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Analysis of Opportunities and Threats of the Demographic Bonus Towards Unemployment in Indonesia

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A B S T R A C T

This study examines the opportunities and threats of Indonesia's demographic bonus on the unemployment rate and its implications for labor absorption and employment policy. The research employs an associative approach to analyze the relationship between the demographic bonus and unemployment. The data consist of time series data on Indonesia's annual unemployment rate from 1980 to 2024, collected through documentation techniques and measured in percentage terms. The Box-ARIMA model is used as the analytical method. The findings indicate that Indonesia's unemployment rate is projected to fluctuate with an overall upward trend during the 2025–2045 period, reaching an estimated 5.76 percent by 2045. These results suggest that the demographic bonus does not automatically generate economic benefits. Without significant economic improvement and sufficient job creation, the demographic bonus may instead become a serious threat by increasing unemployment levels. The study emphasizes the importance of targeted and sustainable labor market policies to ensure that the expanding working-age population can be absorbed productively. In the absence of such policies, the demographic bonus may place additional pressure on the labor market. However, the study has limitations, as it relies on a univariate ARIMA model and long-term projections based solely on historical trends, which may not fully capture structural changes or external shocks

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INTRODUCTION

Unemployment is one of the important issues in the economy (A. Smith, 2025); (Laelia & Priyarsono, 2023). The problem of unemployment and employment continues to be a major issue in countries around the world, especially in developing countries (Yenilmez & Mugenzi, 2023). Indonesia, as a developing country, faces the challenge of controlling the rising unemployment rate (Jolianis et al., 2024) This occurs due to the high rate of workforce growth not being matched by an increase in job opportunities (Rujiwattanapong, 2025). The supply of labour in Indonesia is higher than the demand (Jolianis et al., 2020). The high unemployment rate is certainly a serious problem for the country (Triatmanto & Bawono, 2023).

The issue of unemployment has become such a frightening spectre (Salma et al., 2025); (Hummel, 2021). Unemployment can have an impact not only on the individuals themselves, their families, and society (Lan et al., 2025), (Poschke, 2024). However, it can also affect the country, such as a decline in national income from the tax sector, a high crime rate, and a decrease in the purchasing power of the public (Sacchi & Samuel, 2024). Unemployment is a very crucial issue that needs solutions because if this problem is allowed to persist, Indonesia will have a large chance of becoming a country with a high level of poverty crisis. Moreover, in 2045, Indonesia is projected to reach the peak of demographic bonus, which can provide both opportunities and challenges regarding the issue of unemployment in Indonesia (Putri & Suhartini, 2024).

The demographic bonus is a phenomenon in which during this period, the Indonesian population will be dominated by the productive age group (aged 15-64) compared to the non-productive age group (Aprianti et al., 2022). In Indonesia, the demographic bonus is expected to occur in 2045 (Nuriman et al., 2025). In that year, the number of the productive age population in Indonesia will reach its peak, accounting for 70.1% of the total Indonesian population (Safitri et al., 2023). The demographic bonus does not come by itself; to turn it into a national economic potential, it needs to be prepared and subsequently utilised for enhancing economic growth and people's welfare (Maryati, 2015). One of the benefits of the demographic bonus is its ability to transform the economy from a developing country to a developed nation (Aprianti et al., 2022).

In the concept of population economics, demographic bonus is interpreted as an economic advantage because as the number of people of productive age increases, so does the amount of savings from productive residents, which can stimulate investment and economic growth (Oyedepo, 2024). Therefore, this condition is also known as a window of opportunity for a country to accelerate its economy due to the abundance of the workforce. Many countries (such as China, South Korea) have become wealthy by successfully utilising their demographic bonus opportunities to boost per capita income, thereby achieving community welfare (Maryati, 2015). The increase in the number of people of productive age can be a significant asset for Indonesia's development. This is because the productive age population has high productivity and can be a source of quality human resources if the occurring demographic bonus is addressed wisely. The demographic bonus will certainly have socio-economic impacts

(Purbaningrat et al., 2024). One of them is that the ratio of the productive population supporting the non-productive population will be very low (Safitri et al., 2023).

However, it is important to note that along with this demographic bonus, the increasing quantity must be balanced with the quality of individual competencies in Indonesian society specifically. To address this, all parties involved, such as the government through education regulations and the private sector in preparing job opportunities, should work together, as the abundance of human resources can actually contribute to rising unemployment, leading to its own social issues (Jeyaraj et al., 2025).

To reduce the unemployment rate during the demographic bonus period, comprehensive efforts are required from various parties, including: the government must create quality jobs that match the competencies of the productive age population, increase investment and open new job opportunities, and improve the quality of education and skills to be competitive in the workforce. All layers of society and relevant institutions can participate in taking advantage of the demographic bonus, such as communities engaging in various empowerment programmes from the government to develop competitive skills for the workforce and make use of job opportunities provided by the government. Relevant institutions, such as companies ranging from small to large scale that create job opportunities, should prioritise employing Indonesian workers over foreign workers in order to reduce the unemployment rate in Indonesia, the benefits of the demographic bonus can be felt.

The demographic bonus does not always provide positive opportunities for Indonesia. However, its existence also presents challenges. One of the challenges that can be felt from the demographic bonus is the problem of unemployment. This challenge must be anticipated so that the positive benefits of the demographic bonus can be realised. This research was conducted to gain a deeper understanding of the anticipations and challenges of the demographic bonus in relation to the unemployment issue in Indonesia towards 2045.

The novelty of this study lies in its simultaneous analysis of the opportunities and threats of the demographic bonus on unemployment in Indonesia, emphasizing the role of human resource quality, skill–labor market mismatch, educated unemployment, and regional disparities, thereby offering a more contextual and strategic analytical framework and policy implications

Economic development is carried out to enhance economic activities and the standard of living of the population with the aim of accelerating economic growth, creating job opportunities, developing quality human resources, and reducing unemployment (Agyei et al., 2025), (Bayraktar et al., 2023), (Lin & Xu, 2025). However, in improving the quality of human resources, there are still many obstacles such as difficulties in creating job opportunities, which is the main challenge (Dawn et al., 2025). The problem that arises is the imbalance between labour demand and supply, which prevents workers from being absorbed in the labour market. As a result, the unemployment rate increases due to this imbalance. (Riani & Haryatiningsih, 2023).

Unemployment is a condition where a person is categorized as a workforce (aged 15-64 years) but does not have a job and is actively looking for work, preparing a new business, or has been accepted for work but has not started, where the number of job seekers exceeds the number of available jobs (Baah-Boateng, 2013); (Baah-Boateng, 2015), (Pompei & Selezneva, 2019), (Jolianis et al., 2020), (Jolianis et al., 2022), (Jolianis et al., 2024), (Rujiwattanapong, 2025), (Armand, 2026), (Gomado & Amedanou, 2026)

Unemployment remains one of the economic problems occurring in Indonesia (Adelowokan et al., 2019). The rate of inflation impacts unemployment issues (Karimah et al., 2023). One of the factors causing unemployment is the decline in people's purchasing power (Bhattarai, 2016). A decrease in purchasing power clearly reduces the number of goods/services produced by companies; in such a situation, companies will reduce labour demand, which affects job opportunities and thus increases unemployment (Niken et al., 2023). Job availability and wage levels are important factors that can influence the unemployment rate (Virrankoski, 2025)

The demographic bonus is one of the changes in demographic dynamics that occurs due to changes in the population structure by age (Nakakuni, 2024), (Al-khraif et al., 2022). This demographic transition phenomenon happens due to a decrease in birth rates accompanied by high mortality rates over the long term (Nakakuni, 2024). When there is a long-term decline in birth rates, it will result in a reduction in the number of young people (< 15 years), but on the other hand, the number of working-age population (15 – 64 years) will increase drastically as a result of high birth rates in the past. Meanwhile, the number of people over 64 years will increase gradually and then rise rapidly due to an increase in life expectancy (Siburian et al., 2025), (Qomariyah et al., 2023).

When the number of people of productive age far exceeds the number of people of non-productive age (under 15 years and over 64 years), this is referred to as the demographic bonus condition (Rusli dkk 2015). The parameter used to assess the demographic bonus phenomenon is the dependency ratio, which is the ratio representing the comparison between the number of people of non-productive age (under 15 years and over 64 years) and people of productive age (15–64 years) (Safitri et al., 2023). The dependency ratio indicates the burden of the productive-age population towards the non-productive-age population. When the dependency ratio is low, this condition shows that the productive-age population only bears a small portion of the non-productive-age population.A high population means a high supply of labour. If not matched with adequate job opportunities, it will lead to high unemployment. As stated in Mankiw (2003), unemployment is one of the impacts of the labour market's inability to absorb the available workforce(Putri & Suhartini, 2024)

The demographic bonus, if not accompanied by equitable education and sufficient Human Resources (HR) development, will pose a threat to Indonesia. Therefore, the government, in this case the Ministry of National Education, must be proactive in utilising the abundant adult population of Indonesia as a potential force by making the national education programme the main pillar of national development (Maryati, 2015)

To reap the benefits of the demographic bonus, a country must encourage an economic transition from an agrarian economy to an industrial-based economy(Wineman et al., 2020), (Liu et al., 2024), (Santos & Conte, 2025). Industry becomes a national priority in several developing countries due to its high productivity and income, and it has become a cornerstone of modernization and national economic strength in developed countries (Gil-hernández et al., 2017). When a country reaches a stage where the industrial sector is the leading sector, it can be said that the country has undergone industrialisation. Industry is expected to replace the agricultural sector as the driver of economic growth. Therefore, industrialisation can be categorised as a structural transformation in a country's economy as it involves a gradual shift from agricultural activities to non-agricultural sectors, in this case, the industrial sector. This study will analyse The issue of unemployment in Indonesia in the context of achieving the demographic bonus in 2045.

Empirical studies on demographic change and unemployment often employ time-series or econometric models. Univariate approaches, such as ARIMA models, are widely used to forecast unemployment trends but are limited in explaining underlying causal factors. Multivariate studies indicate that unemployment dynamics are influenced by a combination of demographic, economic, and institutional variables. In Indonesia, existing research largely examines demographic bonus and unemployment separately or focuses on short-term analysis. Limited studies explicitly assess the demographic bonus as both an opportunity and a threat to unemployment using long-term data. This gap highlights the need for comprehensive analyses that integrate demographic dynamics with labor market outcomes in the context of long-term development goals.

METHODOLOGY

The type of research is quantitative with Indonesia as the research object. Quantitative research is research that systematically investigates a phenomenon by collecting data that can be measured using statistics, mathematics, and computation (J. D. Smith & Hasan, 2020), (Wallwey & Kajfez, 2023). The type of research data is time series data collected through documentation techniques for the period 1980-2024. The research variable is the unemployment rate in Indonesia, measured in percentage terms. The data analysis technique used is the Box-Jenkins ARIMA analysis.

The Box-Jenkins ARIMA model is a statistical methodology for analyzing and forecasting time series data by identifying historical patterns, which is a combination of the Autoregressive (AR) and Moving Average (MA) models for non-stationary data, through an iterative process consisting of model identification, parameter estimation, diagnostic checks, and forecasting (Tiao, 2015), (Nurman & Nusrang, 2022). Autoregressive Integrated Moving Average (ARIMA) model is one of the statistical models have been used in this study for analyzing as well as forecasting time series data (Yenilmez & Mugenzi, 2023). ARIMA model is one of the valuable projecting techniques in forecasting to the upcoming events in time series analysis (Permata & Habibi, 2023). The time series

modeling approach is also known as the Box-Jenkins approach (Celik, 2015). Forecasting with ARIMA models is done using the past of process and is particularly suitable for long-term predicting (Razali & Haron, 2023).

Box-Jenkins Models are used for forecasting a variety of anticipated data points or data ranges (Tiao, 2015), (Li et al., 2021), (Yenilmez & Mugenzi, 2023). The Box-Jenkins Model was created by two mathematicians: George Box and Gwilym Jenkins. The two mathematicians discussed the concepts that comprise this model in a 1970 publication called "Time Series Analysis: Forecasting and Control." (Yasmin & Moniruzzaman, 2024). Estimations of the parameters of the Box-Jenkins Model can be very complicated. Therefore, similar to other time-series regression models, the best results will typically be achieved through the use of programmable software (Buhamra et al., 2003). The Box-Jenkins Model is also generally best suited for short-term forecasting of 18 months or less (Yenilmez & Mugenzi, 2023), (Hegerty, 2022).

The Box-Jenkins Model may be one of several, time series analysis models a forecaster will encounter when using programmed forecasting software. In many cases, the software will be programmed to automatically use the best fitting forecasting methodology based on the time series data to be forecasted. Box-Jenkins is reported to be a top choice for data sets that are mostly stable and have low volatility (Yenilmez & Mugenzi, 2023). The Box-Jenkins Model forecasts data using three principles: autoregression, differencing, and moving average. These three principles are known as p, d, and q, respectively. Each principle is used in the Box-Jenkins analysis; together, they are collectively shown as ARIMA (p, d, q). The autoregression (p) process tests the data for its level of stationarity. If the data being used is stationary, it can simplify the forecasting process. If the data being used is non-stationary it will need to be differenced (d). The data is also tested for its moving average fit (which is done in part q of the analysis process). Overall, initial analysis of the data prepares it for forecasting by determining the parameters (p, d, and q), which are then applied to develop a forecast (Tiao, 2015).

RESULT AND DISCUSSION

Stationarity Test

The stationarity test is the most important stage in analysing time series data to see whether there is a unit root among the variables, making the relationship between variables in the equation valid (Bian & Chen, 2024). In the ARIMA model identification process, stationary time series data is required, which is data constant in mean and variance and free from trends. Differencing is performed, or in ARIMA denoted by d, with the ADF test to achieve stationary data. Based on the stationarity test results at the level, the Augmented Dickey-Fuller probability value obtained was 0.4. The probability value is greater than alpha (0.4 > 0.05), indicating that the research data is not yet stationary at the level, so the stationarity test is continued to the 1st difference level. Based on the results of the stationarity test at the first difference level, the Augmented Dickey-Fuller probability value obtained was 0.00. The probability value is smaller than

alpha (0.00 < 0.05), which indicates that the data is stationary at the first difference level. Therefore, the data analysis can proceed to the model identification stage.

Model Identification

The next stage in model identification is testing the ACF and PACF by observing the lags that exceed the threshold. ACF and PACF testing is carried out through a correlogram using the differenced time series data that has already been made stationary, at first-level differencing. Based on the correlogram output, it is known that the AC and PAC values, which show a significant drop towards zero in each model, are at 1. This indicates that the AR order is 1 and the MA order is also 1. Therefore, there are three models suitable for the unemployment rate data, namely ARIMA (1,1,0), ARIMA (0,1,1), and ARIMA (1,1,1).

Model Parameter Estimation

At this stage, the best model among the three ARIMA models will be selected, which will then be used for forecasting. The determination of the best ARIMA model is based on the highest Adjusted R-squared value, while the other three parameters, namely S.E. of regression, Akaike Info Criterion and Schwarz Criterion, should have the smallest values. The parameter estimation results for each model are as follows.

Table 1. Results of ARIMA Estimation Test Parameters for Unemployment Rate Data

No	Model Arima	Adjusted Rsquared	S.E. of regression	Akaike Info Criterion	Schwarz Criterion
1	(1.1.0)	-0.024373	1.343686	3.474106	3.556022
2	(0.1.1)	-0.023792	1.327612	3.449029	3.530129
3	(1.1.1)	0.437871	0.995375	2.895820	3.018695

Source: Processed data, 2025

Based on the ARIMA parameter estimation test results, it is known that the ARIMA (1.1.1) model has the highest Adjusted R-squared value, and the smallest S.E. of regression, Akaike Information Criterion and Schwarz Criterion, making this model the best for forecasting the unemployment rate in Indonesia.

Tabel 2. Estimated Unemployment Rate for 2024-2045

No	*Year*	*Unemployment Rate (%)*
1	2025	4.85
2	2026	4.89
3	2027	4.94
4	2028	4.98
5	2029	5.03
6	2030	5.08

7	2031	5.12
8	2032	5.17
9	2033	5.21
10	2034	5.26
11	2035	5.30
12	2036	5.35
13	2037	5.40
14	2038	5.44
15	2039	5.49
16	2040	5.53
17	2041	5.58
18	2042	5.62
19	2043	5.67
20	2044	5.71
21	2045	5.76

Source: Processed data, 2025

Based on the data analysis results, it is known that the best model to predict the number of unemployed in Indonesia is the ARIMA (1,1,1) model. Prediction results indicate that the number of unemployed in Indonesia will increase from 2024 to 2045. It is evident that there will be a relatively high unemployment rate in 2045, amounting to 8.15%. This indicates that the demographic bonus is a serious threat to Indonesia, as it may drive a relatively high level of unemployment.

The findings of this study prove that the presence of a demographic bonus does not always provide an opportunity for Indonesia to escape the problem of unemployment. However, the demographic bonus can become a challenge that could potentially increase the number of unemployed people in Indonesia compared to this year and the previous year. The demographic challenge could also become a boomerang for the government if it is unable to prepare adequately for the presence of the demographic bonus itself, such as failing to prepare quality human resources through specific training and employment opportunities that match the skills of the population. Such unpreparedness will pave the way for the productive age group to become unemployed and share the same fate as the non-productive age group who do not work. Therefore, what is the value of the demographic bonus for Indonesia if its presence is not met with thorough preparedness by the government and the Indonesian society. Therefore, the greatest challenge that can be felt from the existence of the demographic bonus is to maximise it, namely to develop high-quality human resources. Hence, the presence of education is essential to shape a skilled society supported by other elements. The demographic bonus requires serious development to have a significant impact on the welfare of the society and the country.

The existence of a demographic bonus, which is estimated to occur in 2045 and marked by a larger productive age population compared to the non-productive age population, can influence Indonesia's economic growth. This is

because the productive age, which is considered capable of producing goods or services in the production process, can boost Indonesia's economic growth. However, considering that currently Indonesia still relies heavily on foreign labour due to the local population not yet skilled in producing goods or services, this will ultimately be a challenge for Indonesia regarding unemployment issues, which could increase in 2045 compared to the present if Indonesia's productive age population still cannot compete with the productive age from other countries. Automatically, if Indonesia's productive population still cannot compete with productive age populations from other countries, the opportunity for foreign workers to work in Indonesia will still exist. It happens and can even dominate, ultimately leaving the productive age group without jobs in their own country.

Currently, one of the issues still felt by Indonesian society, including the working-age population, is the low level of education. Low education makes many Indonesians of working age unemployed. This is because, although the working-age population has the skills to work, one of the requirements to obtain a job is a high level of education, which ultimately prevents them from applying for jobs at the desired workplaces. As a result, their skills are not used to their full potential. This, of course, can be seen as an indication of the challenges of the demographic bonus in Indonesia in 2045. Will the working-age population at that time have a low or high level of education? Therefore, the balance between skills and a good level of education must be considered by the government and the Indonesian community, including the working-age population.

Investing in skill training for the community is one form of anticipation that the government can undertake to address the challenges of the forthcoming demographic dividend. Providing training to the community will strengthen specific skills among the population, enabling them to compete with people from other countries. This can minimise the use of foreign labour and increase the employment of the country's own workforce. The training provided should be tailored to the competencies of the productive-age population, ensuring synchronization between the training and existing skills, so that the effectiveness of the training can be more widely felt by the community.

The improvement of the quality and quantity of education by the government for society is an appropriate form of anticipation in responding to the challenges of the upcoming demographic bonus. Enhancing the quality and quantity of education will provide opportunities for the productive age group to balance their knowledge, skills, and attitudes with the requirements of the jobs they will apply for. Fundamentally, nowadays, companies consider education as one of the requirements that must be met by prospective employees. Therefore, with the improvement of education quality and quantity, it is expected to encourage Indonesian society, especially the productive age group, to attain a good level of education and secure good positions in the desired workplaces, while also addressing unemployment issues effectively when the demographic bonus occurs.

An important anticipatory measure that can be taken is the improvement of both the quality and quantity of employment opportunities. This needs to be

done to synchronise the number of people of working age with the number of jobs available to absorb them. By enhancing the quality and quantity of employment, the demographic dividend can be optimally realised as expected, enabling Indonesia to achieve sound development through a population that can earn an income from available jobs, thereby reducing unemployment in the country. The government can improve employment quality and quantity through economic policies that support labour and market flexibility by encouraging the emergence of new entrepreneurs. The government can provide financial support, training, and market access for young entrepreneurs, particularly for UMKM across various regions in Indonesia. Support in the form of money, training, and market access will provide great opportunities for the community to start businesses, and this can encourage the creation of jobs for others. Thus, the improvement of job quality and quantity by the government not only focuses on large-scale state-owned enterprises but can also come from small-scale ventures through the empowerment of UMKM.

CONCLUSION AND RECOMMENDATION

Based on the data analysis results, the best model used to predict the number of unemployed in Indonesia is the ARIMA (1,1,1) model. The prediction results indicate that the number of unemployed in Indonesia will increase from 2024 to 2045. It is evident that there will be a relatively high unemployment rate in 2045, reaching 8.15%. This shows that the demographic bonus is a serious threat to Indonesia as it encourages relatively high unemployment.

Based on the analysis of the opportunities and threats of the demographic bonus on unemployment in Indonesia, it can be concluded that the demographic bonus represents a strategic momentum with great potential to drive economic growth and reduce unemployment if it is managed effectively. The main opportunity lies in the increasing proportion of the working-age population, which can serve as a key driver of development through the availability of abundant labor, higher productivity, and the expansion of entrepreneurship and innovation. With supportive policies in education, vocational training, and skills development aligned with labor market demands, the demographic bonus can significantly contribute to lowering unemployment and enhancing the competitiveness of the national workforce.

However, the demographic bonus also poses serious threats if it is not accompanied by adequate job creation and improvements in the quality of human resources. Mismatches between workforce skills and industry needs, low education and skill levels, and the limited capacity of the formal sector to absorb labor may lead to higher unemployment, particularly among educated job seekers. In addition, regional disparities and unequal access to employment opportunities can exacerbate social and economic problems.

Therefore, the successful utilization of the demographic bonus depends heavily on the synergy between government policies, the business sector, and educational institutions in strengthening human resource quality, expanding employment opportunities, and promoting inclusive and sustainable economic growth. Without strategic and integrated measures, the demographic bonus risks

turning from an opportunity into a burden that worsens unemployment challenges in Indonesia

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Conflict of Interest Statement

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

Ethics Statement

The author(s) confirm that this study does not involve human subjects, animal experiments, or sensitive personal data. The research was conducted using secondary data from public sources and adheres to the ethical standards of academic research.

Data Availability Statement

The data used in this study are time-series data from 1980 to 2024, sourced from official government publications and public statistics. All data processed and analysed in this study are available from the corresponding author upon reasonable request.

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