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Article

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Investigating the impact of the COVID-19 pandemic and macroeconomic variables on unemployment among university graduates in Indonesia: Regression and Fs-QCA approaches

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ABSTRACT

The educated unemployment rate among university graduates (EUUG) in Indonesia has risen steadily, reaching 34.6% during the Covid-19 pandemic (2020-2021), attributed to economic challenges and a national recession. This research aims to analyze the impact of Covid-19 and various macroeconomic variables on educated unemployment across 34 Indonesian provinces. Using panel data regression and Fs-QCA methods, the study found that the pandemic and macroeconomic factors significantly influence educated unemployment. The best configuration for high educated unemployment during the pandemic includes factors such as GDP per capita, inflation, Provincial minimum wage (PMW), investment, and government spending, observed in provinces such as Riau, South Sulawesi, DKI Jakarta, and South Sumatra.

IMPACT STATEMENT

This study meticulously investigates the pressing issue of unemployment among educated graduates in Indonesia, offering a comprehensive analysis that spans various provinces and considers the interaction of macroeconomic variables and the effects of the Covid-19 pandemic. The study highlights West Java as having the highest unemployment rate among college graduates, whereas North Kalimantan records the lowest, illustrating significant regional disparities. The analysis robustly determines that macroeconomic factors such as Gross Regional Domestic Product per capita, inflation, minimum wage, investment, government spending, and the Human Development Index all have significant impacts on graduate unemployment. Particularly, it points out that a combination of these factors leads to higher unemployment rates in regions like Riau, South Sulawesi, DKI Jakarta, and South Sumatra. The practical implications of these findings are substantial. The study advises policymakers to utilize these insights for formulating targeted interventions such as economic stimulation measures and educational enhancements to align graduate skills more closely with industry needs. Businesses are encouraged to tailor their investment and workforce development strategies based on regional economic conditions and potential. Educational institutions are urged to adapt curricula to improve student employability through practical skills training and industry partnerships. Additionally, the study recommends that the government focus on creating specialized job opportunities for highly educated individuals and consider minimum wage adjustments based on educational attainment to promote a fair compensation system. It suggests that companies openly communicate wage scales during recruitment to attract and retain highly skilled workers. Graduates are advised to enhance soft skills and consider entrepreneurship as a viable career option. By implementing these recommendations, stakeholders including government bodies, businesses, and educational institutions can collectively foster a more inclusive and resilient labor market, thereby supporting sustainable economic growth and reducing the unemployment rate among university graduates in Indonesia. This study not only provides a foundation for informed decision-making but also outlines a roadmap for future research, which could include exploring the impact of population size on unemployment and differentiating between graduates from public and private institutions.

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1. Introduction

Indonesia, the world's fourth most populous country, grapples with multifaceted challenges in the wake of the Covid-19 pandemic, which commenced in March 2020. Beyond its direct health impacts, the pandemic has profoundly affected Indonesia's economy and employment landscape. As of August 2022, the nation contends with a staggering 8,425,931 unemployed individuals, a figure exacerbated by the pandemic's disruptive effects on industries and livelihoods. This surge in unemployment carries far-reaching repercussions, extending beyond mere economic strain. Socially, it fosters an environment where many individuals' resorts to illicit means of sustenance, heightening concerns over crime rates. Economically, the ripple effects of widespread unemployment dampen community prosperity, posing significant challenges to Indonesia's overall economic stability.

Notably, the demographic of the unemployed is diverse, encompassing individuals with varying levels of education. Over the past six years, Indonesia has witnessed a concerning uptick in unemployment rates among those with minimal formal education, signaling broader societal shifts in labor dynamics. Educated unemployment rate refers to the proportion of unemployed individuals within the labor force who possess a certain level of education, typically referring to individuals with a higher level of formal education such as college or university degrees. In this sense, educated labor force with a diploma or above unemployment has dominated Indonesian unemployment and even has shown a constant upward tendency during the Covid-19 epidemic dramatically. This fact shows that having a higher education does not guarantee a job.

For insights into the broader determinants and implications of the Covid-19 pandemic to unemployment, a multitude of studies have meticulously examined, offering crucial insights into the multifaceted challenges faced across various sectors and geographical regions. Early investigations, such as those by Pana et al. (2021), which identified the country-level determinants of the severity of the first wave of the COVID-19 pandemic. Adams-Prassl et al. (2020), Dingel and Neiman (2020), and Gherghina (2023) that elucidated the immediate ramifications of lockdown measures, including widespread job losses, disruptions to supply chains, and a rapid shift towards remote work arrangements. These studies underscored disparities in vulnerability and resilience across different locales, highlighting how certain industries, particularly those reliant on physical presence or heavily affected by travel restrictions, faced disproportionate setbacks compared to others. Notable studies such as ILO-OECD (2020) provide valuable perspectives on global impact of Covid-19 across different countries, shedding light on the complex interplay between public health, economics, and social welfare.

Due to the Covid-19 pandemic, Indonesia's GDP per capita fell sharply in 2020, causing the country to enter an economic slump. Inflation, despite a six-year trend of slowing inflation in Indonesia, the pandemic produced a further fall in prices in 2020, signifying a decline in purchasing power and an economic slowdown. Wage Minimum, even during the Covid-19 pandemic, the average minimum wage in Indonesian provinces increased year after year, indicating a government priority on increasing labor buying power. Over the last six years, Indonesia has seen a steady increase in both local and foreign investment. During the Covid-19 outbreak, however, several provinces, such as Sulawesi Barat, had a major drop in investment. This observation underscores the urgent need for comprehensive strategies to address not only the immediate unemployment crisis but also the underlying socio-economic disparities exacerbated by the ongoing pandemic.

In the case of government spending, there was a constant upward trend, with a surge even during the epidemic, showing a focus on containing the spread of Covid-19. Human Development Index (HDI), Indonesia's HDI improved marginally during the pandemic over the last six years. However, not all provinces saw an increase in HDI during the Covid-19 outbreak, with North Kalimantan, East Kalimantan, and Yogyakarta seeing a decrease. As a summary, the essay emphasizes the complex interplay of macroeconomic elements that contribute to the difficulties that highly educated individuals have in finding work in Indonesia, particularly amid the ongoing Covid-19 pandemic.

Reflecting on the gap between expectations and reality, it can be said that government efforts through various policies have not been successful in improving the quality of education and reducing the unemployment rate. Furthermore, from the available data, it can be observed that university graduates, who inherently possess the highest skills, still have a significant proportion of reported unemployment. Ideally, with higher levels of education, the likelihood of securing a job should increase. To develop the right policies to address this phenomenon, it is important to first understand the underlying factors that cause university graduates to remain unemployed.

Despite government initiatives, data indicate that highly educated graduates still play a significant role in the overall unemployment figures. Hence, this study delves into this issue by analyzing key macroeconomic indicators such as GDP per capita, inflation, minimum wage, investment, government spending, and the Human Development Index (HDI). Therefore, this study seeks to contribute to the existing discourse by offering a comprehensive analysis of the factors driving unemployment among university graduates in Indonesia, against the backdrop of the Covid-19 crisis. By integrating insights from macroeconomic literature and empirical data, the research aims to elucidate the nuanced socioeconomic dynamics underlying this phenomenon. This study aims to address the pressing issue of unemployment among university graduates in Indonesia and underscore the importance of governmental focus on this demographic when formulating policies to mitigate overall unemployment rates. Specifically, it aims to present a comparative analysis of the unemployment rates among university graduates across 34 Indonesian provinces before and after the onset of the Covid-19 pandemic. Additionally, the study endeavors to explore the interplay between the pandemic, macroeconomic variables, and the unemployment rates among educated graduates from various higher education institutions within these regions. Through this examination, the paper aims to elucidate the socioeconomic dynamics contributing to unemployment among university graduates during the Covid-19 crisis in 2020.

Following this section, the paper is structured as follows: [Section 2](#) provides a comprehensive review of relevant literature, highlighting key findings and gaps in existing research. [Section 3](#) outlines the methodology employed in conducting the comparative analysis of unemployment rates among university graduates across 34 Indonesian provinces. [Section 4](#) presents the empirical findings, elucidating the interplay between macroeconomic variables, pandemic-induced disruptions, and unemployment rates among educated graduates. Finally, [Section 5](#) offers concluding remarks, synthesizing key insights and proposing recommendation and practical implications.

2. Literature review

The development of the COVID-19 pandemic in late 2019 has triggered unprecedented worldwide issues, having a dramatic impact on several aspects of society, particularly the economy and employment landscape. This review of the literature begins with an examination of current research attempts that investigate the global impact, repercussions of the COVID-19 epidemic and the interaction of macroeconomic determinants with unemployment. These literatures go into other dimensions, adding to a thorough comprehension of this delicate relationship by expanding on the profound impacts of the Covid-19 pandemic on global work and employment dynamics.

2.1. The global impact of covid 19

Several researches has shed light on the profound impact of the COVID-19 pandemic on the global economy, such as Mou's (2020) research offers insights into the projected decline in global GDP, with estimates suggesting a reduction of up to 3%. Developing nations are expected to bear the brunt of this impact, with some experiencing declines of over 6.5%. Additionally, world merchandise trade is forecasted to plummet by 13% in 2020, reflecting the widespread economic disruption caused by the pandemic.

Zahra et al. (2021) highlight a significant reduction in GDP worldwide, amounting to over 2 trillion by the close of 2020. Sectors such as manufacturing, mining, tourism, and airlines have borne the brunt of substantial losses as a result of the pandemic. In a similar vein, Gerald and Massomeh (2021) delve into the pandemic's impact on consumption patterns, emphasizing its diverse effects on different sectors of the global economy. Industries like aviation and tourism experienced a downturn, others such as media and food retail witnessed growth. The pandemic's influence on consumption globalization has been notable, marked by decreased incomes and demand for goods and services, underscoring the necessity for fiscal measures to revitalize incomes and spur growth. While the global tourism industry, as explored by Mohsin and Qamari (2021), faced significant repercussions, with a projected market value decrease from 700 billion to 447 billion in 2020. The World Travel and Tourism Board estimated staggering losses of 75 million jobs and \$2.1 trillion in income due to the pandemic's impact.

The investigations into the intersection of socio-economic factors and geographical contexts, as demonstrated by research by Chetty et al. (2020) and Obradovich et al. (2021), revealed the nuanced nature of the pandemic's impact. They emphasized how pre-existing disparities in infrastructure, healthcare access, and economic resilience shaped the differential impact of the pandemic across regions. Studies such as by World Bank (2020) and McKibbin and Fernando (2020) show the critical role of policy responses and institutional capacities in mitigating or exacerbating these disparities. Scholars highlighted the interconnectedness of global supply chains and labor markets, as explored in research by Baldwin and Tomiura (2020), demonstrating how disruptions in one region could have far-reaching consequences worldwide.

2.2. Covid 19 and its impact on macroeconomic variables

Macroeconomic variables play a pivotal role in shaping unemployment rates during the pandemic and have been a subject of extensive analysis. Studies by Ramey and Zubairy (2018) delve into the impact of fiscal policies, monetary measures, and government spending on employment outcomes. Notably, McKibbin and Fernando (2020) highlight the diverse macroeconomic responses across different countries, emphasizing the need to consider contextual factors in assessing the pandemic's impact on unemployment.

The pandemic's global employment issue has sparked substantial research, particularly by the International Labor Organization (ILO) in 2020. Their findings highlight the critical need for coordinated worldwide measures to address the extraordinary labor market issues. The rapid adoption of remote labor, exacerbated by the epidemic, is a crucial element shaping worldwide employment dynamics. According to researchers such as Brynjolfsson et al. (2020), this transformation, driven by greater reliance on technology not only reshapes labor markets but also presents opportunities for certain industries while leaving others vulnerable to job displacement.

Rajendran (2022) emphasized the significant impact of the pandemic on the world economy, resulting in economic shock and crisis. Despite advancements in various fields, such as medicine and biotechnology, the global economy was unprepared for a pandemic of this scale caused by an unknown virus. Sargsyan and Sargsyan (2022) highlighted the COVID-19 pandemic as the most serious economic crisis since World War II, affecting over 50 million people globally. They noted the uncertainty and difficult choices faced by governments, leading to significant economic shocks and unpredictability in future developments. The pandemic caused a double shock in ter Szomolányi et al. (2023) conducted a study aiming to understand these impacts on the global economy, focusing on deviations in GDP, labor, labor income, and average labor product in the USA and EU from the log-quadratic trend during the pandemic outbreak. Their findings suggest a sudden drop in performance followed by a modest recovery, presenting challenges for governments to mitigate economic impacts through fiscal or monetary policies.

Gagnon et al. (2023) explored the impact of the COVID-19 pandemic on global GDP growth. They identified a small effect on GDP from COVID-19 deaths but emphasized the significant influence on GDP from changes in lockdown measures. Notably, the effects varied between rich and poor countries, with global trade playing a crucial role in transmitting economic effects across borders.

Manna et al. (2023) discussed the negative impact of the COVID-19 pandemic on the world economy, highlighting job losses, business disruptions, and economic decline. Their study provided insights into the pre-COVID-19 economic condition, surveyed the possible effects of the shock on different sectors, and analyzed strategies declared by central governments and international banks to mitigate the financial shock.

2.3. Long-term repercussions of covid 19

It is critical to investigate the potential long-term repercussions of pandemic-induced unemployment. Gallant et al. (2020) study the long-term effects of scarring on people's employment chances and overall well-being. As a result, the psychological influence of uncertainty and health concerns on labor force participation cannot be overlooked. Adams-Prassl et al. (2020) and Coibion et al. (2020) conducted research on how these characteristics influence individuals' decisions to enter the labor force.

Òscar et al. (2020) delve into the medium- to long-term economic consequences of pandemics, contrasting them with other economic crises. Their analysis spans pandemics throughout history, utilizing rates of return on assets dating back to the 14th century. The study reveals that significant

macroeconomic effects of pandemics persist for decades, depressing real rates of return substantially. This stands in stark contrast to the aftermath of wars, where capital destruction is evident but absent in pandemics. The findings align with the neoclassical growth model, suggesting that pandemics may induce relative labor scarcity and/or foster a shift towards greater precautionary savings.

Williamson et al. (2022) investigate the short- and long-term impacts of COVID-19 on economic vulnerability through a population-based longitudinal study. Their research identifies a short-term association between COVID-19 and increased odds of inadequate household income, which does not persist in the long term. Additionally, the study highlights increased odds of long-term work absence due to sickness.

Simanungkalit et al. (2022) analyze the impact of COVID-19 on financial planning from both short- and long-term perspectives. Their findings reveal positive associations between financial planning and analytical decision-making style, time orientation, and self and other orientation. However, under confidence bias is negatively associated only with long-term financial planning, while intuitive decision-making shows no correlation with short-term financial planning. The study offers insights to enhance personal financial planning and develop tailored financial services.

Hao et al. (2023) explore the lasting economic repercussions of the COVID-19 pandemic on South Africa's long-term economic growth. By integrating an epidemiological model into a modified Solow-Swan model, the study examines various channels such as morbidity, mortality, unemployment, loss of school days, and capital accumulation. The findings indicate that COVID-19 is projected to reduce South Africa's average annual GDP per capita growth rate by 0.07 percentage points over the next four decades, representing a 25% decline compared to the no-COVID scenario. Notably, human capital losses resulting from school closures contribute to more than half of this economic slowdown.

2.4. Covid 19 and its impact on specific population segments

David et al. (2020) delve into the socio-economic ramifications of COVID-19 lockdown measures. Their investigation reveals that the pandemic disproportionately affects vulnerable social groups, particularly those facing precarious living conditions. Early evidence suggests that the health and economic burdens of the virus are disproportionately borne by impoverished individuals, including the homeless, refugees, migrants, and displaced persons. These marginalized populations face heightened exposure to the virus and endure socio-economic challenges such as restricted movement and diminished employment opportunities.

Bram et al. (2020) propose segmentation and shielding strategies as essential components of an exit strategy from COVID-19 lockdowns. Their study emphasizes the critical role of the contact matrix between different population segments and the impact of physical distancing measures on transmission rates. The findings underscore the importance of close monitoring of the epidemic during and after lockdowns, with potential applications beyond COVID-19 for infectious diseases affecting vulnerable population segments.

Su et al. investigated the effects of the COVID-19 pandemic on unemployment in five European economies. To that goal, the study employs a Fourier causality test from December 2019 to December 2020. According to Z-test results, unemployment in Germany, Spain, and the United Kingdom has decreased significantly as a result of COVID-19. According to the findings, COVID-19 instances create unemployment in Germany, Italy, and the United Kingdom. Furthermore, COVID-19 generates unemployment in Italy and the United Kingdom. Overall, the study's findings show that the pandemic increases unemployment rates significantly in predominantly European economies.

Dore (2021) found that the COVID-19 pandemic has highlighted the vulnerability and precarity of essential workers in Madrid, Spain. Essential workers, such as healthcare professionals, grocery store workers, and delivery drivers, have been at the forefront of the pandemic, providing services that are critical to the functioning of society. However, these workers often face precarious working conditions, including low wages, lack of job security, and limited access to health insurance and other benefits.

Ezepchuk and Skuratovskaya (2022) shed light on the profound impact of the COVID-19 pandemic on global population structures. The first wave of the pandemic, driven by the highly contagious and lung-specific COVID-19 strain, resulted in significant casualties worldwide, affecting tens of millions of people. This unprecedented threat underscored the global peril posed by the virus to populations across the planet.

Haoning, X, et al. (2022) investigate the impact of COVID-19 on travel behavior across socio-economic segments. Their research reveals nuanced variations in travel patterns among different segments in response to

COVID monitoring measures. For instance, high-income workers exhibit greater flexibility in work trips due to the option of working from home, unlike low-income workers who lack such discretion. Additionally, the study highlights disparities in the recovery of travel behavior between high- and low-employment density segments, as well as the differential impact of limited medical resources on low-income segments. These findings offer valuable insights into understanding the heterogeneous mobility responses to COVID-19 across socio-economic groups, informing targeted regulatory policies and shaping transport models for the post-pandemic era.

The pandemic has disproportionately affected informal labor markets and vulnerable populations. Alon et al. (2020) discuss how specific demographic groups, such as low-income workers and minorities, face heightened challenges in terms of job security and income stability. Recognizing the importance of education and retraining initiatives in responding to evolving labor market dynamics, Gourinchas et al. (2021) argue that the pandemic has disproportionately impacted workers with higher education levels. This underscores the need for nuanced analyses when evaluating the connection between education, skills, and unemployment during the pandemic. Studies by Li (2022) explore the role of up-skilling and re-skilling programs in mitigating unemployment challenges, particularly for workers in industries undergoing transformation.

Kapitsinis and Gialis (2023) emphasize an enduring contrast between peripheral and core areas, where high levels of instability persistently characterize less developed regions. Interestingly, this instability is also on the rise in urbanized, economically advanced areas. Their research indicates that the extent of job insecurity within a regional workforce stem from a multifaceted interplay of national influences and local factors such as specialization, geographic isolation, historical patterns, institutional norms, and demographic trends.

Lastly, a study by Rahman et al. (2022) surveyed the Indonesian public to better understand their health, employment, and economic deterioration during the early stages of the COVID-19 outbreak. Their study depicted that COVID-19 has no immediate collateral effects on the economy of the study participants. However, the pandemic has a negative impact on the employment, health, and social life of the people. To mitigate the negative effects of this pandemic on health, employment, economy, and social life, a complete evaluation of COVID-19 impacts, as well as public health interventions, should be conducted

3. Research methodology

3.1. Data

The data used in this study are quantitative data which include the following:

- a. Data on educated unemployment graduates from universities in 34 provinces in Indonesia from 2017 to 2022;
- b. GDP per capita data for 34 provinces in Indonesia from 2017 to 2022;
- c. Inflation data for 34 provinces in Indonesia from 2017 to 2022;
- d. Minimum wage data for 34 provinces in Indonesia from 2017 to 2022;
- e. Investment data for 34 provinces in Indonesia from 2017 to 2022;
- f. Government expenditure data for 34 provinces in Indonesia from 2017 to 2022;
- g. Human Development Index data for 34 provinces in Indonesia from 2017 to 2022.

All the data used are secondary data sourced from the Indonesia Central Statistics Agency (BPS) in 34 provinces in Indonesia. All of this data was collected as free source by directly downloading from the official BPS website in 34 provinces in Indonesia. The dataset size varies depending on the specific variables and timeframes, but collectively, it constitutes a comprehensive representation of the socio-economic landscape across the 34 provinces in Indonesia over the specified time period. As for rights and permissions, since the data is sourced from a governmental agency and publicly available, no additional rights or permissions were necessary for its usage in this research.

3.2. Methods of analysis

This research employs three complementary methods of analysis. Firstly, the Graphical Descriptive Analysis Method is utilized to assess the comparison of educated unemployment rates among university graduates

in 34 provinces of Indonesia before and after the Covid-19 pandemic. This method visualizes conditions during the years 2018–2021. Secondly, the Panel Data Regression Analysis Method is employed to evaluate the impact of variables related to the Covid-19 pandemic and macroeconomics on the unemployment rates of educated graduates from higher education institutions in 34 provinces of Indonesia. Variables such as economic growth, inflation, minimum wage, investment, government spending, and the Human Development Index are examined to identify statistically significant influences on unemployment rates.

Thirdly, the research utilizes the Fuzzy-Set Qualitative Comparative Analysis (Fs-QCA) Method to gain qualitative insights into the configuration of macroeconomic conditions leading to the emergence of educated unemployment rates among graduates of higher education institutions in provinces across Indonesia during the Covid-19 pandemic. This method used for an understanding of the qualitative role of macroeconomic variables that may not be identified through quantitative approaches. By employing these combined methods, the research aims to provide a holistic understanding of the factors influencing the unemployment rates of educated graduates from higher education institutions in Indonesia during and after the Covid-19 pandemic.

The data analysis stages based on Fs-QCA by Pappas and Woodside (2021) as shown in Diagram 1. The stages are as follows: determining sample data, calibrating data, forming truth tables, sorting truth table results based on frequency and consistency, presenting model solutions, obtaining findings from Fs-QCA, and finally interpreting the findings of Fs-QCA. The focus of Fs-QCA is on the condition of double interaction or cause-effect relationships that yield results in a system. Differences in conditions can

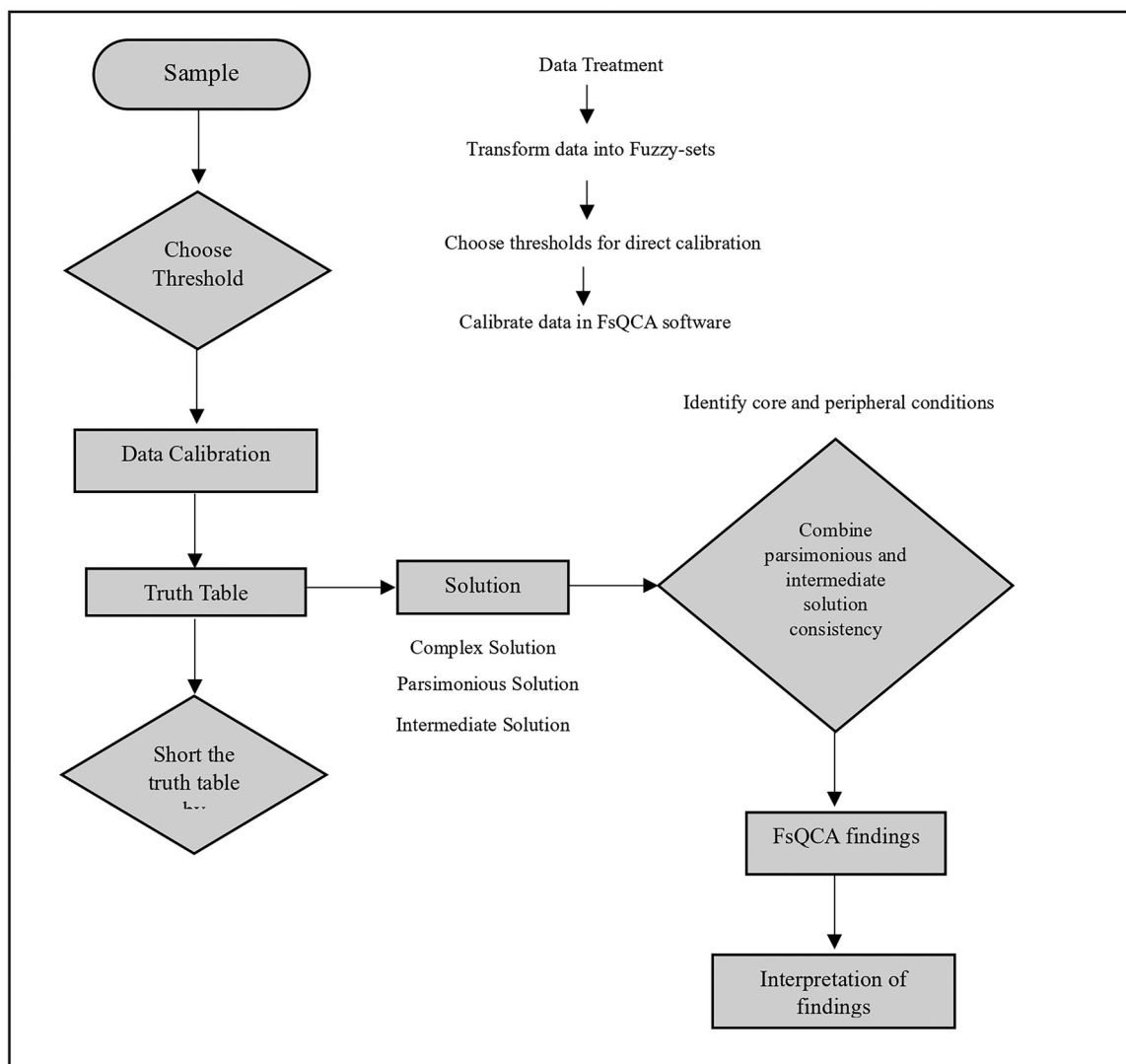


Diagram 1. Fs-QCA analysis step.

produce the same results; data are analyzed qualitatively, and Fuzzy-Set Qualitative Comparative Analysis data describe the membership of many cases in a set; and the concept of the relationship between conditions and outcomes is considered as a set of relationships and requirements that must be met for its interpretation (Garcia-Ramos & Diaz, 2021).

3.3. Operational variables of study

The purpose of this study is to portray the level of unemployment among college-educated graduates in 34 Indonesian provinces before and after the Covid-19 outbreak. Furthermore, it intends to examine the impact of Covid-19 and macroeconomic variables (economic growth, inflation, minimum wage, investment, government expenditure, and the Human Development Index) on the unemployment of college-educated graduates throughout Indonesia's 34 provinces. Furthermore, the study intends to compare the macroeconomic configurations that result in high unemployment rates among college-educated graduates in the provinces during the Covid-19 pandemic in 2020. The variables used in this study include the number of people aged 15 and up who are unemployed and have a minimum education level of a Diploma I/II/III, as well as data on economic growth, inflation, minimum wage, investment, government spending, and the Human Development Index from 2017 to 2022.

The study examines various factors related to employment and economic conditions across 34 provinces in Indonesia from 2017 to 2022. These factors include the number of unemployed college-educated graduates, reflecting the unemployment rates in each province. Economic growth is assessed through the Gross Regional Domestic Product per capita, indicating the economic performance of the provinces over the specified period. Inflation rates, representing the percentage growth in prices for goods and services, are analyzed across the provinces during the same timeframe. Minimum wage levels are documented in Indonesian rupiah for each province from 2017 to 2022. The study also evaluates the realization of both domestic and foreign investment in Billion Rupiah across the 34 provinces during the specified period. Additionally, provincial government expenditure is examined, categorized by expenditure type, and presented in billion rupiahs. The Human Development Index (HDI) serves as an assessment of human development achievements across the provinces, presented as a percentage from 2017 to 2022. Lastly, a binary variable, the Covid-19 Pandemic Dummy, distinguishes data before and after the Covid-19 outbreak in 2020, with Dummy 0 indicating pre-2020 data and Dummy 1 representing data from 2020 onwards.

3.4. Robustness test

To ensure the robustness of our research methodology and address potential biases in our models, we have taken several measures throughout our study. Firstly, we acknowledged the possibility of selection bias and worked to mitigate it by including a diverse range of provinces and utilizing robust data sources. Selection bias refers to the potential distortion in research outcomes caused by the method of selecting participants or data. In this context, by including a diverse range of provinces, the researchers aimed to ensure representation from various regions across Indonesia, thus reducing the risk of bias resulting from regional differences. For example, the data on unemployment rates among college-educated graduates across 34 provinces from 2017 to 2022 forms the core of the study. To address potential selection bias, this study ensured that the data covered a broad geographical scope, including provinces from various regions of Indonesia (Java, Sumatra, Kalimantan, Sulawesi, etc.) and different levels of urbanization (metropolitan areas, rural regions, etc., to capture variations in unemployment rates across different socioeconomic and geographical contexts, thus reducing the risk of bias stemming from regional disparities.

Additionally, the study recognized the potential for measurement bias, especially in variables like unemployment rates and economic indicators, and took steps to minimize errors by using reliable data sources and standardized measurement techniques. This study also considered the risk of model specification bias and addressed it by including relevant covariates, conducting sensitivity analyses, and testing alternative model specifications to ensure the robustness of the results.

Furthermore, this study acknowledged the limitations of the sampling method, particularly the use of non-probability sampling. For example, *Pandemic Impact Heterogeneity*: The impact of the COVID-19 pandemic on unemployment rates among college-educated graduates may vary significantly across provinces due to differences in economic structure, industry composition, and policy responses. The dataset may not fully capture these nuances, leading to potential biases or generalizations in assessing the pandemic's overall impact on employment outcomes. *Limited Historical Context*: While the dataset covers the period from 2017 to 2022, it may lack sufficient historical context to fully understand the long-term implications of the pandemic on unemployment trends among college-educated graduates. Longitudinal data spanning multiple decades or economic cycles would provide a more comprehensive understanding of the pandemic's lasting effects on employment dynamics. Finally, this study recognized the impact of data availability constraints on our analysis and addressed this limitation by maximizing the use of available data, considering alternative data sources, and conducting sensitivity analyses to assess the reliability of the findings.

4. Result of analysis

Panel data regression analysis was conducted to assess the influence of the COVID-19 pandemic and macroeconomic variables on college graduate unemployment. Initially, the panel data was subjected to regression, followed by standard assumption testing. However, the classical assumption test indicated a lack of normal distribution in the initial panel regression data ($p\text{-value} = 0.000 < 0.05$), necessitating a transformation using natural logarithm. Subsequently, determining the optimal regression model became crucial for precise estimations.

This process involved two steps: first, comparing the Common Effect Model (CEM) to the Fixed Effect Model (FEM), and then comparing the FEM to the Random Effect Model (REM) using Chow and Hausman tests, respectively. The Chow test revealed significant heterogeneity among individual effects in the model ($p\text{-value} = 0.000 < 0.05$), favoring the use of FEM over CEM. Subsequent Hausman testing, with a probability value of Cross-section random ($p\text{-value} = 0.1147 > 0.05$), confirmed that the REM was the appropriate model for panel data analysis in this study.

Following this, traditional assumption tests such as normality and multicollinearity were conducted. The normality test (Jarque-Bera test) showed that the regression model's residuals followed a normal distribution ($p\text{-value} = 0.111388 > 0.05$). Furthermore, the multicollinearity test indicated low correlation values (less than 0.085) among independent variables (COVID-19 pandemic, economic growth, inflation, minimum wage, investment, government expenditure, and Human Development Index), suggesting the absence of multicollinearity in the regression model. Based on the Random Effect Model (REM) as the most suitable, Table 1 shows outputs from processing panel data, as following.

The equation for the model of unemployment among educated graduates from higher education based on the formed explanatory variables can be expressed as follows:

$$\text{Ln.UUG}_{it} = -5.1804 - 0,$$

Table 1. Estimation result of panel data model.

Variable Dependent: LN_ unemployment among college-educated graduates		
Variable Independent	Coefficients	Probability
Constanta	−5.1804	0.6366
LN_GDP per capita	−0.4609	0.0018
LN_Inflation	−0.0998	0.0002
LN_Minimum Provincial Wage (MPW)	−0.8274	0.002
LN_Invest	0.0572	0.040
LN_Gov. Expend	0.9833	0.000
LN_HDI	2,5583	0.045
COVID	0.1391	0.0138
Model	Random effect Model (REM)	
Prob. F-statistic	0.0000	
R-squared	0.5664	
Observation	204	
Provinces	34	

$$4609 \text{ Ln}_G\text{DPCap}_{it}-0,0998 \text{ Ln}_I\text{NF}_{it}-0.8274\text{Ln}_P\text{MW}+0.0572\text{Ln}_I\text{NVEST}_{it}+0.9833\text{Ln}_G\text{ov. Expend}_{it} \\ +2,5583 \text{ Ln}_H\text{DI}_{it}+0.1391\text{COVID}_i$$

The constructed model's outcomes are in Natural Logarithm. The findings can be interpreted directly in percentage terms (Gujarati, 2004).

4.1. Results of fuzzy-set qualitative comparative analysis (Fs-QCA)

After identifying which macroeconomic factors significantly influence the unemployment of educated graduates from higher education institutions in 34 provinces in Indonesia, the analysis continued using Qualitative Comparative Analysis to determine which macroeconomic factors caused the outcome of unemployment for educated graduates in each province in Indonesia during the COVID-19 pandemic in 2020.

Based on the steps of Fuzzy-Set QCA explained in the research method, foundational data was compiled to understand the data availability before further analysis. The foundational data shows the complexity of the relationships between conditions and outcomes in this research case. Therefore, to find significant connections between various conditions and outcomes, the values in the foundational data were calibrated with specific threshold values and processed using Fs-QCA software as QCA data.

Then, constructing the Fs-QCA data set is the next step. The calibration process with percentile thresholds produces a data set that will be processed using Fs-QCA software. The calibration results become the Fs-QCA data set for each variable of results and conditions in each province in Indonesia in the year 2020. The next step is the analysis of the truth table as seen Table 2 below.

Table 2 shows that 23 configurations of condition combinations that lead to cases of unemployment for educated graduates from higher education institutions. The highest number of cases is three, with a

Table 2. Report of truth table of Fs-QCA.

cal_GNPkap	cal_INF	cal_RMW	cal_INVEST	~cal_SPENDING	cal_HDI	no	cal_PTLKP	cases	Raw consist	PRI Consist	SYM consist
0	1	0	1	0	0	2	cases	cases	0.619047	0.619047	0.619047
0	1	0	0	1	0	2	cases	cases	0.954545	0.954545	0.82
0	1	0	1	0	1	2	cases	cases	0.545455	0.545455	0.428571
0	1	1	0	1	1	2	cases	cases	0.952381	0.952381	0.804878
0	0	1	1	0	1	2	cases	cases	0.631579	0.631579	0.52381
0	1	0	1	0	1	2	cases	cases	0.619048	0.619048	0.619047
0	1	1	0	1	0	2	cases	cases	0.952381	0.952381	0.852941
0	1	1	0	1	1	2	cases	cases	0.816667	0.816667	0.752
0	1	1	0	1	0	2	cases	cases	0.619048	0.619048	0.619047
0	1	0	1	0	0	2	cases	cases	0.952381	0.952381	0.804878
0	0	1	1	0	0	2	cases	cases	0.619048	0.619048	0.619047
0	1	0	1	1	0	2	cases	cases	0.619048	0.619048	0.619047
1	1	0	0	1	0	2	cases	cases	0.615385	0.615385	0.615385
1	1	0	1	0	0	2	cases	cases	0.781471	0.781471	0.702
1	0	0	1	0	0	2	cases	cases	0.619048	0.619048	0.619047
1	1	0	0	0	0	2	cases	cases	0.619048	0.619048	0.619047
1	0	0	1	1	0	2	cases	cases	0.509090	0.509090	0.458
1	0	1	0	0	0	2	cases	cases	0.509091	0.509091	0.458
1	1	0	0	1	0	2	cases	cases	0.958824	0.958824	0.935
1	1	0	1	1	1	2	cases	cases	0.666667	0.666667	0.666667
1	1	0	0	0	0	2	cases	cases	0.611111	0.611111	0.611111
1	0	1	1	0	0	2	cases	cases	0.5	0.5	0.5
1	1	0	1	1	0	2	cases	cases	0.629630	0.629630	0.62
1	0	0	1	0	0	2	cases	cases	0.612903	0.612903	0.6
1	0	1	1	0	0	2	cases	cases	0.615385	0.615385	0.605
1	1	0	0	1	1	2	cases	cases	0.509091	0.509091	0.509091
1	0	0	1	0	1	2	cases	cases	0.619048	0.619048	0.619047
1	1	1	0	1	0	2	cases	cases	0.5	0.5	0.5
1	0	0	1	1	1	2	cases	cases	0.5	0.5	0.5
1	1	1	0	1	1	2	cases	cases	0.615385	0.615385	0.605
1	1	1	0	0	0	2	cases	cases	0.831153	0.831153	0.831153
1	1	1	1	0	0	2	cases	cases	0.833333	0.833333	0.833333
1	1	1	0	0	0	2	cases	cases	0.833333	0.833333	0.833333
1	1	1	0	0	0	2	cases	cases	0.833333	0.833333	0.833333
1	0	0	0	0	0	2	cases	cases	0.5	0.5	0.5
1	0	1	1	0	0	2	cases	cases	0.5	0.5	0.5

frequency of occurrence of 9 percent. After deleting combinations with low frequencies, the next stage in this analysis is to arrange the truth table based on raw consistency. A cut-off point is employed in this study to arrange combination configurations, i.e. the number of cases is less than one and the original consistency is less than 0.8. Then, from these ordered results, this research reorders based on the total macroeconomic factors that appear in the truth table (Table 3). Additionally, it can be observed which provinces exhibit outcomes of unemployment for educated graduates from higher education institutions.

Table 3 above shows which provinces in Indonesia have the outcome of unemployed educated graduates from higher education institutions. Indicates that the more macroeconomic factors involved, the more apparent the outcome of unemployment will be.

Next, since The Fs-QCA software offers three solution models: complex solution, parsimonious solution, and intermediate solution, a testing phase is conducted for complex solutions, parsimonious solutions, and intermediate solutions to observe the structure of the modeling of outcome and condition variables. The output of complex solutions can be seen in Table 4. For the output of intermediate solution refer to Table 5, and so forth the parsimonious solutions output can be viewed in Table 6 as below:

The complex solution displays all possible configuration combinations that may arise when traditional logical operations are performed. In other words, creating interpretations from the generated solutions is more difficult and often impractical due to the number of configurations identified and may include configurations with specific conditions. Therefore, the complex solution will be reduced to parsimonious solution and intermediate solution sets.

Then, the intermediate solution as seen in Table 5 above is achieved through the counterfactual analysis of the complex solution and parsimonious solution. This analysis includes logical counterfactuals based on theory (Pappas & Woodside, 2021). To compute the parsimonious solution, the intermediate solution uses some of these simplified assumptions. This solution should be consistent with the available theoretical and empirical knowledge. From previous research, when explaining outcomes, it is necessary to consider a variable as “only present,” “only absent,” or both. By default, either “present” or “absent” is included in the calculations.

The parsimonious solution as in the Table 6 is a simpler form of the complex solution based on simple assumptions. This solution describes the core conditions that cannot be removed or eliminated from all the solutions generated (Pappas & Woodside, 2021). In Fs-QCA, these core conditions are automatically identified. Complex solutions exclude counterfactual cases and include limited simplification, while parsimonious solutions incorporate counterfactual combinations that support simpler logical solutions.

Table 3. Truth table results based on the total of macroeconomic factors.

cal_GDP /Cap	cal_Inflation	cal_MW	cal_Inves	cal_Spend	cal_HDI	NO	cal_unemployed educated graduates	Cases	TotMacroeco Factors
1	1	1	1	1	1	2	1	Jakarta, South Sulawesi	6
1	1	1	1	1	0	2	1	Riau, South Sumatra	5
1	1	0	1	1	1	1	1	North Sumatra	5
0	1	1	1	1	1	1	1	Aceh	5
0	1	0	1	1	1	3	1	Lampung, midle Java, west java	4
1	0	0	1	1	1	2	1	East Java, Banten	4
1	0	1	1	1	0	1	1	East Kalimantan	4
0	1	1	0	1	1	1	1	South Kalimantan	4
0	1	0	0	1	1	1	1	West Sumatra	3
0	1	1	0	1	0	1	1	Papua	3
0	1	0	1	0	0	1	1	West kalimantan	2
0	0	0	0	0	1	1	1	Yogyakarta	1
1	0	1	1	0	1	1	0	Riau Island	4
1	1	0	0	0	1	1	0	Midle Sulawesi	3
1	0	1	0	1	0	1	0	West papua	3
1	0	1	0	0	1	2	0	Babel, North Kalimantan	3
1	1	0	0	0	0	1	0	Jambi	2
1	0	1	0	0	0	1	0	Mid Kalimantan	2
0	1	1	0	0	0	2	0	West Sulawesi North Maluku	2
0	0	0	1	0	0	1	0	Western Nusa	1
1	0	0	0	0	0	1	0	Eastern Sulawesi	1
0	0	1	0	0	0	2	0	Gorontalo	1
0	0	0	0	0	0	2	0	Eastern Nusa, Maluku	0

Table 4. Fs-QCA complex solution.

Term	Raw Coverage	Unique Coverage	Consistency	Cases
cal_GDPCap*cal_INF*cal_SPENDING*cal_HDI	0.36207	0.020141	0.920188	West Java (0.74,1), Aceh (0.6,0.8)
cal_GDPCap*cal_INF*cal_RMW*cal_INVEST*cal_SPENDING	0.167393	0.014552	0.736742	Papua (0.64,0.20)
cal_GDPCap*cal_PMW*cal_INVES*cal_SPENDING*cal_HDI	0.214345	0.034055	0.852513	East Kalimantan (0.69,0.54)
cal_GDPCap*cal_INF*cal_INVES*cal_SPENDING*cal_IPM	0.224833	0.044376	0.925174	East Java (0.83,1)
cal_GNPCap*cal_INF*cal_PMW*cal_INVEST*~cal_SPENDING*cal_HDI	0.109628	0.018987	0.813402	DI.Yogyakarta (0.57,0.63)
cal_GDPCap*cal_PMW*cal_INVEST*~cal_SPENDING*cal_HDI	0.048922	0.013049	0.904106	Riau (0.65,0.74), Central Java (0.73,0.5)
cal_GDPCap*cal_INF*cal_PMW*cal_INVEST*cal_SPENDING*cal_HDI	0.469028	0.035497	0.967401	–
cal_GDPCap*cal_INF*cal_PMW*~cal_INVEST*cal_SPENDING*cal_HDI	0.255542	0.012744	0.946957	–
cal_GNPCap*cal_INF*cal_PMW*cal_INVEST*~cal_SPENDING*cal_HDI	0.109628	0.018987	0.813402	West Kalimantan (0.5,0.53), Nort Sumatera (0.87,0.99)
cal_GDPCap*cal_PMW*cal_INVEST*~cal_SPENDING*cal_HDI	0.048922	0.013049	0.904106	South Sumatera (0.5,0.6), South Sulawesi (0.56,0.4)
cal_GDPCap*cal_PMW*cal_INVEST*~cal_SPENDING*cal_HDI	0.048922	0.013049	0.904106	DKI Jakarta (0.61,0.55), West Sumatera (0.6,0.6)
cal_GDPCap*cal_INF*cal_SPENDING*cal_HDI	0.36207	0.020141	0.920188	Central Java (0.56,0.15), South Kalimantan (0.5,0.4)
cal_GDPCap*cal_INF*cal_SPENDING*cal_HDI	0.36207	0.020141	0.920188	South Sulawesi (0.5,0.4), Lampung (0.5,0.57)

Table 5. Fs-QCA intermediate solution.

	Raw Coverage	Unique Coverage	Consistency	Cases
cal_GDPCap cal_INF cal_SPEND*cal_HDI	0.214793	0.021669	0.942857	West Java (0.74,1), Aceh (0.6,0.6), South Sulawesi (0.6,0.55)
cal_PMWcal_INFcal_INVEST*cal_SPENDING	0.147021	0.021669	0.982621	Papua (0.46,0.29)
cal_GDPCap cal_PMW cal_INVES*cal_IPM	0.216738	0.075208	0.910112	East Kalimantan (0.6,0.55)
cal_GDPCap cal_INFcal_SPENDING*~cal_HDI	0.247587	0.085216	0.950676	DI.Yogyakarta (0.57,0.63), Lampung (0.54,0.55), West Kalimantan (0.52,0.53), West Sumatera (0.51,0.53)
cal_GDPCap cal_PMWcal_INVESTcal_SPENDINGcal_HDI	0.189589	0.055407	0.963265	Central Java (0.68,0.55), West Kalimantan (0.52,0.53)
cal_GDPCap cal_INF ~ cal_INVESTcal_PMWcal_SPENDING*cal_HDI	0.095597	0.015658	0.900407	Central Java (0.68,0.55), West Kalimantan (0.52,0.53)
cal_GDPCap cal_INF ~ cal_INVEST ~ cal_SPENDING cal_HDI	0.109852	0.018557	0.906317	Riau (0.6,0.55), DKI Jakarta (0.59,0.53), Banten (0.58,0.55), East Java (0.55,0.56)

In this case, based on the output of the Intermediate Solution, macroeconomic factor variables can elucidate the outcome of unemployment among graduates of higher education institutions during the COVID-19 pandemic covered in the eight solutions as seen in Table 7 as follow.

5. Finding and discussion

5.1. The impact of the covid-19 pandemic and macroeconomics factors on university graduates' unemployment

The R-squared value obtained from the tested model, as shown in Table 1, is 0.5664. This indicates that the combined contribution of the Covid variable, GDP per capita, Inflation, Minimum Wage, Investment,

Table 6. Fs-QCA parsimonious solution.

Term	Raw Coverage	Unique Coverage	Consistency
cal_INF*cal_INVEST	0.54372	0.023399	0.981919
cal_INF*cal_SPENDING	0.65112	0.070172	0.981959
cal_INVEST*cal_SPENDING	0.71835	0.102266	0.951876
cal_INF*cal_PMW*cal_HDI	0.201355	0.014162	0.823678
Term	Region	Values	
cal_INF*cal_INVES	N/A	(0.54372, 0.023399, 0.981919)	
cal_INF*cal_SPENDING	N/A	(0.65112, 0.070172, 0.981959)	
cal_INVEST*cal_SPENDING	N/A	(0.71835, 0.102266, 0.951876)	
cal_INF*cal_PMW*cal_IPM	N/A	(0.201355, 0.014162, 0.823678)	
cal_INF*cal_INVEST	Riau	(0.99, 0.74)	
cal_INF*cal_INVEST	West Java	(0.97, 1)	
cal_INF*cal_INVEST	North Sumatera	(0.87, 0.99)	
cal_INF*cal_INVEST	West Kalimantan	(0.64, 0.53)	
cal_INF*cal_INVEST	South Sulawesi	(0.63, 0.95)	
cal_INF*cal_INVEST	DI.Yogyakarta	(0.61, 1)	
cal_INF*cal_INVEST	Aceh	(0.6, 0.8)	
cal_INF*cal_INVEST	Central Java	(0.57, 1)	
cal_INF*cal_INVEST	South Sumatra	(0.56, 0.6)	
cal_INF*cal_SPENDING	Lampung	(0.56, 0.97)	
cal_INF*cal_SPENDING	Aceh	(0.98, 0.8)	
cal_INF*cal_SPENDING	West Java	(0.97, 1)	
cal_INF*cal_SPENDING	North Sumatera	(0.94, 0.9)	
cal_INF*cal_SPENDING	South Sulawesi	(0.72, 0.95)	
cal_INF*cal_SPENDING	Riau	(0.64, 0.53)	
cal_INF*cal_SPENDING	DI.Yogyakarta	(0.61, 1)	
cal_INF*cal_SPENDING	Central Java	(0.6, 0.97)	
cal_INF*cal_SPENDING	South Sumatra	(0.56, 0.6)	
cal_INF*cal_SPENDING	South Kalimantan	(0.56, 0.15)	
cal_INF*cal_SPENDING	DKI Jakarta	(1, 1)	
cal_INVES*cal_SPENDING	West Java	(0.97, 1)	
cal_INVES*cal_SPENDING	North Sumatera	(0.94, 0.9)	
cal_INVES*cal_SPENDING	South Sulawesi	(0.82, 0.6)	
cal_INVES*cal_SPENDING	Central Java	(0.88, 1)	
cal_INVES*cal_SPENDING	Central Java	(0.79, 1)	
cal_INVES*cal_SPENDING	South Sumatra	(0.74, 0.95)	
cal_INVES*cal_SPENDING	South Kalimantan	(0.64, 0.54)	
cal_INVES*cal_SPENDING	Riau	(0.63, 0.95)	
cal_INVES*cal_SPENDING	South Sulawesi	(0.63, 0.95)	
cal_INF*cal_PMW*cal_HDI	DI.Yogyakarta	(0.59, 0.63)	
cal_INF*cal_PMW*cal_HDI	East Java	(0.56, 1)	
cal_INF*cal_PMW*cal_HDI	Banten	(0.55, 0.96)	
cal_INF*cal_INVEST	North Sumatera	(0.87, 0.99)	

Government Expenditure, and HDI to the unemployment of college graduates is 56.64 percent. The remaining 43.36 percent is attributed to unexamined factors. Additionally, the F-statistic test yielded a probability value of 0.0000, signifying that collectively, the Covid-19 pandemic and Macroeconomic Variables significantly influence unemployment among college graduates in all 34 provinces of Indonesia. Partial estimation results show that both the pandemic and all macroeconomic variables have a significant impact on unemployment in all 34 provinces of Indonesia at a significance level (α) of 5 percent.

Moving on to the variable GDP per capita, it has a negative and significant impact on unemployment among college graduates in Indonesia with a coefficient of -0.4609 . This implies that a one percent increase in GDP per capita will decrease the unemployment rate among college graduates in Indonesia by 0.4609 percent, assuming all other variables remain constant.

This result aligns and consistent with Okun's Law (Mankiw, 2013). Okun's Law suggests that a decrease in a country's Gross Domestic Product (GDP) leads to an increase in the unemployment rate, and conversely, higher GDP reduces the unemployment rate. In 2020, Indonesia experienced an economic recession, with a contraction of 2.07 percent in economic growth. Moreover, due to the impact of Covid-19, Indonesia's GDP per capita contracted significantly by -3.03, declining from IDR 41.02 million in 2019 to IDR 39.78 million. This decline in GDP per capita had a significant impact on the rise in unemployment among college graduates in Indonesia.

Moving forward to the Inflation variable, it has a significant negative impact on unemployment among college graduates in Indonesia, with a coefficient of -0.0998 . This means that a one percent

Table 7. Fuzzy-set QCA findings.

<i>Configuration</i>	<i>Solution</i>							
	1	2	3	4	5	6	7	8
<i>GDP-Cap</i>	x	x	●	●	x	x		●
<i>Inflation</i>	x	●	●		x	●	●	●
<i>PMW</i>		●	●	x	x	x		●
<i>Investment</i>		x	●	●	x	●	●	●
<i>Government spending</i>	●	●	●	●	x	x	●	●
<i>HDI</i>	●		x	●	●	x	●	
<i>consistency</i>	0,9202	0,7368	0,9286	0,9588	0,8011	0,9031	0,9670	0,9497
<i>raw coverage</i>	0,36207	0,1638	0,2161	0,2438	0,0868	0,1090	0,4698	0,2555
<i>unique coverage</i>	0,02401	0,02032	0,0449	0,0394	0,0135	0,0080	0,0135	0,0172
<i>Overall solution consistency</i>	0,8877							
<i>Overall solution coverage</i>	0,6866							

increase in inflation will reduce the unemployment rate among college graduates in Indonesia by 0.0998 percent, assuming all other variables remain constant. The results are consistent with A.W. Phillips's theory, which explains the relationship between the unemployment rate and inflation, assuming that inflation indicates an increase in aggregate demand (Mankiw, 2013). According to demand theory, prices will rise when demand increases. To meet this demand, producers increase their production capacity by adding labor, which is the only input that increases output. As a result, unemployment decreases because the demand for labor increases with inflation. Additionally, this research aligns with the findings of Ummatin (2020) and Fahmi (2022), where inflation has a significant impact on educated unemployment.

Next, the minimum wage (MW) variable has a negative and significant impact on the unemployment of university graduates in Indonesia, with a coefficient of -0.8274 . This implies that each one percent increase in minimum wage (MW) will decrease the unemployment of university graduates by 0.8274 percent, assuming other variables remain constant. This result aligns with McCall's (1970) findings where unemployment is linked to the duration of job search, depending on the offered wage and the expected minimum wage.

Additionally, Borjas (2016) states that individuals may stop job hunting when the offered wage does not match their expected wage. Supporting this statement, Pasay and Indrayanti (2012) mention that, fundamentally, the higher a person's education level, the greater the likelihood that they will have a job that pays according to their education level. In other words, someone with higher education is less likely to accept a job if it does not meet the expected minimum wage.

An increase in the minimum wage could result in several outcomes. Firstly, it may lead to higher consumer spending, as individuals with higher wages have more disposable income. This increased spending can stimulate economic growth and potentially create more job opportunities, thereby reducing unemployment. Secondly, a higher minimum wage can improve the standard of living for workers, reducing income inequality and enhancing overall well-being. These results suggest that an increase in

the minimum wage can have a favorable impact on reducing unemployment among university graduates in Indonesia and indicating that the minimum wage has a significant negative impact on educated unemployment. As the education level of the workforce increases, they also have higher wage expectations. Thus, when the offered wage is high, they will be willing to accept the job.

However, it's essential to consider potential drawbacks, such as the possibility of increased production costs for businesses, which may lead to price hikes or layoffs to offset the higher wage expenses.

This is due to the lockdown during the Covid-19 period significantly affecting job opportunities and wage levels, as studied by Baltaji et al. (2023) when they investigated COVID-19 lockdowns in Jordan and Morocco led to job losses and wage cuts, particularly affecting manufacturing, retail, and other service sectors, emphasizing the need for digitalization and targeted unemployment benefits. They found that manufacturing firms laid off workers in the short term and reduced wages in the medium term, while retail firms shed fewer jobs initially but cut more jobs in the medium term, especially part-time positions, and also reduced wages. The policymakers should carefully weigh the potential benefits and drawbacks before implementing any changes to the minimum wage policy to ensure sustainable and inclusive economic growth.

Furthermore, the Investment variable has a positive and significant impact on the unemployment of university graduates in Indonesia, with a coefficient of 0.0572. This means that each one percent increases in investment will increase the unemployment of university graduates in Indonesia by 0.0572 percent, assuming other variables remain constant.

The study reveals numerous factors for the considerable positive link between investment and university graduate unemployment in Indonesia. To begin, the favorable relationship between investment and university graduate unemployment is uncertain over a six-year period due to the impact of the COVID-19 epidemic from 2020 to 2022. Despite the pandemic, investment values climbed steadily from 2017 to 2022, with a significant 6.99 percent growth in 2020. However, the increase in investment does not correspond with the rising unemployment of university graduates, which rose by 34.64 percent in 2020 due to extensive layoffs and large-scale termination of job rights in accordance with government rules.

Second, during the pandemic, there is significant possibility for investment in several Indonesian areas. However, not all 34 provinces offer the same level of appeal to investors. Some have great investment potential, while others do not, showing that low investment values are less tempting to investors.

Third, there is a clear imbalance between the number of university graduates and the degree of investment in each region. For example, West Java, which accounted for 16.53 percent of all employed university graduates in Indonesia in 2020, saw just a 4.25 percent rise in investment. Despite increased investments, this inequality adds to Indonesia's continuing increase in unemployment among university graduates.

With a coefficient of 0.9833, the variable of government expenditure has a positive and significant impact on the unemployment of university graduates in Indonesia. This means that a 1% increase in government spending will result in 0.9833 percent more unemployment among university graduates in Indonesia, provided all other variables remain constant. This finding is consistent with Maria's (2015) research, which found that government spending has a favorable effect on unemployment rates. The disparity in findings between this study and other studies, such as Kaharudin et al. (2019), is linked to the government's concentration on the health sector during the COVID-19 pandemic in order to slow the virus's spread. This is demonstrated by the 35.20 percent rise in government spending on health during the pandemic.

The Human Development Index (HDI) variable exhibits a coefficient of 2.5583, indicating a notable positive impact on the unemployment of university graduates in Indonesia. This implies that a 1% increase in HDI corresponds to a reduction in university graduate unemployment by 2.5583 percent, assuming all other variables remain constant. This observation aligns with the findings of Qamariyah et al. (2022), affirming the significant beneficial influence of the Human Development Index on unemployment. Despite Indonesia's HDI experiencing an upward trajectory from 2017 to 2022, the unemployment rate among educated graduates surged. This paradox can be attributed to the correlation between HDI and the average length of schooling, a determinant factor within the HDI framework. As the HDI rises, so does the average length of schooling, reflecting an expanding workforce with higher education credentials annually. However, the exponential growth in the number of university graduates

entering the labor market has not been met with a proportional increase in job opportunities. Furthermore, the adverse impact of the COVID-19 pandemic, characterized by reduced output and widespread layoffs, exacerbated the unemployment situation in Indonesia.

Lastly, the variable of the COVID-19 pandemic has a significant positive impact on the unemployment of university graduates in Indonesia, with an estimated coefficient of 0.1391 (p -value = 0.0138). This suggests that the occurrence of the COVID-19 pandemic increases the unemployment of university graduates in Indonesia by 0.1391 percent. This result is consistent with the study by Sani et al. (2022), which found that the COVID-19 pandemic led to an increase in unemployment across all provinces in Indonesia. The pandemic's effects, starting in 2020 with the identification of COVID-19 in Indonesia, were acknowledged by the government through the implementation of Large-Scale Social Restrictions, restricting public activities, and Work from Home (WFH) and School from Home policies. These measures hindered economic activities, leading to reduced cash flow for companies, resulting in an inability to cover labor costs for all employees. Consequently, companies made decisions to lay off some workers, reducing job vacancies and increasing unemployment. The impact of PSBB also affected those working in the informal sector, such as SMEs, transportation services, and other businesses, resulting in significant job losses. Therefore, the ongoing increase in unemployment in Indonesia, especially among university graduates, is closely linked to the COVID-19 pandemic.

5.2. Unemployment among university graduates during the pandemic (Fs-QC.1)

The truth table or validity table generated reveals 12 configurations of macroeconomic conditions leading to increased college-educated unemployment in 15 provinces during the 2020 Covid-19 pandemic. Conversely, 11 configurations did not result in increased unemployment. Notably, three main groups of provinces exhibit distinct combinations of macroeconomic factors influencing unemployment outcomes.

In the Comprehensive Macro Factors Group (Jakarta and South Sulawesi), all macroeconomic factors contribute to educated unemployment during the pandemic. Riau and South Sumatra experience unemployment due to a combination of Per Capita GDP, Inflation, Minimum Provincial Wage, Investment, and Government Expenditure. North Sumatra's unemployment is influenced by Per Capita GDP, Inflation, Investment, Government Expenditure, and HDI. Aceh's unemployment results from a combination of Inflation, PMW, Investment, Government Expenditure, and HDI. This finding aligns with research by Ramey and Zubairy (2018) and McKibbin and Fernando (2020) that have examined the impact of fiscal policies, monetary measures, and government spending on employment outcomes.

Unemployment in provinces like Lampung, Central Java, West Java, East Java, Banten, East Kalimantan, and South Kalimantan is linked to combinations of Inflation, Investment, Government Expenditure, and HDI. West Sumatra's unemployment is influenced by Inflation, PMW, Government Expenditure, and HDI, while Papua experiences unemployment due to Inflation, MPW, and Government Expenditure.

In provinces like West Kalimantan and Yogyakarta, unemployment is associated with specific macroeconomic factors. For example, West Kalimantan's unemployment is associated with Inflation and Investment, while Yogyakarta's unemployment is linked to HDI alone.

The Fs-QCA findings indicate that Solution 8, with a configuration involving five macroeconomic factors, best explains educated unemployment during the pandemic. This solution, particularly prevalent in Riau, South Sulawesi, DKI Jakarta, and South Sumatra, shows a consistency level of 94.97% and explains approximately 25.55% of the high unemployment outcomes. However, overall, these configurations collectively explain around 1.72% of college-educated unemployment during the pandemic.

6. Conclusion

In examining the impact of unemployment among educated graduates in Indonesia, this research delves into various aspects, ranging from the unemployment rate in different provinces to the influence of macroeconomic variables and the Covid-19 pandemic. The conclusions and recommendations drawn from this analysis provide valuable insights for addressing employment challenges, particularly in

reducing the rate of unemployment among the educated workforce. Based on the result of the analysis and discussions, the following conclusions can be drawn:

6.1. Unemployment among college graduates by province

The province with the highest rate of Unemployment among College Graduates, both before and after the Covid-19 pandemic, is West Java. In contrast, North Kalimantan has the lowest Unemployment among College Graduates rate.

6.2. Partial statistical test

All variables in the model, including the Covid-19 pandemic and macroeconomic variables (Gross Regional Domestic Product per capita, inflation, minimum wage, investment, government spending, and Human Development Index), significantly influence the unemployment of college graduates in Indonesia.

6.3. Configuration of macroeconomic factors

The combination of macroeconomic factors, including Gross Regional Domestic Product per capita, inflation, minimum wage, investment, and government spending, leads to a high unemployment outcome for college graduates in Riau, South Sulawesi, DKI Jakarta, and South Sumatra.

7. Practical implication

The findings of this study offer several practical implications for policymakers, businesses, and educators in Indonesia such as:

- Policymakers can utilize the insights provided by this research to formulate targeted policies aimed at addressing unemployment among university graduates. For instance, policies aimed at stimulating economic growth and investment, such as tax incentives or infrastructure development projects, could help create job opportunities for graduates. Additionally, policymakers may consider measures to enhance the quality of education and skills development to better align with industry needs, thereby improving graduates' employability.
- Businesses can leverage the understanding of the impact of macroeconomic factors on unemployment to inform their strategic decision-making. For example, businesses may adjust their investment strategies based on regional disparities in investment potential highlighted in the research. Moreover, businesses can consider implementing policies that support workforce development and training to ensure alignment with evolving industry demands and reduce unemployment among graduates.
- Educators and educational institutions can use the research findings to adapt their curricula and programs to better prepare students for the labor market. This may involve incorporating practical skills training, internships, or industry collaborations to enhance students' employability and competitiveness in the job market. Additionally, educators can provide career guidance and counseling to help students make informed decisions about their educational and career pathways.

Overall, the research provides valuable insights that can inform evidence-based policymaking, business strategies, and educational initiatives aimed at addressing unemployment among university graduates in Indonesia. By implementing targeted interventions informed by these findings, stakeholders can work towards fostering a more inclusive and resilient labor market that supports sustainable economic growth and development.

8. Recommendations

In terms of government initiatives, there is a need to prioritize the creation of specialized job opportunities tailored for individuals with higher education. Moreover, directing investments towards absorbing skilled and educated workers can significantly contribute to alleviating unemployment challenges. By fostering and enhancing the creative industry, the government can further diversify employment avenues. Additionally, designing minimum wage categories based on educational criteria, akin to civil service classifications, would establish a fair and structured compensation system.

For companies, a strategic approach involves displaying minimum wages during recruitment for each educational or skill category. Recognizing and rewarding highly skilled and knowledgeable workers with ideal compensation packages is essential for fostering a motivated and competent workforce.

University graduates, on the other hand, are advised to enhance soft skills, aligning their capabilities with the needs of the job market. It is crucial for them to broaden their focus beyond employment and consider entrepreneurship as a viable career path. Lastly, for future research endeavors, incorporating additional variables like population size can provide a more comprehensive understanding of the dynamics influencing unemployment. Furthermore, separating the analysis of unemployment among graduates of public and private universities can yield nuanced insights into educational and sector-specific disparities.

Author contribution

The authors confirm contribution to the paper as follows: **Nahu Daud**: main idea, drafting manuscript and data analysis, **Bayu Taufiq Possumah**: study conception, writing manuscript structure, revision writing, **Ranggi Aditya Nugraha**: Data Collection and analysis, **Suyanto Sukri Mustofa**: Data validation, robustness check, revision writing **Chairullah Amin**: analysis and interpretation of results. All authors reviewed the results and approved the final version of the manuscript.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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Data availability statement

Data derived from public domain resources. The data that support the findings of this study are available in <https://www.bps.go.id/id/publication/2023/05/16/ef80bec78ab91cb5b703b943/indeks-pembangunan-manusia-2022.html>.

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