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Research Paper

Closing the Gap Between Education and Labor Market Requirement: Do Vocational Education Matter?

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Abstract

The alignment between educational attainment and job type is expected to create a win-win solution from both the labour supply and demand perspectives. Despite these expectations, challenges must be addressed to realize such alignment within labour markets fully. In Indonesia, vertical mismatch is a significant concern due to its relation with productivity and income, particularly among the youth. Vocational education is predicted to close that gap. This study aims to (1) analyze the impacts of vocational education toward vertical mismatch and (2) examine the impact of vertical mismatch on decent income among young people in Indonesia. Using Sakernas microdata, which was analyzed using the logistic regression method that can provide the best estimate for this study, the study finds that youth who complete vocational education are less likely to experience vertical mismatch. Furthermore, matched or overeducated youth have higher chances of earning a decent income. These findings underscore the need for policies that can align vocational school curricula with labour market demands.

Keywords: vertical mismatch; education; youth; decent income; logistic regression

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1. Introduction

Education is a critical determinant of individuals' success in transitioning into the labor market, especially in the increasingly competitive global economy. From an economic standpoint, education is seen as an essential form of human capital investment, yielding returns in the form of higher future income and improved employment prospects (Forsyth, 2023; Shu & Wang, 2023). By equipping individuals with the technical skills required by modern industries, education not only increases their employability but also enhances cognitive capabilities such as problem-solving, critical thinking, and adaptability, which are essential in a rapidly changing labor market. As countries strive to compete in the global economy, the role of education in preparing a highly skilled and adaptable workforce becomes increasingly crucial, aligning with the broader goals of economic development and sustainability.

Moreover, education significantly increases the likelihood of individuals attaining decent work, a core component of sustainable economic growth. Decent work refers to employment that provides fair wages, security in the workplace, and social protection for families, thus contributing to poverty reduction and overall economic well-being. This is closely tied to the achievement of the United Nations' Sustainable Development Goals (SDGs), particularly SDG 4, which promotes inclusive and equitable quality education, and SDG 8, which advocates for decent work and economic growth (Bappenas, 2018). The alignment between education and labor market demands thus plays a pivotal role in ensuring not only personal economic success but also broader societal progress towards the SDGs.

Vocational education is widely recognized as a critical strategy in bridging the gap between labour market demands and the supply of skilled workers by acquiring technical and practical skills directly aligned with industry needs (Choi, 2021; English & Mayo, 2023). It makes vocational training particularly relevant in the context of rapid economic and technological changes, where the demand for specialized skills is growing. The focus on practical training ensures that graduates are well-versed in theoretical knowledge and can apply their skills in real-world settings, enhancing their employability (Oswald-Egg & Renold, 2021).

Youth represents a critical phase in determining long-term labor market outcomes, where the foundations for future career success are laid (Kluve et al., 2019). Education plays a pivotal role in this process, ideally serving as a bridge that equips young people with the skills required by businesses and industries. However, the reality in Indonesia reveals a persistent issue of vertical mismatch between the education level attained by youth and the types of jobs they occupy. This mismatch highlights the education system's inability to adequately prepare graduates for the specific demands of the labor market.

The 2022 and 2023 Sakernas survey in Indonesia highlights that approximately one-third of working youth in Indonesia are mismatched in their current roles, either over- or undereducated, which impacts productivity and income (Wicaksono et al., 2023; Kim & Choi, 2018; Tran et al., 2023). This condition persists without showing any significant changes over the past two years.

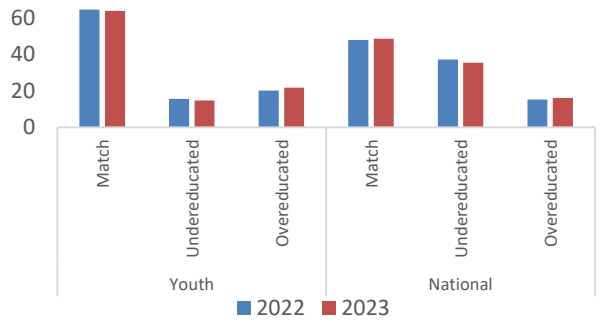

Figure 1: Mismatch Status of Youth and All Workers in Indonesia, 2022-2023
Source: Sakernas August 2022 and August 2023 (BPS), processed

Addressing these mismatches is crucial for optimizing labour market efficiency and individual career outcomes. It ensures that education translates effectively into employment opportunities that match qualifications.

Moreover, even when youth achieve a match between their education and job, it does not automatically translate into earning a decent income. The International Labour Organization (ILO) utilizes the low-pay-rate proxy as a measure of decent income, which is based on the median earnings of workers (BPS, 2023). Despite having jobs that align with their educational qualifications, many youth continue to face income instability and vulnerability (Al Ayyubi et al., 2023). This suggests that simply aligning education with employment is not sufficient to ensure financial stability, particularly in environments where low-wage jobs are prevalent. The persistence of low-paying jobs, even for well-matched workers, reflects deeper structural issues within the labor market, such as wage stagnation and the limited bargaining power of young workers.

The income vulnerability experienced by youth, even those in roles suited to their qualifications, is a critical issue that warrants further investigation. Youth are particularly susceptible to low wages, as they often occupy entry-level positions with limited opportunities for advancement. This can persist a cycle of income insecurity, where youth are unable to accumulate savings or invest in further skill development (Wachter, 2020a). Moreover, the presence of low-paying jobs within well-matched employment scenarios raises concerns about the quality of jobs available to youth, pointing to the need for broader reforms aimed at improving wage structures and enhancing job quality. Ensuring that matched workers are adequately compensated for their skills and qualifications is essential for fostering long-term economic resilience and reducing income inequality among youth in the labor market.

Several previous studies have examined the issue of vertical mismatch and income adequacy among the workforce, often focusing on specific aspects rather than providing a comprehensive analysis. For instance, Wicaksono et al., (2023) highlighted the prevalence of educational mismatch in Indonesia during 2017-2018, showing that overeducated workers are more likely to face income penalties due to the underutilization of their skills. Similarly, the study by Wen & Maani (2022) found that educational mismatches, particularly overeducation, lead to lower wages compared to workers who are appropriately matched to their jobs, which suggests that the labor market fails to fully reward additional educational attainment. These findings are inline in the work of Rossen et al., (2019) who further emphasize the long-term income consequences of overeducation, noting that workers who start their careers in mismatched roles often experience prolonged wage gaps throughout their careers. This research attempts to provide insights through a continuous analysis of both aspects between educational mismatch and decent income.

The objectives of this study are (1) to analyze the impact of vocational education on vertical mismatch among youth in Indonesia and (2) to analyze the impact of vertical mismatch on decent income among youth in Indonesia. The findings from this research will offer feasible policy recommendations to bridge the gap between education and the skill requirements of the labor market.

2. Methods

This study adopts a quantitative research approach, utilizing secondary data from the National Labor Force Survey (Sakernas) for the August 2023 period. Sakernas provides comprehensive microdata on employment conditions in Indonesia, including education levels, types of employment, and individual labor market circumstances. The data is highly relevant for examining issues related to job matching, overeducation, and undereducation, as well as their implications for income outcomes. The study focuses on the youth demographic, defined by the International Labour Organization (ILO) as individuals between the ages of 15 and 24 years (ILO, 2023). The Sakernas microdata from August 2023 used in this study has undergone a data checking and handling process, ensuring no missing values. Subsequently, the variable coding process was carried out based on the operational definitions of the variables used in this study.

The classification of educational mismatch—whether an individual is overeducated, undereducated, or in a well-matched job—relies on the alignment between the highest completed level of education and the job classification code (ISCO), as specified by ILOSTAT (2024). The mismatch status is categorized into three groups: 0 for a match, 1 for undereducation, and 2 for overeducation. Classification of vertical mismatch status used in this study, declared in Table 1.

Table 1: Mapping of Vertical Mismatch Status by Level of Education and Job Occupation

Job Occupation	Level of Education			
	Elementary School	High School (Junior and High School)	Diploma (D-I until D-IV degree)	Higher Education (Bachelor, Master, and PhD)
Managers				
Professionals				
Technicians and Associate Professionals				
Clerical workers				
Services and Sales Workers				
Skilled Agricultural, Forestry and Fishery Workers				
Craft and Related Trades Workers				
Plant and Machine Operations and Assemblers				
Elementary Occupations				

Source: Adapted from (ILOSTAT, 2024; Wicaksono et al., 2023)
Note: Under educated Match Over educated

Income adequacy, the key outcome variable, is measured using a proxy for decent income, derived from the low-pay rate calculation. Decent income is defined as earnings at least two-thirds of the median income, based on BPS standards. Based on this calculation, income status is dichotomized into two categories: 0 for not decent income and 1 for decent income BPS (2023). This operationalization allows for an analysis of how educational mismatch influences labor market outcomes, particularly in terms of earning an adequate income, providing key insights into the broader context of income inequality and labor market mismatches in Indonesia. Table 2 gives clearer definition of dependent and independent variables used in this research.

Table 2: Definition of Variables

Name of Variables	Definition
Dependent Variable	
Vertical Mismatch	Alignment between the highest completed level of education and the job classification code (ISCO). Classified into three categories: match (as reference category), undereducation and overeducation.
Income Status	Individual income status. Classified into decent and not decent income (as reference category).
Independent Variable	
Vocational education	Classified as attaining vocational education if graduated from vocational high school/ diploma programme/ applied post-graduate degree/ applied PhD degree.
Gender	Gender consist of male and female (as reference category).
Age	Age of individual.
Age-Squared	Age of individual in squared number.
Residential Area	Classification of residence area divided into urban and rural area (as reference category).
Training Participation	Participation status of individual in training held by public or private agency. Training participation divided into two categories: have attended training or not (as reference category).
Working Experience	Individual working experience, classified into have working experience and not have working experience (as reference category).
KartuPrakerja	Participation in the KartuPrakerja programme, job training programme provided by the Indonesian government starts from the pandemic era, classified into two categories: participating in the preemployment card and not knowing/not registering/not selected the KartuPrakerja programme (as reference category).
Employment Sector	Employment sector classified into agriculture sector (as reference category), manufacture sector and services sector.

Source: Author

In this study, logistic regression serves as the primary analytical method to explore the research objectives effectively. Two distinct types of logistic regression models are utilized, aligning with the specific aims of the investigation (Agresti, 2012). Furthermore, according to Jose et al. (2020), logistic regression is preferred over probit regression as it delivers more accurate and consistent estimation results. The first objective, which focuses on identifying the determinants of mismatch, employs

multinomial logistic regression. This approach is appropriate as the dependent variable is categorized into more than two distinct classes, allowing for a comprehensive understanding of the various factors contributing to the mismatch phenomenon. Using multinomial logistic regression, we can capture the complexities inherent in the relationship between educational qualifications and employment outcomes across multiple categories.

Conversely, the second objective examines the determinants of wage adequacy, utilizing binary logistic regression. This model is fitting since the dependent variable in this case is dichotomous, consisting of only two categories: adequate and inadequate wage levels. To enhance the robustness of the findings, the analysis in this model is conducted through three iterations, with a primary focus on the variable representing mismatch status. Moreover, a robustness check was also carried out to provide an adequate estimate of the results through estimation with an ordinary least square regression model on individual income (on a continuous scale that is not categorized). The logistic regression models employed in this research are encapsulated by the following equations (1), which outline the mathematical frameworks guiding the analysis and elucidate the interdependencies among the key variables under investigation.

$$ln\left(\frac{P(Y=j|x)}{P(Y=0|x)}\right) = \beta_{j0} + \beta_{j1}x_1 + \beta_{j2}x_2 + \cdots + \beta_{jp} \quad \ldots (1)$$

where: j = 0,1,2 (for the first model) and j = 0,1 (for the second model) ; p = number of independent variable

3. Results and Discussions

The key findings of this study consist of two main points (1) Youth who complete vocational education are more likely to experience a match or become overeducated, but less likely to be undereducated. (2) Youth whose education matches their job, as well as those who are overeducated, have higher chances of obtaining a decent income. Conversely, youth experiencing an undereducation mismatch are less likely to achieve a decent income.

Table 3: Marginal Effect of Mismatch Status (Multinomial Logit Model)

Variables	Vertical Mismatch		
	Match	**Undereducation**	**Overeducation**
Vocational education	0.102***	-0.107***	0.004
Male	-0.048***	0.001	0.046***
Age	0.133***	-0.092***	-0.041***
Age-Squared	-0.004***	0.002***	0.001***
Urban	0.009**	-0.043***	0.034***
Training	0.005	-0.060***	0.055***
Working Experience	-0.001	0.000	0.002
KartuPrakerja	0.053**	-0.030***	-0.023**
Employment Sector			
Manufacture	0.034***	-0.083***	0.049***
Service	0.140***	-0.064***	-0.076***
Observations		**60,955**	

Source: Author
Note: *significance at 10%; **significance at 5%; ***significance at 1%

The results from the multinomial logit model, presented in Table 3, highlight the marginal effects of various determinants on the probability of matching, undereducation, or overeducation in the labor market. The primary variable of interest, vocational education, demonstrates a significant positive effect on the probability of job match, with a marginal effect of 0.102. This indicates that individuals with vocational education are more likely to be in jobs that match their qualifications, compared to those without. This suggests that vocational training may better equip Indonesian youth with relevant skills, improving their job suitability and reducing mismatches, particularly in technical fields. In contrast, vocational education shows a negative effect on undereducation, with a marginal effect of -0.107, suggesting that vocationally trained workers are less likely to be undereducated for their jobs. However,

the effect of vocational education on overeducation is not significant, implying no meaningful impact on the likelihood of being overqualified for their job.

Gender differences also emerge as significant, with males being less likely to be in job matches, as indicated by the negative marginal effect of -0.048. However, males are more likely to be overeducated, with a marginal effect of 0.046. This gender disparity suggests that males may face greater challenges in obtaining jobs that match their educational qualifications. Age and its squared term provide further insights into the dynamics of vertical mismatches. As age increases, the probability of a job match rises by 13,3 percent, but at a diminishing rate, as indicated by the negative marginal effect for age-squared. Older workers are also less likely to experience undereducation but face a modest increase in the probability of overeducation as they age.

Other variables, such as urban residence, the Kartu Prakerja program, and sector of employment, also influence mismatch status. Urban workers are more likely to experience but are less likely to be undereducated. Participation in the Kartu Prakerja program is associated with a decreased probability of undereducation and a lower probability of overeducation. Employment in the manufacturing sector reduces the probability of both undereducation and overeducation, whereas employment in the service sector increases the probability of job match by 14 percent but reduces the chances of both undereducation and overeducation. These findings underscore that labor market sector and targeted government programs significantly shapes education-job match outcomes.

The findings from the multinomial logit model in Table 3 provide important insights into the relationship between vocational education and job matching in the labor market. Overall, vocational education reduces under education and enhances job alignment, as shown by the significant marginal effects. Prior research supports this finding, showing that vocational education improves the alignment between education and job requirements by offering specialized skills directly applicable to specific industries (Xiaohong, 2024). The finding that vocational education reduces the likelihood of undereducation further emphasizes its role in preparing individuals for appropriately matched jobs, minimizing skill gaps.

On the contrary, the lack of significant impact of vocational education on overeducation suggests that while vocational training enhances the likelihood of securing matched positions, it may not fully protect against the risks of overqualification. This aligns with earlier studies that indicate overeducation is a more complex phenomenon, influenced by broader labor market conditions and the availability of jobs at appropriate skill levels (Beltramo et al., 2023; McDonnall & Cmar, 2024). Overeducation often results from structural imbalances in the labor market, where individuals with higher qualifications may accept jobs below their skill level due to a lack of suitable opportunities. The absence of a significant relationship between vocational education and overeducation reflects this challenge and suggests that while vocational programs address undereducation effectively, they may need further refinement to reduce overqualification.

The findings also highlight important gender differences in educational mismatch. Males are found to be less likely to secure jobs that match their qualifications. This aligns with Bamieh and Ziegler (2023) which finds similar gender-based challenges in job match outcomes. This could be driven by factors such as gendered labor market expectations or differences in job search behavior between men and women. Additionally, the higher likelihood of overeducation among men suggests that men may face more significant barriers in securing jobs that fully utilize their educational qualifications. This is consistent with previous findings indicating that men are more prone to overqualification, particularly in industries where demand for highly skilled labor is constrained.

Age also plays a significant role in determining education-job matching outcomes. The positive relationship between age and the likelihood of job match reflects the accumulation of work experience, which can improve an individual's chances of securing a well-matched job. However, the diminishing marginal effect as age increases suggests that older workers, while more likely to be in matched positions, face challenges in sustaining this advantage as they age. This finding related to study by Pröbster et al., (2024) who found the changes in job requirements over time, skills obsolescence, or a lack of opportunities for retraining and upskilling among older workers. At the same time, older individuals are less likely to experience undereducation, likely due to their longer tenure in the labor market and accumulated experience.

The impact of urban residence on educational mismatch also aligns with previous research, suggesting that workers in urban areas are more likely to face overeducation, possibly due to a higher supply of educated labor relative to available job opportunities. In contrast, urban workers are less likely to be undereducated, reflecting better access to education and employment resources in urban centers. The Kartu Prakerja program's role in reducing both undereducation and overeducation highlights the potential of government initiatives aimed at upskilling the labor force to address educational mismatches. Similar findings have been documented in other contexts where targeted training programs improve employment outcomes by addressing skill gaps (ÖZER & SUNA, 2020; Somers et al., 2019).

Finally, the sector of employment significantly influences mismatch status, with workers in the manufacturing and service sectors experiencing different outcomes. Manufacturing workers are less likely to experience either undereducation or overeducation, possibly due to the sector's emphasis on specific technical skills that align well with vocational training. In contrast, employment in the service sector increases the probability of a job match, which may reflect the broader range of skill levels required in service jobs, allowing for more flexibility in matching qualifications with job requirements. This finding is consistent with prior studies showing that the service sector often accommodates a diverse range of skills and educational backgrounds, reducing the risk of both undereducation and overeducation (Kampelmann et al., 2020; Rossen et al., 2019). Overall, these findings suggest that sectoral differences and targeted policy interventions are critical in shaping the relationship between education and labor market outcomes.

Table 4: Estimation Results of Income Status Model

Variables	Simulation by Vertical Mismatch Status					
	Simulation 1		Simulation 2		Simulation 3	
	Logit	OLS	Logit	OLS	Logit	OLS
Match	0.025***	0.051***				
Undereducation			-0.078***	-0.155***		
Overeducation					0.034***	0.054***
Vocational education	0.255***	0.138***	0.139***	0.131***	0.092***	0.144***
Male	-0.006***	0.280***	0.252***	0.278***	0.136***	0.273***
Age	0.120***	0.555***	-0.006***	0.546***	0.264***	0.569***
Age-Squared	0.012***	-0.012***	0.117***	-0.012***	-0.006***	-0.012***
Urban	0.007***	0.230***	0.009***	0.225***	0.119***	0.229***
Training	-0.019**	0.054***	0.007	0.049***	0.010*	0.052***
Working Experience	0.089	-0.019**	-0.019	-0.018**	0.007	-0.018**
KartuPrakerja	0.140	-0.073***	0.085	-0.073***	-0.017	-0.069***
Employment Sector						
Manufacture	0.156***	0.291***	0.150***	0.279***	0.157***	0.292***
Service	0.028***	0.037***	0.027***	0.035***	0.035***	0.049***
Observations	**39,251**	**39,251**	**39,251**	**39,251**	**39,251**	**39,251**

Source: Author

Note: *significance at 10%; **significance at 5%; ***significance at 1%

Based on the Table 4, there are some findings about the income status by youth vertical mismatch status. In simulation 1, youth with matching education-job occupation shows a positive marginal effect of 0.025. This implies that individuals who match between their educatoin and occupational status at their job will experience 2,5% rise in probability of earning a decent income. Moreover, in simulation 2, undereducation status reflects a negative marginal effect of -0.078. This suggests that individuals who are underqualified for their jobs experience a 7.8% reduction in the probability of earning a decent income. Conversely, in simulation 3, which captures the overeducation status, reveals a positive marginal effect of 0.034. This implies that individuals with educational credentials exceeding job requirements have a 3.4% higher probability of attaining a decent income.

The findings from these three simulations align with the existing literature on educational mismatch and its impact on labor market outcomes. The results for individuals in jobs where their education matches the job requirements highlight the importance of educational alignment in improving income prospects. This supports previous research that emphasizes how individuals with qualifications suited to their jobs are more likely to experience better wage outcomes (Bol et al., 2019; Wachter, 2020b). The role of educational congruence is crucial, as it allows individuals to fully utilize their skills and maximize

productivity, thereby enhancing their chances of earning decent income. This finding is consistent with human capital theory, which posits that aligning skills with job requirements leads to better labor market performance and wage premiums, as also observed in earlier studies (Arellano-Bover, 2022)

On the contrary, the findings for undereducated individuals highlight the negative consequences of skill deficits in the labor market. Those who do not meet the educational requirements of their jobs often face wage penalties and reduced access to decent income opportunities. This outcome aligns with the skill-deficit hypothesis, which argues that underqualified workers are less productive and face significant barriers to earning higher wages (Rotz et al., 2019). Previous studies have also shown that undereducation is associated with lower job stability, limited career advancement, and a higher risk of unemployment, which collectively contribute to income inequality (Lahtinen et al., 2020; Wachter, 2020a). The persistent wage penalties faced by undereducated individuals underscore the need for targeted interventions to address skill mismatches in the workforce.

Conversely, individuals with education levels exceeding job requirements tend to have better income outcomes, although this result should be interpreted cautiously. While overqualification may result in wage premiums, overeducated workers often experience non-monetary costs such as job dissatisfaction and underutilization of their skills. This reflects the complexities of educational mismatch, where excess qualifications may provide short-term wage gains but could have negative long-term implications for career satisfaction and growth (Mah et al., 2024). Previous research has cautioned against overemphasizing the wage benefits associated with overeducation, as these advantages may be offset by lower job satisfaction and a mismatch between workers' skills and job demands (Wen & Maani, 2022). These findings contribute to broader discussions about the impact of educational mismatch on income inequality and labor market efficiency.

Conclusion

This research conclude that (1) Vocational education reduces undereducation, suggesting its value as a targeted intervention for reducing mismatch among youth. (2) Youth whose education matches their job, as well as those who are overeducated, have higher chances of obtaining a decent income.

Based on the findings, this research offers several policy recommendations aimed at addressing skill mismatches, particularly undereducation, among the youth workforce. First, the government should prioritize the development and expansion of targeted skills training programs that are aligned with the evolving needs of the labor market. The government can enhance targeted skills training programs by conducting comprehensive labor market analyses to identify high-demand sectors and integrating industry-identified competencies into vocational educational curricula. Pilot programs in emerging industries such as technology and renewable energy can be launched to refine approaches. Leveraging technology for online training and implementing robust monitoring systems to evaluate program outcomes will ensure alignment with labor market needs and drive youth preparedness for high-demand roles.

Another critical recommendation is the improvement of career guidance systems for youth. Many young people enter the labor market without a clear understanding of the skills needed for specific jobs or the pathways available to achieve them. The government should invest in developing a robust career counseling framework within schools and higher education institutions, providing students with comprehensive information on labor market trends, in-demand skills, and career prospects. This guidance should also focus on helping students navigate vocational and technical education options, ensuring that their career choices are aligned with realistic opportunities in the labor market. Additionally, the creation of a national labor market information system would allow both youth and educators to stay informed of employment trends, skill gaps, and emerging industries, fostering a more efficient match between education and employment.

Lastly, policies should also focus on addressing wage disparities and ensuring that youth who are well-matched to their jobs are able to achieve a decent standard of living. The government could implement wage-setting mechanisms or review minimum wage policies to ensure that wages reflect the value of skills and qualifications in specific sectors. Programs that encourage continuous skills upgrading and lifelong learning would also help youth adapt to the changing nature of work, maintaining their employability and income potential over time. Furthermore, incentives for businesses that provide fair

wages and invest in worker development can help create a more equitable labor market. By combining efforts to reduce mismatches with initiatives to enhance wage structures, these policies would contribute to long-term labor market efficiency and income adequacy for the youth workforce.

Limitations

One significant limitation of this study is the lack of a specific analysis regarding horizontal mismatch, which refers to the alignment between academic fields of study and corresponding occupations. This gap in analysis may impact the comprehensiveness of the findings, as understanding horizontal mismatch is crucial for evaluating the effectiveness of educational programs in meeting labor market demands. Future research should aim to incorporate this analysis to provide a more nuanced understanding of how educational backgrounds correspond with employment opportunities.

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