school the respondents completed | (0) General (SMA) | 67.9% | | |
| | | (1) Vocational (SMK) | 32.1% | | |
| **Control variables** | | | | | |
| Gender | Gender of respondents | (0) Female | 46.9% | 49.2% | 42.1% |
| | | (1) Male | 53.1% | 50.8% | 57.9% |
| HH | Head of household | (0) No | 71.6% | 71.0% | 72.7% |
| | | (1) Yes | 28.4% | 29.0% | 27.3% |
| Age | Age of respondents | in Years | 32.99 | 33.4 | 32.03 |
| Marital status | The marital status of respondents | (0) Not married | 45.2% | 43.9% | 48.1% |
| | | (1) Married | 54.8% | 56.1% | 51.9% |
| Course enrolment | If the respondents have enrolled in a course/training | (0) No | 83.5% | 85.9% | 78.6% |
| | | (1) Yes | 16.5% | 14.1% | 21.4% |
| Family size | The number of family member | Person | 4.3 | 4.4 | 4.3 |
| Educational provider | The provider of education | (0) Private | 31.0% | 24.4% | 44.9% |
| | | (1) Public | 69.0% | 75.6% | 55.1% |
| Geographical location | The current location of respondents | (0) Outside Java | 69.6% | 75.1% | 57.9% |
| | | (1) Java | 30.4% | 24.9% | 42.1% |
| Area typology | Tye type of area | (0) Rural | 47.8% | 51.3% | 40.3% |
| | | (1) Urban | 52.2% | 48.7% | 59.7% |
| Digital Skill | Own digital skill | (0) No | 72.5% | 75.3% | 66.7% |
| | | (1) Yes | 27.5% | 24.7% | 33.3% |
| State Employee | All kind of state employee | (0) No | 93.3% | 92.9% | 94.3% |
| | | (1) Yes | 6.7% | 7.1% | 5.7% |
| Post-graduation Period | Long of time since graduation from SMA or SMK | in Years | 14.4 | 14.8 | 13.6 |
| Age at graduation | Age when graduated from SMA or SMK | in Years | 18.9 | 19.0 | 18.7 |
| Number of samples | | | 171,945 | 116,787 | 55,158 |

Note: Categorical variables are expressed as proportions (%), whereas numeric variables are presented as means

Source: authors' calculation based on 2021 SAKERNAS dataset

have two specification models, and we apply different estimation methods in accordance with the measurement scale of the outcome variables. The first outcome variable has ratio measurement scale, representing the length of time (months) the respondents need to obtain their first job. Thus, the relationship between this first outcome variable and the type of secondary education that the respondents completed will be analyzed using ordinary least square (OLS) method. The Eq. (1) is the proposed model for this first outcome variable.

$$T_i = \alpha + \beta X_i + \epsilon_i \tag{1}$$

where *i* is the individual indices, *T* is the length of months required to secure the respondents' first job, and *X* represents a set of explanatory variables, which includes the primary explanatory variable—school type—and control variables. School type refers to the type of secondary level education completed by the respondents. This variable is a binary dummy variable, having value of 1 if the respondents attained a SMK degree as their highest educational attainment, and 0 for those with a SMA degree. $\alpha$, $\beta$, $\gamma$ are the parameters being investigated. ε is the error term.

The second outcome variable is the change in average monthly income/salary during the COVID-19 pandemic, delineated into three distinct categories: decrease (1), not change (2), and increase (3). Thus, the ordered probit regression model was the suitable approach for examining the association between school type and the change in income during the pandemic. This method employs a maximum likelihood technique to estimate the model's parameters. We denoted the dependent variable as *C**, coded as 1, 2, and 3 to represent different categories of the income changes. Moreover, the income change is described as a function of a set of explanatory variables *X* through a linear relationship:

$$C^*{}_i = \alpha + \beta X_i + \epsilon_i \tag{2}$$

*C** represents the unobservable outcome variable. Even though we cannot directly observe *C**, we can observe the response categories: $C = j, if \alpha_{j-1} \leq C^* \leq \alpha_j$ (3)

where *C* is the observed ordinal outcome variable, namely the change in income, and $\alpha_j$ is the threshold parameter for category *j*, which are the points distinguishing the various categories of the outome variable. The initial threshold is typically designated as 0.

However, selection bias poses a significant challenge in estimating returns to education. Individuals may opt out of the labor market intentionally due to some reasons, one of which is that offered wages lower than their reservation wage (Brauw and Rozelle 2008). In this study, some samples have never been employed, so we lack data on the time taken to secure their first job. Additionally, certain samples are unable to respond to inquiries regarding changes in income during the pandemic because they either changed their occupation or are currently unemployed. Therefore, failing to correct for selection bias can lead to biased Ordinary Least Squares (OLS) estimates. To address this issue, we also propose employing the Heckman two-step method, which aims to mitigate selection bias. This method relies on the use of the ratio derived from a probit model to adjust for selection bias. The inverse mills ratio, denoted as $\lambda$, as expressed in Eq. (4).

$$\lambda = \frac{\varnothing\left(\alpha Z_i\right)}{\varphi\left(\alpha Z_i\right)} \tag{4}$$

$\phi$ and $\Phi$ each represents the probability density and cumulative distribution of the normal distribution, and *Z* denotes the independent variable of the selection model.

## Results

### Estimated results

#### *Time required for finding the first job*

Table 2 displays the estimated results of an OLS and Heckman model analyses that examines the effect of school type on the length of time it takes for graduates to secure

**Table 2** Estimated results for number of months required for finding the first job

| Explanatory variables | OLS Model | Heckman Model |
|---|---|---|
| Primary variable | | |
| School type (ref: general) | -7.6304*** | -3.5922*** |
| Control variables | | |
| Gender of respondents (ref: female) | -5.7590*** | 6.2820*** |
| The provider of education (ref: private) | 1.8109*** | -1.5648*** |
| Location (ref: outside Java) | -6.8553*** | -4.7082*** |
| Tye type of area (ref: rural) | 6.7929*** | 5.6063*** |
| $\lambda$ (Inverse Mills Ratio) | | 47.2525*** |
| Number of Observation | 121,869 | 121,869 |

Note: (1) * $p < .1$, ** $p < .05$, *** $p < .01$; (2) Ref: Reference. All estimated results with a reference are relative to each reference

Source: authors' analysis results

**Table 3** Estimated results for the graduates' income change during the pandemic

| Explanatory variables | Ordered Probit Model | Heckman Model |
|---|---|---|
| Primary variable | | |
| School type (ref: general) | 0.0661*** | 0.0527*** |
| Control variables | | |
| Gender of respondents (ref: female) | 0.1078*** | -0.0465*** |
| Head of household (ref: no) | 0.2539*** | 0.0709*** |
| Marital status (ref: not married) | 0.0477*** | -0.1385*** |
| Course enrolment (ref: not enrolled) | 0.0408*** | 0.0441*** |
| The number of respondents' family member | -0.0142*** | -0.0091*** |
| The provider of education (ref: private) | 0.0172* | 0.0287*** |
| Location (ref: outside Java) | 0.0167 | 0.0836*** |
| Tye type of area (ref: rural) | -0.0595*** | 0.0698*** |
| Own digital skill (ref: no) | 0.1875*** | -0.2138*** |
| State employee (ref: no) | 0.7265*** | 1.1952*** |
| Years since graduation | -0.0046*** | -0.0086*** |
| Number of Observation | 79,139 | 79,139 |

Note: (1) * $p < .1$, ** $p < .05$, *** $p < .01$; (2) Ref: Reference. All estimated results with a reference are relative to each reference

Source: authors' analysis

their first job after graduation. The results reveal that the coefficients of school type in both models are negative and highly significant, with a p-value of less than of 1%. This indicates that SMK graduates require less time to obtain their first job compared to SMA graduates.

#### *The resilience of graduates during the COVID-19 pandemic*

Table 3 presents the findings from the ordered probit and Heckman model analyses on the effect of school type on the graduates' resilience during the COVID-19 pandemic, as measured by their change in monthly income. The results show that the school type coefficients in both models are positive and statistically significant, indicating that SMK graduates exhibit higher levels of resilience during the pandemic compared to their SMA counterparts. In other words, SMK graduates were more likely to see their incomes either remain the same or increase, while SMA graduates were less likely to experience such positive changes in income.

### Robustness test

To enhance the reliability of the results, especially regarding school type as depicted in Tables 2 and 3, we conducted robustness checks by modifying the initial model specification. This involved introducing or eliminating one or more control variables to assess their impact on the empirical findings (Lu and White 2014). This test is performed using the *checkrob* command in Stata 16 (Barslund 2007), which estimates the dependent variable's regression on the primary variable along with all possible combinations of the control variables. The purpose of this evaluation is to address the issue of omitted variable bias, which arises when important variables are excluded from the model, leading to potential endogeneity problems. By systematically testing the model with different combinations of control variables, the study can assess the stability of the empirical results and identify the robustness of the findings.

#### *Robustness test for the first outcome: the duration required for finding the first job*

The robustness test was conducted to assess the reliability of the results presented in Table 2. This test examines the relationship between the first outcome variable and different combinations of the primary and four control variables through a series of regressions, resulting in the analysis of 16 regressions for the primary variable. The findings, presented in Table 4, consistently demonstrate a negative trend in the coefficients associated with school type across all cases (100%), corroborating the observed outcomes outlined in Table 2. Furthermore, the coefficients pertaining to school type are statistically significant across all sixteen regressions performed. Notably, the mean coefficient value is -8.084, with a range from −9.234 to -7.192. Consequently, it can be inferred that, despite variations in magnitude, enrollment in vocational school is positively associated with a shorter duration in obtaining the first job after graduation, compared to those attending general school.

#### *Robustness test for the second outcome: the income changes during the COVID-19 pandemic*

We have also conducted a rigorous robustness test to validate the results pertaining to the second outcome variable, which focuses on the change in income during the COVID-19 pandemic. This test rigorously examines the correlation between the secondary outcome variable and diverse combinations of the primary variable (school type) along with 11 control variables through a series of sequential regression analyses, ultimately encompassing the evaluation of 2048 ($2^{11}$) regression models for the primary variable. The results, presented in Table 5, consistently unveil positive and statistically significant coefficients for school type across all regressions conducted, consistent with

**Table 4** Robustness test for the duration required for finding the first job

| Explanatory variables | Max | Min | Mean | Coefficients | | | Iteration |
|---|---|---|---|---|---|---|---|
| | | | | Sig (%) | Positive (%) | Negative (%) | |
| Primary variable | | | | | | | |
| School type (ref: general) | -7.192 | -9.234 | -8.084 | 100% | 0% | 100% | 16 |
| Control variables | | | | | | | |
| Gender of respondents (ref: female) | -5.627 | -5.992 | -5.810 | 100% | 0% | 100% | 8 |
| The provider of education (ref: private) | 3.384 | 1.284 | 2.279 | 100% | 100% | 0% | 8 |
| Location (ref: outside Java) | -4.943 | -7.282 | -6.106 | 100% | 0% | 100% | 8 |
| Tye type of area (ref: rural) | 6.989 | 4.977 | 6.059 | 100% | 100% | 0% | 8 |

Source: authors' analysis

**Table 5** Robustness test for the change in monthly income during the COVID-19 pandemic

| Explanatory variables | Max | Min | Mean | Coefficients | | | Iteration |
|---|---|---|---|---|---|---|---|
| | | | | Sig (%) | Positive (%) | Negative (%) | |
| Primary variable | | | | | | | |
| School type (ref: general) | 0.2348 | 0.0987 | 0.1625 | 100.0% | 100.0% | 0.0% | 2048 |
| Control variables | | | | | | | |
| Gender of respondents (ref: female) | 0.4904 | 0.2963 | 0.3870 | 100.0% | 100.0% | 0.0% | 1024 |
| Head of household (ref: no) | 0.6078 | 0.1716 | 0.3662 | 100.0% | 100.0% | 0.0% | 1024 |
| Marital status (ref: not married) | 0.2205 | -0.0880 | 0.0749 | 93.4% | 85.1% | 14.9% | 1024 |
| Course enrolment (ref: not enrolled) | 0.2037 | -0.0409 | 0.0630 | 84.6% | 74.2% | 25.8% | 1024 |
| The number of family member | 0.0171 | -0.0221 | -0.0040 | 79.1% | 41.4% | 58.6% | 1024 |
| The provider of education (ref: private) | 0.0036 | -0.0766 | -0.0358 | 93.8% | 2.1% | 97.9% | 1024 |
| Location (ref: outside Java) | 0.1111 | -0.1172 | 0.0032 | 97.4% | 50.0% | 50.0% | 1024 |
| Tye type of area (ref: rural) | -0.0316 | -0.1977 | -0.1182 | 100.0% | 0.0% | 100.0% | 1024 |
| Own digital skill (ref: no) | 0.9278 | 0.7633 | 0.8367 | 100.0% | 100.0% | 0.0% | 1024 |
| State employee (ref: no) | 0.8728 | 0.3925 | 0.6145 | 100.0% | 100.0% | 0.0% | 1024 |
| Years since graduation | 0.0031 | -0.0114 | -0.0047 | 93.2% | 16.4% | 83.6% | 1024 |

Source: authors' analysis

the outcomes presented in Table 3. These coefficients span from 0.0987 to 0.2348, with an average value of 0.1625. Consequently, it can be inferred that, despite variations in magnitude, attendance at vocational school is positively linked with greater income resilience during the COVID-19 pandemic.

## Discussion and implications

This study investigates labor market outcomes of individuals with SMK and SMK education as their highest educational level, focusing on two outcome variables: the number of months required to secure first job and the changes in income during the COVID-19 pandemic. Regarding the first outcome, the summary of variables suggests that SMK-graduated respondents experience a shorter time gap between their month and year of graduation and the month and year they enrolled in their first job compared to SMA-graduated respondents. On average, SMK-graduated respondents took 27.7 months to find their first job, while SMA-graduated respondents took 36.4 months. This finding is supported by the OLS and Heckman regression results, confirming that SMK-graduated respondents have a statistically significant advantage in finding their first job in comparison to SMA-graduated respondents. Robustness test upholds the findings, as all regressions demonstrate that the coefficients of the core explanatory variable are negative and statistically significant, impying the superiority of SMK over SMA in terms of the time taken to secure the first job after graduation.

Meanwhile, the proportion of the samples of SMA graduates that are higher than those of SMK graduates and the higher proportion of SMK graduates who have stable or increase in comparison to SMA graduates may indicate that SMK graduates are more resilience in the pandemic time. This finding is further supported by the results of Ordered Probit and Heckman models, which demonstrate that SMK are more likely to have stable or increased income than SMA graduates during the COVID-19 outbreak. The robustness test supports this finding, as out of 2,048 regressions, the directions and

the significances of the main explanatory variable are 100% consistent, namely statistically significant and positive across all iteration.

### Theoretical implication

The results of this study carry several crucial theoretical implications. Firstly, they enrich our comprehension of the labor market outcomes experienced by graduates of vocational compared to general school programs, both in normal conditions and during periods of crisis. By examining the two outcome variables, namely time to secure the first job and changes in income, the study sheds light on the association of these educational paths on individuals' career progression and economic well-being in different situation.

The significant advantage of SMK-graduated individuals in finding their first job faster compared to SMA-graduated respondents indicates the effectiveness of vocational education in facilitating early entry into the labor market. This finding aligns with human capital theory, which suggests that vocational education equips individuals with specific and practical skills that are directly applicable in the workplace (Becker 1962). Additionally, this finding supports the idea that the association of vocational education and employment varies across different career stages, with a positive effect in the early phase (Forster et al. 2016; Golsteyn and Stenberg 2017; Hanushek et al. 2017; Wolbers 2007; Zilic 2018). The shorter time gap between graduation and employment for SMK graduates may be attributed to the focused training they receive, enabling them to meet the specific demands of certain industries or occupations more efficiently.

Additionally, our finding that SMK graduates exhibit greater resilience than SMA graduates during the COVID-19 pandemic offers an intriguing extension of the Mincerian earnings function, which put greater weight to the specialized skills. While the Mincerian earnings function typically focuses on earnings as a function of education and professional experience (Mincer 1974), representing specialized skills (Kuzminov et al. 2019), our study diverges by specifically examining changes in income associated with specific skills acquired from vocational school. This highlights the dynamic nature of earning potential during challenging times. Our findings suggest that the principles underlying the Mincerian earnings function remain relevant during crises, such as the economic downturn triggered by the COVID-19 pandemic.

However, it is crucial to note that the impacts of the COVID-19 pandemic on income changes are complex and multifaceted, and the outcomes can be influenced by various factors, including government policies, industry-specific responses, and the severity and duration of the pandemic in different regions.There is a need for a comprehensive analysis that considers the complex interplay between education, labor market conditions, and external factors to fully understand the mechanisms influencing income changes.

### Policy and practical implications

While the unemployment rate among SMK graduates in Indonesia has consistently remained the highest for years, as presented by Fig. 2, our study reveals that SMK graduates tend to secure their first jobs faster compared to SMA graduates. This implies that the often-cited 'link and match' issue, which pertains to the misalignment of skills possessed by SMK graduates and industry requirements, is not supported by the findings of this study, as the shorter time required by SMK graduates to secure their first job could be an indicative that their acquired skills are well-aligned with the skills demanded

by the job market. As such, individuals considering their educational options should be made aware of the potential benefits of vocational education in terms of expedited entry into the job market. Furthermore, the underlying concern might lie in a demand-side issue, characterized by an inadequate number of job vacancies available for SMK graduates. Under this circumstance, the policy shift advocated by Ohara et al. (2020) could potentially serve as a viable strategy to tackle the issue of youth unemployment. Their proposal emphasizes the need to establish additional vocational secondary schools within a demand-driven framework, guided by labor market signals and informed policy analysis. Another contributing factor to the high unemployment rate among SMK graduates could be the limited effectiveness of the Specialized Job Fair (BKK) in vocational schools to disseminate vacancy information might contribute to the high unemployment rate among SMK graduates due to information asymmetry. This may stem from the use of conventional media, such as posters and brochures, which are less appealing to graduates and may not effectively reach those located far from the school (Putri and Dermawan 2020). The lack of collaboration between BKK and industries represent another factor contributing to the ineffectiveness of BKK.

Additionally, the finding that SMK graduates exhibit greater resilience compared to SMA graduates, particularly in maintaining or increasing their income stability during the COVID-19 pandemic, carries significant practical and policy implications. Firstly, understanding the factors contributing to the resilience of SMK graduates can inform educational institutions and policymakers in enhancing the curriculum and vocational training programs offered at SMKs. This may involve emphasizing practical skills development, industry-specific training, and entrepreneurship education to better prepare graduates for challenges in the labor market, including economic downturns like the pandemic. Additionally, employers could benefit from recognizing the value of SMK qualifications and the resilience demonstrated by SMK graduates, potentially leading to increased recruitment and investment in these individuals. Policymakers may consider incentivizing collaborations between educational institutions and businesses to facilitate smoother transitions from education to employment for SMK graduates, ultimately contributing to economic growth and stability. Moreover, efforts to bridge the gap between SMA and SMK graduates' labor market outcomes could involve targeted interventions such as career counseling, apprenticeship programs, and skill-building initiatives tailored to the needs of both groups. Overall, recognizing and leveraging the resilience of SMK graduates can lead to more inclusive and effective labor market policies that benefit individuals, businesses, and the broader economy.

## Conclusions, limitations, and future research directions

This study examines the labor market outcomes of SMA and SMK graduates, with a focus on two main variables: the duration it takes to secure the first job and resilience during the COVID-19 pandemic, assessed by the change in average monthly income. The results suggest that SMK graduates experience a shorter period between graduation and their initial employment compared to SMA graduates, suggesting a potential advantage in early job placement. Additionally, SMK graduates demonstrate greater resilience during the pandemic, as they are more likely to maintain or even increase their income stability compared to SMA graduates.

However, it is essential to recognize the limitations of this study. Firstly, the focus on vocational and general secondary education graduates may limit the generalizability of the findings to other educational contexts. Secondly, the reliance on self-reported data introduces the possibility of bias or inaccuracies in responses. Therefore, future research should consider broader samples and incorporate objective measures or longitudinal data for a more comprehensive understanding. In addition, further investigation into the specific skills and competencies associated with income stability during crises would be valuable. Likewise, considering industry-specific dynamics can provide a more nuanced understanding of labor market outcomes. Thirdly, this study specifically examines the resilience of SMK graduates compared to SMA graduates during the pandemic, with a focus on income changes. While we have controlled for several important variables in our model, it is important to note that we do not explicitly investigate the causal relationship between the COVID-19 pandemic and income changes of graduates. Therefore, future studies may explore this relationship more comprehensively to better understand the impact of the pandemic on income fluctuations. Fourthly, we focused solely on whether respondents experienced a decrease, no change, or an increase in income, without considering the income levels before and after the change, as well as the magnitude of the change. Finally, as the COVID-19 pandemic may have long-term effects on the labor market, longitudinal studies tracking the career trajectories and income trajectories of vocational and academic secondary education graduates could provide valuable insights. This would enable researchers to examine the sustainability of income gains, long-term career prospects, and potential differences in career advancement opportunities between the two groups.

By addressing these limitations and pursuing future research directions, policymakers, educators, and career counselors can enhance their efforts in supporting vocational and general school graduates in navigating the labor market and promoting favorable employment outcomes and income stability.

**Acknowledgements**
We would like to express our gratitude to the Badan Pusat Statistik (BPS) Indonesia for providing invaluable support by granting access to the necessary data for this research. Their contribution was instrumental in the completion of this study. Furthermore, we would like to express our sincere appreciation to the anonymous reviewers whose insightful comments and constructive feedback greatly contributed to the enhancement of our manuscript.

**Author contributions**
-

**Funding**
The funding for this study was provided by Organisasi Riset Tata Kelola Pemerintahan, Ekonomi, dan Kesejahteraan Masyarakat (ORTKP-EKM), Badan Riset dan Inovasi Nasional (BRIN), Indonesia. The research grant number is B-3173/III.12/HK.01.00/6/2023.

**Data availability**
We have a non-disclosure agreement in place with the data provider.

## Declarations

**Competing interests**
The authors have no relevant financial or non-financial interests to disclose.

Received: 31 August 2023 / Accepted: 3 April 2024
Published online: 18 April 2024

**References**

Abdel-Rahman S, Awwad FA, Qasim M, Abonazel MR (2023) New evidence of gender inequality during COVID-19 outbreak in the Middle East and North Africa. Heliyon 9(7). https://doi.org/10.1016/j.heliyon.2023.e17705. Scopus

Aizenman J, Jinjarak Y, Ngo N, Noy I (2018) Vocational Education, Manufacturing, and income distribution: International evidence and Case studies. Open Econ Rev 29. https://doi.org/10.1007/s11079-017-9475-7
Ali M, Prasojo LD, Maedapi D, Soenarto (2018) Design of Self-evaluation Management Information Systems (Semis) for Vocational School Based on National Education Standard. *Journal of Physics: Conference Series*, *1140*, 012008. https://doi.org/10.1088/1742-6596/1140/1/012008
Allen ER (2016) Analysis of trends and challenges in the Indonesian labor market. Asian Dev Bank. https://www.adb.org/sites/default/files/publication/182935/ino-paper-16-2016.pdf
Alp E, Karadeniz O, Çağlar A, İslamoğlu E (2022) Does extending the internship period in vocational schools of higher education lead to better employment results? The case of Turkey. Educ + Train ahead–of–print(ahead–of–print). https://doi.org/10.1108/ET-11-2021-0418
Arceo-Gomez EO, Campos-Vazquez RM, Esquivel G, Alcaraz E, Martinez LA, Lopez NG (2023) The impact of COVID-19 infection on labor outcomes of Mexican formal workers. World Dev Perspect 29. Scopus https://doi.org/10.1016/j.wdp.2023.100488.
Astuti NFV, Setyonaluri D (2022) Labor Market Outcomes of Vocational High Schools (SMK) and General High Schools (SMA) during the COVID-19 pandemic. J Indonesia Sustainable Dev Plann 3(3):278–293. https://doi.org/10.46456/jisdep.v3i3.328
Attanasio O, Kugler A, Meghir C (2011) Subsidizing Vocational Training for Disadvantaged Youth in Colombia: evidence from a Randomized Trial. Am Economic Journal: Appl Econ 3(3):188–220. https://doi.org/10.1257/app.3.3.188
Azari CE (1996) Measuring Student outcomes in Postsecondary Vocational Education: using wage Record Data. Community Coll Rev 24(3):37–51. https://doi.org/10.1177/009155219602400305
Badan Pusat Statistik (2023) *Tingkat Pengangguran Terbuka Berdasarkan Tingkat Pendidikan*. Badan Pusat Statistik. https://www.bps.go.id/id/statistics-table/2/MTE3OSMy/tingkat-pengangguran-terbuka-berdasarkan-tingkat-pendidikan.html
Bahl S, Bhatt V, Sharma A (2021) Returns to formal and informal vocational education and training in India. Int J Manpow 43(7):1620–1645. https://doi.org/10.1108/IJM-04-2021-0211
Bairagya I (2021) Impact of formal vocational training on the earnings of self-employed individuals in rural India. J Bus Venturing Insights 16:e00269. https://doi.org/10.1016/j.jbvi.2021.e00269
Barcucci V, Zanola L, Axmann M (2017) Vocational Education and Training (VET) and the transition of Young women and men to the Labour Market in Middle-Income countries: a comparative analysis based on International Labour Organization (ILO) surveys in Jamaica, Jordan, Peru, Tunisia, Ukraine, Vietnam and Zambia. In: Pilz M (ed) Vocational Education and Training in Times of Economic Crisis: lessons from around the World. Springer International Publishing, pp 59–81. https://doi.org/10.1007/978-3-319-47856-2_4
Barslund M (2007) CHECKROB: Stata module to perform robustness check of alternative specifications. *Statistical Software Components S456837, Boston College Department of Economics*. https://ideas.repec.org/c/boc/bocode/s456837.html
Becker GS (1962) Investment in Human Capital: a theoretical analysis. J Polit Econ 70(5):9–49
BPS (2022a) *Analysis of Indonesia's Population Profile (Original title: Analisis Profil Penduduk Indonesia)* (07300.2205). Badan Pusat Statistik (BPS). https://www.bps.go.id/publication/2022/06/24/ea52f6a38d3913a5bc557c5f/analisis-profil-penduduk-indonesia.html
BPS (2022b) Analysis of Indonesia's Population Profile (Original Title: Analisis Profil Penduduk Indonesia) (07300.2205). Badan Pusat Statistik (BPS). https://www.bps.go.id/publication/2022/06/24/ea52f6a38d3913a5bc557c5f/analisis-profil-penduduk-indonesia.html
BPS (2022c) *Indikator Pasar Tenaga Kerja Indonesia Agustus 2022 (04100.2210)*. Badan Pusat Statistik (BPS). https://www.bps.go.id/id/publication/2022/12/14/590d81be67bee04024183a0e/indikator-pasar-tenaga-kerja-indonesia-agustus-2022.html
BPS (2022d) *Labor Force Situation In Indonesia August 2022(Original Title: Keadaan Angkatan Kerja Di Indonesia Agustus 2022) (04100.2207)*. Badan Pusat Statistik (BPS). https://webapi.bps.go.id/download.php?f=0XF/0e0HfZd0fekNc4DlMYhIAUV+e6hpn4TOA9R5y4g+HNNlegOpg4AkA/31izTms+8n7dNGx1aLURgOlUSzFxkc1GeRvd5HUuh5OgDa6KlBPW0NvcpSsolkY9NuZCXAfbBz0/R9YcZla8g0qLnYOda/JqbMfhWSW/lBErXuOxODT2rvJO9uHQfeae8MJJSuxwDFy7Nb8afQv-l9mMOt8pN9iFmK0YouSxDFcvBeUVl8K6/QmjdWfDC0OjevwQ7YPc8jk/oTF/wCgpvbCkN4Gs0lzSYiuT5a1H9a+cEADcZA=
BPS (2023) *Tingkat Pengangguran Terbuka Berdasarkan Kelompok Umur 2020–2022*. Badan Pusat Statistik. https://www.bps.go.id/indicator/6/1180/1/tingkat-pengangguran-terbuka-berdasarkan-kelompok-umur.html
Brauw AD, Rozelle S (2008) Reconciling the returns to education in off-farm wage employment in Rural China. Rev Dev Econ 12(1):57–71
Calero López I, Rodríguez-López B (2020) The relevance of transversal competences in vocational education and training: a bibliometric analysis. Empir Res Vocat Educ Train 12(1):12. https://doi.org/10.1186/s40461-020-00100-0
Carneiro P, Dearden L, Vignoles A (2010) The Economics of Vocational Education and Training. In P. Peterson, E. Baker, and B. McGaw (Eds.), *International Encyclopedia of Education (Third Edition)* (pp. 255–261). Elsevier. https://doi.org/10.1016/B978-0-08-044894-7.01737-1
Cedefop (2017) Cedefop European public opinion survey on vocational education and training. Publications Office of the European Union. https://data.europa.eu/doi/10.2801/575587
Choi S (2021) Urban/rural disparities in the wage effect of additional vocational education after formal education: the case of the Philippines. Int J Train Res 19(3):229–241. https://doi.org/10.1080/14480220.2021.1935296
Choi SJ, Jeong JC, Kim SN (2019) Impact of vocational education and training on adult skills and employment: an applied multilevel analysis. Int J Educational Dev 66:129–138. https://doi.org/10.1016/j.ijedudev.2018.09.007
Cholik M, Samani M, Buditjahjanto IGPA, Putri AR (2021) The Effect of Education System Components on the quality of Vocational High School graduates. Int J Instruction 14(3):241–254. https://doi.org/10.29333/iji.2021.14314a
Comi SL, Grasseni M, Origo F (2022) Sometimes it works: the effect of a reform of the short vocational track on school-to-work transition. Int J Manpow 43(7):1601–1619. https://doi.org/10.1108/IJM-06-2021-0391
Corbett WP, Clark HB, Blank W (2002) Employment and Social Outcomes Associated with Vocational Programming for youths with emotional or behavioral disorders. Behav Disorders 27(4):358–370. https://doi.org/10.1177/019874290202700403
di Gropello E (2013) Role of the education and training sector in addressing skill mismatch in Indonesia. In D. Suryadarma and G. W. Jones (Eds.), *Education in Indonesia* (pp. 236–266). ISEAS Publishing. https://doi.org/10.1355/9789814459877-017
Doerr A (2022) Vocational training for female job returners—effects on employment, earnings and job quality. Labour Econ 75:102139. https://doi.org/10.1016/j.labeco.2022.102139

Ferri V, García-Pereiro T, Pace R (2022) Gender pay-gap: exploring the school-to-work transition of graduates in Italy. Int J Manpow 44(6):1143–1167. https://doi.org/10.1108/IJM-06-2021-0363
Finlay I, Niven S, Young S (eds) (1998) Changing Vocational Education and Training: An International Comparative Perspective. Routledge. https://doi.org/10.4324/9780203980477
Forster AG, Bol T, van de Werfhorst HG (2016) Vocational education and employment over the life cycle. Sociol Sci 3:473–494. https://doi.org/10.15195/v3.a21
Golsteyn B, Stenberg A (2017) *Earnings Over the Life Course: General versus Vocational Education* (SSRN Scholarly Paper 2931330). https://doi.org/10.2139/ssrn.2931330
Guven C, Sotirakopoulos P, Ulker A (2023) Individual labour market transitions of australians during and after the National COVID-19 Lockdown. Appl Econ 55(8):853–868. https://doi.org/10.1080/00036846.2022.2094881. Scopus
Hanushek EA, Woessmann L, Zhang L (2011) *Vocational education facilitates entry into the labour market but hurts employment at older ages | Eric A. Hanushek*. http://hanushek.stanford.edu/publications/vocational-education-facilitates-entry-labour-market-hurts-employment-older-ages
Hanushek EA, Schwerdt G, Woessmann L, Zhang L (2017) General Education, Vocational Education, and Labor-Market outcomes over the lifecycle. J Hum Resour 52(1):48–87
Hao X, Yang X, Kou K, Zhang Y, Guo C (2023) Research on the contribution mechanism of Vocational Human Capital characteristics to income. Educ Sci 13(3):246. https://doi.org/10.3390/educsci13030246
Harris A, Jones M (2018) Why context matters: a comparative perspective on education reform and policy implementation. Educ Res Policy Pract 17(3):195–207. https://doi.org/10.1007/s10671-018-9231-9
Honoré BE, Hu L (2023) The COVID-19 pandemic and Asian American employment. Empirical Economics 64(5):2053–2083. https://doi.org/10.1007/s00181-022-02306-5. Scopus
ILO (2020) *ILO Monitor: COVID-19 and the world of work. 6th edition* [Briefing note]. International Labour Organization. http://www.ilo.org/global/topics/coronavirus/impacts-and-responses/WCMS_755910/lang--en/index.htm
Indrawati SM, Kuncoro A (2021) Improving competitiveness through Vocational and Higher Education: Indonesia's Vision for Human Capital Development in 2019–2024. Bull Indones Econ Stud 57(1):29–59. https://doi.org/10.1080/00074918.2021.1909692
Jones BL, Jones JS (2020) *Gov. Cuomo is wrong, covid-19 is anything but an equalizer—The Washington Post*. The Washington Post. https://www.washingtonpost.com/outlook/2020/04/05/gov-cuomo-is-wrong-covid-19-is-anything-an-equalizer/
Kemendikbudristek (2021), August 16 *Pendidikan Vokasi Bisa Jadi Peluang Sekaligus Solusi Masalah Pengangguran*. Kementerian Pendidikan, Kebudayaan, Riset, Dan Teknologi. https://www.kemdikbud.go.id/main/blog/2021/08/pendidikan-vokasi-bisa-jadi-peluang-sekaligus-solusi-masalah-pengangguran
Korber M, Oesch D (2019) Vocational versus general education: employment and earnings over the life course in Switzerland. Adv Life Course Res 40:1–13. https://doi.org/10.1016/j.alcr.2019.03.003
Kuczera M, Jeon S (2019) Vocational Education and Training in Sweden. OECD. https://doi.org/10.1787/g2g9fac5-en
Kurniawan AW (2016) Grand Design Pengembangan Teaching Factory Dan Technopark Di SMK. Direktorat Pembinaan Sekolah Menengah Kejuruan, Direktorat Jenderal Pendidikan Dasar dan Menengah
Kuzminov Y, Sorokin P, Froumin I (2019) Generic and specific skills as components of Human Capital: New challenges for Education Theory and Practice. Foresight STI Gov (Foresight-Russia till 3/2015) 13(2):19–41
Lent RW, Brown SD (2013) Social cognitive model of career self-management: toward a unifying view of adaptive career behavior across the life span. J Couns Psychol 60(4):557–568. https://doi.org/10.1037/a0033446
Liang X, Rozelle S, Yi H (2022) The impact of COVID-19 on employment and income of vocational graduates in China: evidence from surveys in January and July 2020. China Econ Rev 75:101832. https://doi.org/10.1016/j.chieco.2022.101832
Lu X, White H (2014) Robustness checks and robustness tests in applied economics. J Econ 178:194–206. https://doi.org/10.1016/j.jeconom.2013.08.016
Lukesch V, Zwick T (2020) Does tertiary vocational education beat academic education? A matching analysis of young men's earnings developments. Empir Res Vocat Educ Train 12(1):16. https://doi.org/10.1186/s40461-020-00104-w
Luthar SS, Cicchetti D, Becker B (2000) The Construct of Resilience: a critical evaluation and guidelines for future work. Child Dev 71(3):543–562. https://doi.org/10.1111/1467-8624.00164
Manacorda M, Rosati FC, Ranzani M, Dachille G (2017) Pathways from school to work in the developing world. IZA J Labor Dev 6(1):1. https://doi.org/10.1186/s40175-016-0067-5
Männasoo K, Pareliussen K, J., and, Saia A (2023) Digital capacity and employment Outcomes: Microdata evidence from Pre- and Post-COVID-19 Europe. *Telematics and Informatics*, *83*. Scopus. https://doi.org/10.1016/j.tele.2023.102024
Mincer J (1974) *Schooling, Experience, and Earnings* [NBER Books]. National Bureau of Economic Research, Inc. https://econpapers.repec.org/bookchap/nbrnberbk/minc74-1.htm
Ministry of Health (2021), December *Penguatan Sistem Kesehatan dalam Pengendalian COVID-19 – P2P Kemenkes RI*. http://p2p.kemkes.go.id/penguatan-sistem-kesehatan-dalam-pengendalian-covid-19/
Misbah Z, Gulikers J, Dharma S, Mulder M (2020) Evaluating competence-based vocational education in Indonesia. J Vocat Educ Train 72(4):488–515. https://doi.org/10.1080/13636820.2019.1635634
Morris K (2023) Getting a foot in the door: local labour markets and the school-to-work transition. J Youth Stud 0(0):1–21. https://doi.org/10.1080/13676261.2023.2248905
Müller W (2005) Education and Youth Integration into European Labour Markets. Int J Comp Sociol 46(5–6):461–485. https://doi.org/10.1177/0020715205060048
Neugebauer M, Weiss F (2018) A transition without tradition: earnings and unemployment risks of academic versus vocational education after the Bologna process. Z Für Soziologie 47(5):349–363. https://doi.org/10.1515/zfsoz-2018-0122
Newhouse D, Suryadarma D (2011a) The Value of Vocational Education: High School Type and Labor Market outcomes in Indonesia. World Bank Econ Rev 25(2):296–322. https://doi.org/10.1093/wber/lhr010
Newhouse D, Suryadarma D (2011b) The Value of Vocational Education: High School Type and Labor Market outcomes in Indonesia. World Bank Econ Rev 25(2):296–322. https://doi.org/10.1093/wber/lhr010
*Presiden Luncurkan Perpres Revitalisasi Vokasi, Kejar Kualitas SDM Bonus Demografi*. Novrizaldi, Kemenko PMK (2023) https://www.kemenkopmk.go.id/index.php/presiden-luncurkan-perpres-revitalisasi-vokasi-kejar-kualitas-sdm-bonus-demografi
Organisation for Economic Co-operation and Development (2015) In: Bank AD (ed) Education in Indonesia: rising to the challenge. OECD Publishing; ADB

OECD (2020) *Improving evidence on VET: Comparative data and indicators*. Organisation for Economic Co-operation and Development. https://www.oecd.org/education/improving-evidence-on-vet-d43dbf09-en.htm
Ohara E, Harto S, Maruanaya R (2020) Policy shift to reduce unemployment of Vocational School graduates in Indonesia (A National Study). Jurnal Pendidikan Teknologi Dan Kejuruan 26:129–139. https://doi.org/10.21831/jptk.v26i2.33144
Pastore F, Quintano C, Rocca A (2022) The duration of the school-to-work transition in Italy and in other European countries: a flexible baseline hazard interpretation. Int J Manpow 43(7):1579–1600. https://doi.org/10.1108/IJM-03-2021-0135
Pritadrajati DS (2022) From School to work: does Vocational Education improve Labour Market outcomes? An empirical analysis of Indonesia. Buletin Ekonomi Moneter Dan Perbankan 25(3):471–492. https://doi.org/10.21098/bemp.v25i3.1315
Putra RAA, Ovsiannikov K, Kotani K (2023) COVID-19-associated income loss and job loss: evidence from Indonesia. J Asian Econ 87. Scopus https://doi.org/10.1016/j.asieco.2023.101631.
Putri PO, Dermawan DA (2020) Studi literatur peningkatan kinerja BKK sekolah dengan sistem informasi bursa kerja. IT-Edu: Jurnal Inform Technol Educ 5(01):480–488
Redfering DL, Cook D (1980) Relationships among vocational training, income, and job complexity of high school dropouts and high school graduates. J Vocat Behav 16(2):158–162. https://doi.org/10.1016/0001-8791(80)90046-9
Richards EW (1984) Undergraduate preparation and early career outcomes: a study of recent college graduates. J Vocat Behav 24(3):279–304. https://doi.org/10.1016/0001-8791(84)90013-7
Ryan P (2001) The School-to-work transition: a cross-national perspective. J Econ Lit 39(1):34–92. https://doi.org/10.1257/jel.39.1.34
Savickas ML (1999) The transition from school to work: a developmental perspective. Career Dev Q 47(4):326–336. https://doi.org/10.1002/j.2161-0045.1999.tb00741.x
Silliman M, Virtanen H (2022) Labor Market Returns to vocational secondary education. Am Economic Journal: Appl Econ 14(1):197–224. https://doi.org/10.1257/app.20190782
Singh S, Parida JK (2022) Employment and earning differentials among vocationally trained Youth: evidence from field studies in Punjab and Haryana in India. Millennial Asia 13(1):142–172. https://doi.org/10.1177/0976399620964308
Ssenyonga M (2021) Imperatives for post COVID-19 recovery of Indonesia's education, labor, and SME sectors. Cogent Econ Finance 9(1):1911439. https://doi.org/10.1080/23322039.2021.1911439
Stevens ND (1973) Job-seeking behavior: a segment of vocational development. J Vocat Behav 3(2):209–219. https://doi.org/10.1016/0001-8791(73)90011-0
Suharno, Pambudi NA, Harjanto B (2020a) Vocational education in Indonesia: history, development, opportunities, and challenges. Child Youth Serv Rev 115:105092. https://doi.org/10.1016/j.childyouth.2020.105092
Suharno, Pambudi NA, Harjanto B (2020b) Vocational education in Indonesia: history, development, opportunities, and challenges. Child Youth Serv Rev 115:105092. https://doi.org/10.1016/j.childyouth.2020.105092
Sukanti N, Sulistyaningrum E (2022) Mismatch effect between education, workers, and occupations on the labor market in Indonesia. Southeast Asian J Econ 10(3):103–133
Tentua MN, Winarko E (2020) Applying Data Mining to Analysis of Mismatch Between Education and Labor Market in Indonesia. *IOP Conference Series: Materials Science and Engineering*, *771*, 012020. https://doi.org/10.1088/1757-899X/771/1/012020
Torun H, Tumen S (2019) Do vocational high school graduates have better employment outcomes than general high school graduates? Int J Manpow 40(8):1364–1388. https://doi.org/10.1108/IJM-11-2017-0314
Tsai J, Umucu E, Fish K (2023) Job automation and concerns during the COVID-19 pandemic among Middle and Low-Income US adults. J Occup Environ Med 65(2):113–118. https://doi.org/10.1097/JOM.0000000000002734. Scopus
Wang G, Zhang X, Xu R (2023) Does Vocational Education Matter in Rural China? A comparison of the effects of Upper-secondary vocational and academic education: evidence from CLDS Survey. Educ Sci 13(3). https://doi.org/10.3390/educsci13030258
Wolbers MHJ (2007) Patterns of Labour Market Entry: a comparative perspective on School-to-work transitions in 11 European Countries. Acta Sociol 50(3):189–210. https://doi.org/10.1177/0001699307080924
Wößmann L (2008) Efficiency and equity of European education and training policies. Int Tax Public Finance 15(2):199–230. https://doi.org/10.1007/s10797-008-9064-1
Yu D, Botha J, Nackerdien MF (2023) Examining the South African labour market during the COVID-19 lockdown period. Dev South Afr. Scopus https://doi.org/10.1080/0376835X.2023.2229875.
Zamfir A-M, Militaru E, Mocanu C, Lungu EO (2020) School-to-work transition of higher education graduates in four European countries. Compare: J Comp Int Educ 50(1):36–52. https://doi.org/10.1080/03057925.2018.1493572
Zilic I (2018) General versus vocational education: lessons from a quasi-experiment in Croatia. Econ Educ Rev 62:1–11. https://doi.org/10.1016/j.econedurev.2017.10.009
Zimmermann M (2021) Postsecondary and labour market outcomes of vocational vs. General higher track secondary pupils. Educ Econ 29(2):213–231. https://doi.org/10.1080/09645292.2021.1871884
Zimmermann KF, Biavaschi C, Eichhorst W, Giulietti C, Kendzia MJ, Muravyev A, Pieters J, Rodríguez-Planas N, Schmidl R (2013) Youth unemployment and vocational training. Found Trends® Microeconomics 9(1–2):1–157. https://doi.org/10.1561/0700000058

## Publisher's Note