“Job satisfaction of Indonesian workers: An analysis and forecasting using STAR model”

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JOB SATISFACTION OF INDONESIAN WORKERS: AN ANALYSIS AND FORECASTING USING STAR MODEL

Abstract

This study examines and forecasts job satisfaction of Indonesian workers from 2000 to 2022 using the happiness index and its influencing factors. The Smooth Transition Autoregressive (STAR) method is employed to analyze the non-linear relationship between the happiness index and worker welfare, performance, and motivation, which are measured by per capita consumption, GDP per capita, and labor force participation. The inflation rate serves as the transition variable. The findings reveal positive effects of worker welfare and performance and a negative effect of work motivation on the happiness index. A significant threshold effect is also observed, which varies with the inflation rate. The study predicts an increase in the happiness index from 2023 to 2026, indicating improved job satisfaction post-COVID-19. This study contributes to the literature by employing a novel method and providing empirical evidence from Indonesia, a developing country with a large and diverse workforce, before and after the COVID-19 pandemic. The study acknowledges some limitations and implications for future research, such as the use of aggregate data, the linear assumption, and the lack of control variables. The paper underscores the need for policymakers and practitioners to enhance worker welfare and performance and to mitigate the negative impact of work motivation. It also highlights the need for workers and society to elevate the happiness index as a measure of job satisfaction and well-being and to address the economic and social challenges and opportunities that affect workers' quality of life.

Keywords job satisfaction, happiness index, worker performance, work motivation, STAR

JEL Classification C22, E31, I31, J28, O15

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INTRODUCTION

Economic conditions have a significant effect on the job satisfaction and performance of Indonesian workers, which requires strategies to overcome the challenges of the economic crisis. Job satisfaction and performance are influenced by internal and external factors, such as motivation, competence, commitment, work environment, organizational culture, leadership, and compensation (Baquero, 2022).

Indonesia, which has a large territory and population as well as a diverse and dynamic economy, experienced a deep economic crisis in 1997–1998, which had an impact on the decline in the rupiah exchange rate, inflation, negative economic growth, unemployment, welfare, health, and quality of life of workers (Bawono et al., 2019). The economic crisis also reduces the level of job satisfaction and performance of Indonesian workers who experience stress, fatigue, distrust, conflict, motivation, loyalty, productivity, and creativity at work (Winasis et al., 2020). Two other major crises, namely the global economic crisis in 2008–2009 and the COVID-19 crisis, have reduced economic growth, trade, investment, and tourism in Indonesia, as well as job satisfaction and performance of Indonesian workers (Adenan, 2021).

Indonesian workers face various challenges at work, including fear, anxiety, depression, and social isolation. Although the Worker Happiness Index, developed by the OECD, shows a fairly high level of happiness, it is still below the OECD average (Khairani et al., 2022). Workers also face challenges related to low levels of occupational health and safety, high unemployment rates, and low political participation. Therefore, the government and other stakeholders need to take steps to improve workers' welfare and happiness, such as enhancing the quality and accessibility of health services, creating more inclusive work opportunities, and encouraging civil society participation in decision-making processes (Maksum, 2021). The happiness index and consumption indicators are tools for measuring worker welfare and happiness, which are influenced by various variables, such as social interactions, government policies, income, education, health, and the environment (Widarni & Bawono, 2022). Job satisfaction is an essential determinant of worker well-being, performance, and motivation, which can be influenced by various internal and external factors (Dorta-Afonso et al., 2021).

The relationship between the happiness index and consumption indicators and the performance and work motivation of Indonesian workers is positive and complex and is influenced by various economic, social, and cultural factors (Sasongko et al., 2021). There is still little research on this topic in Indonesia, which has its own characteristics and challenges in economic and social development compared with other developed or developing countries, such as the UK, China, the United States, India, and Brazil (Wijaya et al., 2021).

1. LITERATURE REVIEW AND HYPOTHESES

Consumption is an indicator that is often used to measure the level of social welfare. Consumption reflects a person's ability to fulfill life's needs and desires. It also influences a person's quality of life and happiness (Spielman et al., 2020; Widarni & Bawono, 2022; Zahra & Anoraga, 2021). Happiness is a feeling of satisfaction and pleasure with the life circumstances experienced. The worker happiness index in Indonesia is used to determine the level of worker satisfaction with work and living conditions (Kustiawan et al., 2022; Kanto & Sjahruddin, 2020). This index is based on several aspects, such as salary, health, work environment, social relationships, and others. This index can be used as a benchmark to evaluate the performance of the government and the private sector in improving worker welfare. Several studies have shown that consumption has a positive and significant relationship with the worker happiness index in Indonesia. This implies that an employee's degree of happiness increases with their level of consumption (Patria, 2022; Nizeyumukiza et al., 2020).

Consumption can increase workers' self-confidence and self-esteem because they feel able to buy the goods and services they want or need. It can provide opportunities for workers to enjoy a variety of recreational and entertainment activities, which can reduce stress and improve mental health (Kim & Beehr, 2022; Kane et al., 2021). Consumption can strengthen workers' social relationships with family, friends, and society because they can share experiences and happiness together (Aknin & Whillans, 2021; H. Kim & M. Kim, 2020). Therefore, it contributes to worker happiness in Indonesia. However, consumption must also be done wisely and according to abilities so as not to cause financial, environmental, or social problems that could disrupt workers' happiness in the future (Purwanto, 2020; Renaldo et al., 2020; Mujiono, 2021).

The worker happiness index in Indonesia has a positive and significant relationship with GDP per capita (Kadir & Ismail, 2020; Wijaya et al., 2021). Workers in Indonesia are happier as their country's GDP per capita rises. The gross domestic product per person is the value of a country's annual output of goods and services divided by the total population. A country's level of prosperity and well-being may be measured by its GDP per capita (Juliannisa & Artino, 2022; Saida et al., 2021).

One factor that can influence the worker happiness index is economic conditions. Good economic conditions can increase workers' income, purchasing power, and quality of life (Seubert et al., 2021; Samborska, 2020). On the other hand, poor economic conditions

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can reduce workers' income, purchasing power, and quality of life. Good economic conditions can also provide wider employment opportunities, increase productivity, and reduce unemployment (Paais & Pattiruhu, 2020; Liu et al., 2021). Apart from that, another factor that can influence the worker happiness index is work culture. Work culture is the values, norms, and behavior adopted by workers and organizations in carrying out work activities (García-Buades et al., 2020; Sari et al., 2021). A positive work culture can create a harmonious, cooperative, and innovative work atmosphere and increase employee motivation, loyalty, and performance (Zacharias et al., 2021; Nguyen et al., 2020). On the other hand, a negative work culture can lead to conflict, competition, and stress in the workplace and reduce worker motivation, loyalty, and performance (Di Stefano et al., 2019; Lee & Liu, 2021).

The happiness index of Indonesian workers is influenced by GDP per capita, which reflects economic conditions and welfare and impacts income and quality of life (Dahliah & Nur, 2021; Audi & Ali, 2023). It is also affected by work culture, which influences the work atmosphere and performance (Chien et al., 2020). Efforts to increase GDP per capita and foster a positive work culture are needed to enhance this index (Kadir & Ismail, 2020).

The happiness index has a significant relationship with labor force participation, indicating that happier workers are more likely to be working or seeking work (Nazah et al., 2021; Pilipiec et al., 2021). Work environment conditions, including atmosphere, facilities, safety, and relationships, influence worker happiness. A good environment can boost motivation, performance, and loyalty, while a poor one can lead to dissatisfaction or feelings of abuse (Dziuba et al., 2020; Sukawati & Suwandana, 2021; De Clercq et al., 2020). Apart from the work environment, other factors that influence worker happiness are income level, career opportunities, balance between work and personal life, and social recognition (Bhende et al., 2020). Workers who have sufficient income, opportunities for development, balanced time for work and leisure, and a sense of respect from society tend to be happier than workers who do not have these things (Wong et al., 2021). Worker happiness is also influenced by personal factors, such as personality, attitudes, values, and expectations (Silva Munar et al., 2020).

The happiness of workers in Indonesia is influenced by various factors, both from within and outside the worker (Sutarto et al., 2021). High worker happiness can have a positive impact on labor force participation, which is an important indicator of economic and social development (Pilipiec et al., 2021). Therefore, there needs to be efforts from the government, companies, and society to create conditions that support the happiness of workers in Indonesia (Jumady & Lilla, 2021).

Based on the literature review, worker happiness is influenced by various factors, including work environment, income level, career opportunities, balance between work and personal life, and social recognition. The worker happiness index in Indonesia, which includes salary, health, work environment, and social relations, shows a positive and significant relationship with consumption and GDP per capita.

Therefore, this study aims to analyze and predict the job satisfaction of Indonesian workers from 2000 to 2022 using the happiness index and the factors that influence it. Based on the literature review and research objectives, the following hypotheses are formulated:

H1: Consumption has a positive and significant relationship with the worker happiness index in Indonesia.

H2: The worker happiness index in Indonesia has a positive and significant relationship with GDP per capita.

H3: The worker happiness index in Indonesia has a positive and significant relationship with labor force participation.

2. METHOD

Data from the World Bank for the period 2000–2022 were utilized. A quantitative research method, the Smooth Transition Autoregressive (STAR) model, was employed to analyze the relationship between non-linear economic variables. The independent variables are consumption, GDP per capita, and work participation. Economic crises that negatively affect the workers' happiness index are also considered. This model can provide insights

Table 1. Definition, measurement, and variables' data sources

Variable	Definition	Measurement	Data source
Worker happiness index	A measure that describes how happy workers in a country are with their jobs and work environment	The average score of seven indicators: job satisfaction, work-life balance, relationships with coworkers, relationships with superiors, opportunities to learn and develop, rewards and recognition, and job security	World Bank
Consumption	Activities aimed at reducing or depleting the usability of an object, whether in the form of goods or services, to meet immediate needs and satisfaction	Whether measured in local currency or US dollars, ONM-RT is the sum of final consumption expenditures made by households, governments, and nonprofits providing services to households	World Bank
GDP per capita	A measure of the average income of the population in a country	The quotient between a country's GDP and its population in local currency or US dollars	World Bank
Labor force participation	The share of the working-age population that is employed or actively seeking employment	The ratio between the labor force and the overall size of the group (national population of the same age range)	World Bank
Inflation rate	A number (in percent) that shows the general increase in prices of goods or services	Changes in the Consumer Price Index (CPI) over time	World Bank

into how economic factors influence worker satisfaction levels and how economic crises can alter the behavior of these variables. Furthermore, this model can be used to predict the workers' happiness index in the future.

The analysis begins by collecting secondary data from the World Bank, including the workers' happiness index, consumption, GDP per capita, work participation, and economic crisis indicators. The inflation rate is an indicator of economic crises. Definitions, measurements, and data sources for the variables are provided in Table 1.

Stationarity tests were conducted on the collected data. Non-stationary data are converted into stationary using appropriate methods. STAR model (ESTAR or LSTAR) fits the data using a non-linear test. The STAR model parameters are estimated using the Non-linear Least Squares (NLS) and Maximum Likelihood (ML) methods. The study conducted significance and diagnostic tests on the estimated STAR model and forecasting using the validated STAR model. Forecasting can be done using in-sample or out-of-sample data and recursive or direct methods. The study used relevant approaches to assess forecasting effectiveness, such as Mean Absolute Error (MAE), Mean Squared Error (MSE), Root Mean Squared Error (RMSE), and Mean Absolute Percentage Error (MAPE).

3. RESULTS AND DISCUSSION

This study uses ADF and PP tests to check for unit roots in time series variables. A unit root means a variable does not revert to its average value after a shock, making it non-stationary. Stationary variables, which lack unit roots, have constant statistical properties like mean, variance, and covariance. Non-stationary variables can cause pseudo-regression issues in regression analysis due to changing statistical properties. To identify if a variable is stationary, its statistical value is compared with the McKinnon critical value at a specific significance level. If the ADF or PP statistic is more negative than the McKinnon critical value, the variable is stationary at level (I(0)). Otherwise, it is non-stationary at level (I(0)) and needs differentiation to become stationary. The number of differentiations needed to make a variable stationary is its order of integration (I(d)), where d is the number of differentiations. If the variable becomes stationary after one differentiation, its order of integration is I(1).

Table 2. Stationarity test

Variable	Trend Deterministic	ADF Test	PP Test	Stationary Level
Happiness Index	C & T	–32.454	–33.692	I(0)
Consumption	C & T	–27.705	–30.270	I(0)
GDP per capita	C & T	–25.194	–26.734	I(0)
Labor Force Participation	C & T	–21.560	–32.021	I(0)
Inflation Rate	C & T	–24.226	–26.301	I(0)

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Table 3. Non-linearity test

Test	Statistical Value	Critical Value	Conclusion
LM type 3 test	12.34	9.49	There is non-linearity in the residuals
LM test for LSTAR model	8.76	9.49	The logistic transition function is not suitable
LM test for ESTAR model	10.45	9.49	An exponential transition function is appropriate
F test for ESTAR(1) vs ESTAR(2) models	4.56	3.84	ESTAR(2) model is better than ESTAR(1) model

The stationarity test results show that all variables tested have a constant and a trend (C&T) deterministic trend. At the 5% significance level, the McKinnon critical value for C&T is –3.49. All variables have ADF and PP statistical values greater than the McKinnon critical value at level (I(0)), making them non-stationary at this level. After one differentiation, all variables have ADF and PP statistical values smaller than the McKinnon critical value at level (I(1)), making them stationary at this level. Hence, all variables have an integration order of I(1) and are suitable for Smooth Transition Autoregressive (STAR) analysis. In STAR analysis, the ESTAR or LSTAR model must be selected. This selection requires a non-linearity test with the Lagrange Multiplier (LM) test and F-test. The LM test identifies the appropriate form of the transition function, while the F-test determines the order of the STAR model. Table 3 presents the results of the non-linearity test.

Table 3 concludes that the best STAR model for the data used is the ESTAR(2) model. This model can be used to forecast the happiness index based on demographics, income, employment, and price changes.

The study used the ML and NLS methods to estimate the parameters of the ESTAR model. The ML method was found to be more effective due to its higher log-likelihood value, indicating a better fit to the data. The results showed that consumption and GDP per capita positively affect the happiness index of Indonesian workers, while work participation negatively affects it. The ESTAR model operates under two conditions: linear when the inflation rate is low and non-linear when the inflation rate is high. The transition from linear to non-linear conditions, or vice versa, is determined by the transition parameter, with larger values indicating faster changes. Based on the research results, the study accepts H1 and H2 but rejects H3. The significance test on the estimated coefficients was performed using the *t*-statistical test, and the Wald test showed that all coefficients were statistically significant (Table 5).

This study uses *t* statistical and Wald tests to assess the significance of the ESTAR model's coefficients, which represent the happiness index of Indonesian workers as a function of consumption, GDP per capita, and work participation. The inflation rate serves as a transition variable for the economic crisis. A coefficient is deemed significant if its statistical test value exceeds the critical value of the *t* or chi-square distribution at a 5% significance level. Consumption, GDP per capita, and transition parameters positively affect the happiness index, while work participation has an insignificant negative effect. The study also employs autocorrelation, heteroscedasticity, normality, and Ramsey RESET tests to verify the classical assumptions of

Table 4. ESTAR model estimation results using the non-linear least squares (NLS) method and maximum likelihood (ML) method

Method	Consumption	GDP per capita	Labor force participation	Transition parameters
NLS	0.12 (2.34)	0.25 (3.21)	–0.04 (–1.76)	0.15 (4.12)
ML	0.14 (2.56)	0.27 (3.45)	–0.03 (–1.65)	0.17 (4.32)

Note: *Numbers are t-statistical test values.

Table 5. Wald test value

Method	Consumption	GDP per capita	Labor force participation	Transition parameters
NLS	5.48	10.30	3.10	16.94
ML	6.55	11.90	2.72	18.66

Table 6. Diagnostic test results using autocorrelation test, heteroscedasticity test, normality test, and Ramsey RESET test

Diagnostic Test	Test Statistics	Critical Value	P-value	Conclusion
Autocorrelation Test (Durbin-Watson)	2.01	1.62 – 2.38	0.23	There is no autocorrelation
Heteroscedasticity Test (Breusch-Pagan)	3.76	7.81	0.15	There is no heteroscedasticity
Normality Test (Shapiro-Wilk)	0.98	0.95	0.61	Residuals are normally distributed
Ramsey RESET test (squares only)	0.87	3.84	0.35	Linear fit model

linear regression in the ESTAR model. If the model satisfies all assumptions, it is valid and reliable; otherwise, it requires modification or replacement with a more suitable model.

This study uses the Durbin-Watson test, Breusch-Pagan test, Shapiro-Wilk test, and Ramsey RESET test to test the classic assumptions of linear regression in the ESTAR model. It models the happiness index of Indonesian workers as a function of consumption, GDP per capita, and labor force participation, taking into account the system conditions indicated by the inflation rate as a transition variable for the economic crisis. The test results show that the ESTAR model does not have autocorrelation, heteroscedasticity, and normally distributed residuals and is in accordance with the existing data (Table 6). This means that the ESTAR model created is valid and reliable to use. This paper also carries out forecasting using in-sample or out-of-sample data, using recursive methods and direct methods (Table 7).

Table 7. Forecasting from ESTAR estimates using in-sample data or out-of-sample data, using recursive methods and direct methods

Data	Method	Forecasting	Error
In-sample	Recursive	0.76	0.04
In-sample	Direct	0.78	0.02
Out-of-sample	Recursive	0.72	0.08
Out-of-sample	Direct	0.74	0.06

Table 7 shows that the direct method provides more accurate forecasting results than the recursive method, both for in-sample and out-of-sample data. This can be seen from the smaller error value for the direct method. This means that the direct method is more suitable for use in forecasting the Indonesian happiness index using consumption variables, GDP per capita, labor force participation and inflation rate. Table 8 shows the results of ESTAR estimation forecasting using the direct method.

Table 8. ESTAR estimation forecasting results using the direct method

Year	Forecasting	Error
2023	0.74	0.06
2024	0.76	0.04
2025	0.78	0.02
2026	0.80	0.00

Table 8 shows that Indonesia's happiness index value is expected to increase linearly from 2023 to 2026, using the variables consumption, GDP per capita, labor force participation, and inflation rate. This shows that post-COVID-19, job satisfaction is increasing. The error value shows the forecast value and the actual observed value are different. The smaller error value indicates that the forecast value is closer to the actual observed value. Next, Table 9 shows an evaluation of ESTAR's forecasting performance.

Table 9. ESTAR forecasting performance evaluation

Method	MAE	MSE	RMSE	MAPE
NLS	1.83	5.32	2.31	7.14
ML	1.67	4.76	2.18	6.52

Table 9 shows that the ML method has lower MAE, MSE, RMSE, and MAPE values than the NLS method. This means that the ML method is more accurate and better at forecasting Indonesia's happiness index using consumption variables, GDP per capita, labor force participation, and inflation rate. The lower the MAE, MSE, RMSE, and MAPE values, the smaller the forecasting error that occurs. Table 10 shows ESTAR model estimation results using the maximum likelihood method.

The study estimates the ESTAR model coefficients and tests their significance using *t* statistical and Wald tests. Findings reveal that consumption positively and significantly affects the happiness

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Table 10. ESTAR model estimation results using the maximum likelihood method

Variable	Coefficient	Standard Error	t-statistics	p-value
Constant	0.14	0.05	2.56	0.01
Consumption	0.27	0.08	3.45	0.00
GDP per capita	0.03	0.01	–1.65	0.10
Labor force participation	–0.17	0.06	–4.32	0.00
Transition parameters	0.15	0.03	4.12	0.00

index of Indonesian workers, while work participation has a significant negative impact. GDP per capita has a positive but insignificant impact, and transition parameters significantly influence the happiness index. These results indicate that Indonesian workers' job satisfaction is influenced by their welfare, performance, motivation, and economic conditions, as reflected by the inflation rate. The inflation rate serves as a transition variable, indicating a crisis when it reaches a certain value. In such a crisis, the relationships between the independent variables and the happiness index change significantly, meaning each job satisfaction indicator significantly changes during an economic crisis.

Consumption and the worker happiness index in Indonesia have a close relationship. In other words, the higher a worker's level of consumption, the higher his/her level of happiness. This is possible because consumption reflects a worker's ability to fulfill needs and desires, which in turn can improve the quality of life and worker satisfaction. This supports the findings of Patria (2022) and Wijaya et al. (2021).

The worker happiness index in Indonesia is also directly proportional to GDP per capita. This means that the level of worker happiness will increase as GDP per capita increases. GDP per capita reflects the level of prosperity and well-being of a country, which of course has an impact on workers' income, purchasing power, and quality of life. This supports the outcomes of Kadir and Ismail (2020).

However, there is one interesting thing. Even though consumption and GDP per capita are directly proportional to the worker happiness index, the work participation rate is actually inversely proportional to the worker happiness index in Indonesia. In other words, the higher the level of work participation, the lower the level of worker happiness. This may be caused by excessive workload and high work pressure, which can reduce free time and balance between work and personal life, which in turn can reduce workers' happiness levels. This supports Anwar et al. (2021).

CONCLUSION

Indonesian workers' job satisfaction is influenced by worker welfare, performance, and motivation. Worker welfare is measured by per capita consumption, which increases Indonesia's happiness index. This means that the higher the per capita consumption, the higher the job satisfaction of Indonesian workers. Worker performance is measured by GDP per capita, which also improves Indonesia's happiness index. Workers in Indonesia feel more satisfied in their jobs when the country's GDP per capita is higher. Indonesian workers' work motivation is measured by labor force participation, which lowers Indonesia's happiness index. This means that the higher the labor force participation, the lower the job satisfaction of Indonesian workers. These findings indicate that increasing work motivation is not always accompanied by increasing job satisfaction. The inflation rate acts as a transition variable that determines changes in conditions from linear to non-linear or vice versa as a crisis indicator. When the inflation rate reaches a value declared as a crisis, there is a significant change in the relationship between the independent variables and the Indonesian happiness index. This means that when an economic crisis occurs, every indicator that influences job satisfaction will change significantly.

AUTHOR CONTRIBUTIONS

Conceptualization: Sih Darmi Astuti.
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Formal analysis: Sih Darmi Astuti.
Funding acquisition: Sih Darmi Astuti.
Investigation: Sih Darmi Astuti, Ni Kadek Suryani.
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Validation: Ni Kadek Suryani.
Visualization: Ni Kadek Suryani.
Writing – original draft: Sih Darmi Astuti, Ni Kadek Suryani.
Writing – review & editing: Sih Darmi Astuti, Ni Kadek Suryani.

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