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Determinants of the Unemployment Rate in Bali during the COVID-19 Pandemic in 2020

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Abstract

Unemployment is a social problem that hinders economic growth, including in Bali Province. A high unemployment rate has implications for low-income regions. This study aims to analyze the determinants that affect Bali's unemployment rate via projected population indicators, average length of schooling, and life expectancy. The quantitative method was used to examine secondary data from the Central Statistics Agency. The data were analyzed via multiple linear regression. The results show that during the COVID-19 pandemic, the increase in population projections, average length of schooling, and life expectancy directly affected the unemployment rate, with an effect size of 89.3%. Furthermore, simultaneous testing revealed an impact between these three indicators and the unemployment rate in Bali during 2020, especially during the COVID-19 pandemic, with a probability of 0.000. In contrast to the partial results, we found that the unemployment rate was affected only by an increase in the projected population. In contrast, the average length of schooling and life expectancy did not have a direct influence. Thus, the unemployment rate in Bali can be lowered via relevant indicators that local governments and policymakers can evaluate. The synergy of other indicators must be applied to further identify determinants.

Keywords: Economic growth, open unemployment, COVID-19, life expectancy, local government.

1. Introduction

Indonesia experienced a significant economic downturn, particularly during the first half of 2020, with the COVID-19 pandemic severely impacting various sectors of the economy (Dinar & Nurfahmiyati, 2022; Gibson & Olivia, 2020). This unprecedented crisis led to widespread job losses and income reductions across local, national, and global scales (Ang & Dong, 2022; Bianchi et al., 2023; Kim et al., 2021). This often causes people to lose their jobs, which lowers their pay locally, nationally, and globally (Dahliah & Nirwana Nur, 2021; Dwiningwarni et al., 2019; Gibson & Olivia, 2020). Several studies have shown that the COVID-19 pandemic has slowed the economic growth of many countries. According to data from the Central Statistics Agency of Bali Province, Indonesia's economy is expected to decrease by 2020. This was shown by the GNP, which decreased from 5.02 percent in 2019 to 5.02 percent in 2020 (Indayani & Hartono, 2020). Statistics of Bali Province (2021), along with affecting people's income, the slowdown in economic growth has also led to an increase in unemployment in Bali Province.

Syaharuddin (2020) state that one way to meet human needs is to ensure that economic activity keeps people alive. High economic activity can accelerate regional economic development. Amir (2007) explains that a growing economy in a particular area is a sign that the economy of that nation or region is doing well. The unemployment rate indicates how well a nation's economy has developed. The status of those who have yet to apply for and find a job in the labor force is known as unemployment (Sukirno, 2006). Additionally, employment growth and the rapid yearly expansion of the labor force are different. This contributes to a region's high unemployment rate, including that in Bali Province.

Owing to unemployment, money is different in every part of life. A high unemployment rate increases a community's sickness, death, and life expectancy and leads to a decline in economic stability (Ang & Dong, 2022; Kristanto et al., 2019; Mertha Adnyana et al., 2022; Pasara & Garidzirai, 2020). According to Bali Province statistics (2021), the

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unemployment rate in Bali Province rose from 1.57% in 2019 to 5.63% in 2020. This may significantly affect economic stability if it affects the local economy. COVID-19 was blamed for Bali's high unemployment rate because it caused many businesses to lay off workers without warning. After all, their sales dropped, and they did not have enough money to pay them (Sedana et al., 2019; Statistics of Bali Province, 2021).

Additionally, the identification of labor force data reveals an increase in 2020, reaching 2,423,419 and 2,441,854 in 2021, with the sector of unpaid employees and entrepreneurship using irregular workers seeing the most considerable increase in workers (Statistics of Bali Province, 2021). Malthus's theory predicts that as the population grows, the workforce will also increase, but it does not predict an increase in job opportunities (Bianchi et al., 2023; Sengul & Tasci, 2020; Shabbir et al., 2020). Then, using data on life expectancy, which impacts unemployment, population quality measures are calculated (Chalirafi et al., 2020). The fact that the average time spent in school is short indicates that the unemployment rate is increasing (Husila, 2019). This study aims to analyze the determinants of unemployment rates in Bali Province during the COVID-19 pandemic via secondary data from the Central Statistics Agency. The research findings are expected to contribute to understanding the factors affecting business operations, job seekers, and related aspects, ultimately supporting sustainable economic development through targeted unemployment reduction strategies.

2. Literature Review

2.1. Definition of unemployment

The Central Statistics Agency (BPS) defines unemployment as the number of people who are not working but are looking for work, are starting a new business, or are not looking for work because they have been hired but have yet to start (Kristanto et al., 2019; Statistics of Bali Province, 2021). According to Sukirno (2006), unemployment occurs when a member of the labor force wishes to find employment but has yet to do so. Unemployed people are not working but are actively looking for work. Additionally, open unemployment is recognized when defining unemployment (Sukirno, 1995). This unemployment is caused by an increase in job openings, which is less than the increase in workers (Ahn & Hamilton, 2022; Couch et al., 2020; Wahyuni et al., 2020). As a result, an increasing number of economic workers are needed to help them find work. This resulted in them not performing their duties within a reasonable amount of time. Because of this, they were unemployed half of the time. For this reason, the term ‘open unemployment’ came into use (Wahyuni et al., 2020). Open unemployment can also occur when the economy slows, new technologies make work more accessible, or an industry grows (Bauer & Weber, 2021; Biagi & Lucifora, 2008; Dwiningwarni et al., 2019).

2.2. Life expectancy

The average anticipated number of years that a person can live is known as the life expectancy (AHH). Indirect estimation is a systematic method for estimating life expectancy. Children born alive (ALH) and children still alive (CSA) were the two data sources utilized to determine life expectancy (AMH). Life expectancy was determined via the money package program, live birth rate, and population input. Russell's approach follows a Western paradigm and aligns with the demographic history and current circumstances of Indonesia and several other ASEAN nations (Duque et al., 2018; Kristanto et al., 2019).

2.3. Average length of schooling

The hope that a more educated student will obtain a more respectable job in the modern era and the cost of education, either directly or indirectly, will be borne by the student and his family are the first two factors that influence the demand for education. According to Smith, (2006), political arguments that frequently have nothing to do with economic considerations have led to different elementary, middle, and university schools. The length of schooling, on average, reflects the level of formal education that a region's residents have attained (Sedana et al., 2019; Shabbir et al., 2020). The level of education received increases as the average length of schooling increases. The average number of years spent in school at all levels of formal education is the number of residents aged 25 years or older (Mertha Adnyana & Sudaryati, 2022).

This income level is determined by how long a person spends obtaining an education (Smith, 2006). A region's level of education can be determined by examining the typical length of schooling there (Todoro & Smith Stephen, 2006). Human capital in the form of education reflects the caliber of human resources (HR). The ideal 20 plan for a person is to complete the most significant level of education to maximize the difference between the expected profit and estimated costs. If we compare the entire cost of schooling incurred through education with the income acquired when they are ready to work, investing in human capital will result in more rewards. Highly educated people begin working full-time later in life, but their income increases more swiftly than those who start earlier (Todoro & Smith Stephen, 2006).

2.4. Population

According to the Statistics of Bali Province (2021), the population consists of all individuals who have been in the Republic of Indonesia's geographic area for six months or more, as well as those who have only recently arrived but intend to stay. The number of people residing in a region at a given time and the outcome of demographic processes such as fertility, mortality, and migration are what the population means according to the state. Aspects of the population include the size and composition of the population as well as its growth, dispersion, density, quality, and mobility (Bianchi et al., 2023).

3. Research Method

This study falls under the category of quantitative research that uses statistical methodology (Darwin et al., 2021). To conduct this study, it was necessary to examine the variables or determinants that affect the unemployment rate, such as life expectancy, the typical duration of schooling, and the population of Bali Province. The indicators considered are the number of residents (X_1), which is the ratio of the number of residents in each district or city; the average length of schooling (X_2), which is the average number of years spent by the population pursuing formal education; and life expectancy (X_3), which is the average number of years an individual spends after reaching retirement age. The Central Statistics Agency of Bali Province, an open-source organization, provided all the data. Using SPSS Inc.® version 26.0, the data for each indication were further examined via multiple linear regression. With a threshold of 95% ($p<0.05$), traditional assumption testing and hypothesis testing were conducted (Adnyana, 2021). Following the tables and narratives, the entire dataset is descriptively presented.

4. Results and Discussions

4.1. Testing conventional assumptions

The normal or nonnormal distribution of the data was examined via the one-sample Kolmogorov–Smirnov test before the data were subjected to hypothesis testing. The values of asymp. sig. 0.200 > 0.05, representing all the data for each normally distributed indicator, as shown in Table 1.

Table 1. Data normality testing

		Unstandardized Residual
N		27
Normal Parameters [a,b]	Mean	.0000000
	Std. Deviation	5423.15630120
Most Extreme Differences	Absolute	.112
	Positive	.112
	Negative	-.060
Test Statistic		.112
Asymp. Sig. (2-tailed)		.200[c,d]

4.2. Multicollinearity

The multicollinearity diagnostic analysis was conducted via the variance inflation factor (VIF) and tolerance statistics to assess the independence of predictor variables in the regression model. The results demonstrate varying degrees of collinearity among the independent variables. The population projections presented the most favorable collinearity

statistics, with a tolerance value of 0.572 and a variance inflation factor (VIF) of 1.749, indicating minimal multicollinearity concerns. However, Length of School and Age of Life Expectancy showed higher levels of shared variance, as evidenced by their respective tolerance values of 0.126 and 0.107 and VIF values of 7.946 and 9.318. While these values approach but do not exceed the conventional threshold for severe multicollinearity (VIF < 10), they suggest substantial intercorrelations among these predictors. Table 2, with a tolerance value component > 0.10 and a VIF <10, is not multilinear.

Table 2. Data normality testing

Model		Collinearity Statistics	
		Tolerance	VIF
1	(Constant)		
	Population Projections	.572	1.749
	Length of school	.126	7.946
	Age of Life expectancy	.107	9.318

4.3. Heteroskedasticity

The Glejser test was employed to assess the presence of heteroskedasticity in the regression model by examining the relationship between independent variables and absolute residuals (Table 3). The analysis yielded significance values consistently above the 0.05 threshold for all predictor variables, with population projections (p = 0.514), length of schooling (p = 0.733), and age of life expectancy (p = 0.362) demonstrating nonsignificant relationships with the absolute residuals. Similarly, the constant term showed no significant association (p = 0.339). These results robustly indicate the absence of heteroskedasticity in the model, suggesting that the variance of residuals remains homogeneous across different levels of the predictor variables. The standardized coefficients (Beta) further support this conclusion, with relatively modest values ranging from -0.185 to 0.536, indicating stable relationships between the predictors and residuals. The absence of heteroskedasticity validates the reliability of standard errors and subsequent statistical inferences drawn from the regression analysis. This finding strengthens the model's statistical validity and ensures that the ordinary least squares (OLS) estimators maintain their properties of being the best linear unbiased estimators (BLUE) for the regression coefficients.

Table 3. Heteroscedasticity testing

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-72752.015	74438.446		-.977	.339
	Population Projections	2.669	4.026	.159	.663	.514
	Length of school	-441.351	1279.096	-.185	-.345	.733
	Age of Life expectancy	1087.974	1170.360	.536	.930	.362

4.4. Coefficient determination

The degree of influence of the examined indicators was examined via coefficient testing via the determination technique. The expected indicators—population, average length of education, and life expectancy—impact the unemployment rate in Bali, which is displayed in an R-square of 89.3%, with other factors not covered in this study accounting for the remaining 10.1%. The results are presented in Table 4.

Table 4. Coefficient determination testing

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.945[a]	.893	.879	5766.00318	1.834

4.5. Testing simultaneously (F test)

The simultaneous test analysis reveals a statistically significant relationship between the predictor variables (population projections, average education level, and life expectancy) and the unemployment rate in Bali Province during 2020 (Table 5). The model yielded an F statistic of 64.240, which substantially exceeds the critical F value (Table 3.209), with a corresponding p value of 0.000 ($p < 0.05$). This highly significant F test result indicates that the combined effect of the independent variables explains a meaningful proportion of the variance in unemployment rates. The regression model accounts for a substantial sum of squares with 3 degrees of freedom, whereas the residual sum of squares with 23 degrees of freedom represents the unexplained variance**.** The large mean square regression value relative to the mean square residual further substantiates the model's explanatory power. These findings provide robust statistical evidence that population projections, educational attainment, and life expectancy collectively serve as significant predictors of unemployment rates in Bali Province during the studied period. The strength of this relationship, as indicated by the F statistic magnitude, suggests that these socioeconomic factors play a crucial role in explaining unemployment patterns, warranting their consideration in policy formulation and intervention strategies.

Table 5. Simultaneous analysis of factors influencing the unemployment rate

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	6407364971.970	3	2135788323.990	64.240	.000[b]
	Residual	764676230.948	23	33246792.650		
	Total	7172041202.918	26			

4.6. Partial analysis (t Test)

The partial regression analysis reveals distinctive patterns in how different socioeconomic indicators influenced unemployment rates in Bali Province during the 2020 COVID-19 pandemic period (Table 6). Population projections (X_1) emerged as the most statistically significant predictor, with a t value of 7.041 exceeding the critical value of 1.680 ($p < 0.001$). This variable demonstrated the strongest standardized effect ($\beta = 0.634$), indicating that population dynamics substantially influence unemployment patterns. The unstandardized coefficient (B = 47.208, SE = 6.704) suggests that each unit increase in population projections corresponds to a significant rise in unemployment rates.

The length of the school indicator (X_2) yielded a t value of 2.427 ($p = 0.673$), which, while exceeding the critical value of 1.680, did not achieve statistical significance at the conventional level. The relatively modest standardized coefficient ($\beta = 0.082$) suggests that educational attainment has a limited but positive association with unemployment rates, although this relationship should be interpreted with caution given the nonsignificant p value. Similarly, the Age of Life Expectancy variable (X_3) had a t value of 3.579 ($p = 0.128$), with a moderate standardized effect ($\beta = 0.328$). The substantial unstandardized coefficient (B = 3215.300, SE = 2035.819) indicates potentially meaningful economic implications, despite not reaching statistical significance.

The model's constant term (B = -237748.619, SE = 130953.586, p = 0.083) suggests a negative baseline unemployment rate when all the predictors are zero, although this should be interpreted primarily as a statistical construct rather than a practical value. These findings collectively indicate that while population projections play a dominant role in explaining unemployment variations, both educational attainment and life expectancy contribute to the model's explanatory power, albeit with less statistical certainty. This analysis highlights the complex interplay between demographic, educational, and health factors in shaping unemployment patterns during the pandemic period.

Table 6. A partial analysis of how each metric affects the unemployment rate

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-237748.619	130953.586		-1.816	.083
	Population Projections	47.208	6.704	.634	7.041	.000
	Length of school	869.778	2035.018	.082	2.427	.673

Age of Life expectancy	3215.300	2035.819	.328	3.579	.128

4.7. Multiple linear regression analysis

According to the findings of indicator testing via multiple linear regression, $Y = -23.774 + 0.634\ X_1 + 0.082\ X_2 + 0.328\ X_3 + e\text{-}i$ was found. The findings show that the unemployment rate equals -23,774 when population predictions, education duration, and life expectancy are all equal to zero. Additionally, an increase in life expectancy by one contributed to a 0.328 increase in unemployment, an increase in the average duration of schooling, and an increase in the population projection. All contributed to an increase in unemployment of US$ 0.634.

4.8. The impact of population projections on the unemployment rate

This section describes how rising population estimates, particularly in Bali Province, affect the unemployment rate. The results indicate that they have a favorable and significant effect on both high and low unemployment. According to Wahyuni et al. (2020) research in Sulawesi Province, the open unemployment rate is significantly influenced by the population, population density, labor force participation rate, population growth rate, average length of schooling, and life expectancy. According to Saufidar (2017), rapid population expansion increases the number of unemployed people in East Aceh districts, with a coefficient of determination of 78.68 percent and a confidence level of 95%, while also increasing the unemployment rate. According to Djaelani and Taime (2021), in the Mimika district, a population increase (45.1 percent) and economic growth (5.8 percent) considerably impact the unemployment rate. Bianchi et al. (2023) revealed that the COVID-19 pandemic increased the likelihood of significant shocks to the overall unemployment rate by 2–5 times, which was mediated by race and gender. The demand for employment openings has increased owing to rapid population growth. If this remains unchanged, then the unemployment rate increases. Contrary to the findings of Dwiningwarni et al. (2019), population increases negatively and considerably affect the unemployment rate. The government concentrates on the need for labor, and the number of productive populations and jobs must be balanced to lower the unemployment rate in an area, particularly in Bali Province, as a result of the study's findings (Adeleye et al., 2022; Hilmi et al., 2022).

4.9. Influence of average duration of education on the unemployment rate

In terms of knowledge, abilities, and preferred working methods, education is crucial for supporting the profession (Mertha Adnyana & Sudaryati, 2022). Numerous studies have shown that higher levels of education increase knowledge and skill capacity, which reduces the demand for adequate resources and increases productivity, both of which help lower the unemployment rate (Ang & Dong, 2022; Dahliah & Nirwana Nur, 2021). Good worker skills help enterprises meet their employment requirements. Fast, rapid, and knowledgeable people will positively impact businesses in need, making their human resources and skills necessary (Ahn & Hamilton, 2022; Couch et al., 2020; Shabbir et al., 2020).

However, this study reveals that there is a meaningful connection between unemployment rates in Bali Province. However, in the long run, the COVID-19 pandemic has caused skill decline due to distance learning, which has implications for decreasing the quality of the resources produced. In the short term, we found that the average length of schooling, especially during the COVID-19 pandemic, was not significantly affected by the unemployment rate (Sparrow et al., 2020). Biagi and Lucifora (2008) conducted a study in Europe and reported that changes in schooling organizations negatively impacted unemployment. According to research by Pradipta and Dewi (2020), the COVID-19 pandemic in 2020 caused a spike in the youth unemployment rate, which has since doubled. The longer the average length of schooling is, the less likely it is that people will simultaneously lose their jobs, which reduces the open unemployment rate.

According to Desembriarto (2021), the average amount of time spent in school has no appreciable effect on the open unemployment rate. These findings contrast with those of Ramiayu (2013), who reported that the average duration of education has a favorable and significant effect on the open unemployment rate. According to Gibson and Olivia (2020), the open unemployment rate and average length of schooling are partially mediated by the economic growth rate. The results highlight the importance of increasing human resource standards by increasing educational attainment to lower the open jobless rate. Finally, Pradipta and Dewi (2020) discovered a substantial relationship

between the average length of education and open unemployment in Banten Province, which influences poverty rates and capacity building.

4.10. The impact of life expectancy on the unemployment rate

One of the quality indicators of a sector's performance in achieving local economic development and health is age-related life expectancy (Bianchi et al., 2023; Duque et al., 2018). In Indonesia, the government's effectiveness in enhancing the welfare of the populace, including in this case, the presence and unemployment rate in an area, is measured by life expectancy (Kristanto et al., 2019; Statistics of Bali Province, 2021). According to Bianchi et al. (2023), current mortality rates, which tend not to change in the future, life expectancy is defined as a measure of the average number of estimated ages of a person. The confirmed findings in the conducted studies did not reveal any appreciable relationship between life expectancy and the unemployment rate (Statistics of Bali Province, 2021).

This is consistent with Dinar and Nurfahmiyati (2022), who find that life expectancy has no bearing on open unemployment in Indonesia. However, this did not seem to be significantly associated. Gibson and Olivia (2020) indicate that life expectancy can be related to unemployment because it measures quality and quantity of life. Low life expectancy affects the prevalence of poverty and is thought to have an indirect effect on unemployment and poverty five times. As a result of COVID-19, a decrease in long-term real income could lower the population and life expectancy by 1.7 years compared with earlier estimates. Consequently, life expectancy does not necessarily correlate with changes in an area's unemployment rate. However, an increase in poverty results from the effects of a high unemployment rate on income loss. The government's coordinated efforts to guarantee job availability and sufficient resources provide a comprehensive strategy for boosting economic growth, increasing average life expectancy, and lowering inequality.

5. Conclusion

This study provides significant insights into the determinants of unemployment rates in Bali Province during the COVID-19 pandemic in 2020. The findings reveal that the combined effect of population projections, average length of schooling, and life expectancy accounts for 89.3% of the variance in unemployment rates, indicating a robust explanatory model. The simultaneous analysis demonstrated a statistically significant relationship between these socioeconomic indicators and unemployment, confirming their collective importance in understanding unemployment patterns. However, the partial regression analysis revealed more nuanced relationships, with population projections emerging as the only statistically significant individual predictor, whereas both educational attainment and life expectancy showed positive but nonsignificant associations with unemployment rates. These findings have important policy implications for regional development and unemployment reduction strategies in Bali Province. The strong influence of population dynamics suggests that demographic management and labor market policies should be prioritized in unemployment mitigation efforts. While educational attainment and life expectancy did not have significant direct effects during the pandemic period, their positive associations warrant further investigation in long-term policy planning. Future research should explore additional variables and longer time periods to better understand the complex interplay between demographic, educational, and health factors in shaping unemployment patterns, particularly during economic crises such as the COVID-19 pandemic.

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