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The Effectiveness of The Food Supply and Price Stabilization Rice Policy on The Rice Market in East Java

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ABSTRACT

Rice has become a central focus of the Indonesian government in ensuring both availability and price stability. To address these concerns, the government, through Perum Bulog, introduced the SPHP (Stabilization of Food Supply and Prices) rice policy. This study aims to analyze the effectiveness of SPHP rice policy in influencing the price of premium rice in East Java Province. This study contributes to the limited empirical evidence on food policy evaluation in Indonesia and offers insights for designing more differentiated price stabilization strategies. The analysis in this study was conducted using a fixed effect model–dynamic unbalanced panel data regression with a double-log natural functional form. The dataset consists of monthly panel data covering 34 cities/regencies in East Java Province over the period June 2024–May 2025. The estimation results indicate that only the lagged premium rice price has a significant effect on the premium rice price. However, the price of SPHP rice, both current and lagged, does not have a significant effect on the price of premium rice. This suggests that the SPHP rice policy, designed primarily to stabilize the market for medium-quality rice and ensure affordability for low- to middle-income households. This research highlighting limited substitution effects between the two segments (premium rice segment and SPHP or medium rice segment). Policy implications suggest that premium rice stabilization requires more direct interventions, including targeted market operations with premium rice, recalibration of the Maximum Retail Price (HET), and enhanced monitoring against collusive practices.

KEYWORDS

Food price stabilization; Food security; Panel regression; Premium rice; SPHP

1. INTRODUCTION

Food constitutes the most fundamental human necessity. The availability and stabilization of food prices, particularly staple commodities, serve as key indicators of food security and play a crucial role in maintaining both social and economic stability. To safeguard food availability and price stability, the government has implemented various policies, especially interventions in staple food markets, which continue to evolve in response to inflationary pressures and market volatility [1], [2], [3].

Among all staple foods, rice has consistently received primary attention. Rice is the staple food for the majority of Indonesians and exerts a profound influence on inflation, purchasing power, and national stability. Fluctuations in rice prices, especially at the consumer level, directly affect household welfare, particularly for low-income groups. This explains why rice availability and price stability have always been at the forefront of government policy priorities [1], [4], [5].

In early 2023, the Indonesian government, through *Perum Bulog*, introduced the SPHP (Food Supply and Price Stabilization, Indonesian: *Stabilisasi Pasokan dan Harga Pangan*) for rice. The SPHP rice policy is designed to maintain price stability by distributing SPHP rice (Indonesian: *SPHP Beras*) directly to consumer markets, serving as part of a broader strategy to stabilize the rice market [6], [7]. The implementation of the SPHP rice policy is guided by the Decree of the Head of the National Food Agency

No. 01/Ks.02.02/K/I/2023 on Technical Guidelines for Stabilizing Rice Supply and Prices at the Consumer Level in 2023, as well as Regulation of the National Food Agency No. 15/2022 on Stabilization of Rice, Corn, and Soybean Supply and Prices.

The mechanism of SPHP rice program involves distributes medium-quality rice under the SPHP label to both traditional markets and modern retailers at a government-determined maximum retail price (MRP, Indonesian: *Harga Eceran Tertinggi*/HET). Distribution follows quotas and targeted allocations coordinated with local government demand and reporting systems. The program aims to maintain rice availability and price stability at the consumer level, thereby sustaining consumers purchasing power and controlling inflation across Indonesia [7], [8], [9].

Practically, SPHP rice is expected to act as a substitute good for premium rice. If consumers perceive it as an adequate substitute, the program could potentially suppress demand for premium rice, thereby reducing and stabilizing its price. This aligns with the economic concept of cross-price elasticity and substitution of goods; both of which are highly relevant in analyzing rice market dynamics [10], [11].

However, the effectiveness of the SPHP rice program remains debatable. Reports from the PIHPS (Strategic Food Price Information Center, Indonesian: *Pusat Informasi Harga Pangan Strategis*) and *Bapanas* (National Food Agency, Indonesian: *Badan Pangan Nasional*) indicate that despite the distribution of SPHP rice to consumer markets, premium rice prices remain relatively high and volatile. This issue is particularly evident in East Java, one of Indonesia's largest rice-producing and consuming provinces, where premium rice prices continue to fluctuate and the price disparity between premium and SPHP rice remains significant [12], [13].

This issue raises critical questions about the actual effectiveness of the SPHP rice policy at the regional level, especially in terms of its ability to reduce premium rice prices. Theoretically, the introduction of SPHP rice should create downward pressure on premium rice prices through substitution effects. Practically, however, such outcomes have yet to materialize consistently. Evaluating the program's success is therefore essential, not only in stabilizing consumer rice prices but also in ensuring adequate supply and affordable access for the population. Without evidence-based evaluation and market analysis, the policy risks missing its objectives and even creating unintended market distortions.

East Java represents a particularly strategic context for this evaluation, as its rice market is segmented into premium, medium, and SPHP rice categories, each shaped by consumer preferences and purchasing power. Despite government–imposed MRP for these categories, rice prices in practice continue to be largely determined by free market mechanisms. Ideally, SPHP rice should help suppress medium rice prices while simultaneously acting as a substitute for premium rice, thereby exerting downward pressure on overall consumer prices [10], [11].

This study contributes to analyze the effectiveness of the SPHP rice policy in influencing premium rice prices in East Java. This research offers novelty as evaluation of food security policy; given the scarcity of empirical studies as a critical gap, specifically addressing the effectiveness of SPHP rice program affects premium rice prices in East Java. The findings are expected to provide valuable insights for both central and local governments, as well as for *Perum Bulog* as the program's technical implementer, to design more effective interventions. The scope of this research is limited to examining the impact of SPHP rice prices on premium rice prices in East Java, with cross-price elasticity serving as a key indicator of the extent to which the policy influences the premium rice market.

2. MATERIALS AND METHODS

2.1. Research Approach

This study employs a deductive-quantitative approach, utilizing secondary data on premium rice prices and SPHP rice prices in East Java Province. The primary object of this research is the premium rice market (in economic terms) of East Java Province, represented through the dynamics of premium rice prices. Data on premium rice prices using premium (super) rice I prices and are obtained from PIHPS; and SPHP rice prices are obtained from the *Bapanas*. The dataset consists of monthly panel data covering 34 cities/regencies in East Java Province over the period June 2024–May 2025.

2.2. Data Analysis

Data analysis in this study was conducted using a dynamic panel data regression with a double-log natural functional form. However, if missing data are found, the data analysis was conducted using a dynamic unbalanced panel data regression with a double-log natural functional form. This method integrates both time-series and cross-sectional dimensions, accounting for time effects and the dependence of variables on their lagged values, while also accommodating missing observations that result in an unbalanced dataset.

2.3. Model Identification and Specification

Model identification and specification are the stages in designing an econometric model. This study uses a model for dynamic panel data. The specification of the econometric model equation for the premium rice market in this study is formulated in equation (1).

$$ln\text{PRP}_{t,ij} = \beta_0 + \beta_1\, ln\text{PRP}_{t-1,ij} + \beta_2\, ln\text{SRP}_{t,ij} + \beta_3\, ln\text{SRP}_{t-1,ij} + \mu_{ij} + \alpha_{ij} \quad (1)$$

The following hypotheses for coefficient values are β_1, β_2, $\beta_3 > 0$. $\text{PRP}_{t,ij}$ is premium rice price for individual i at time j, $\text{PRP}_{t-1,ij}$ is premium rice price one month prior for individual i at time j, $\text{SRP}_{t,ij}$ is SPHP rice price for individual i at time j, $\text{SRP}_{t-1,ij}$ is SPHP rice price one month prior for individual i at time j, β_0 is constant, $\beta_{1,2,3}$ is regression coefficients, μ_{ij} is individual effects (unobserved), and α_{ij} is error term/residual for individual i at time j.

The model specification is a novelty in this research. Practically, SPHP rice is expected to act as a substitute good for premium rice. This aligns with the economic concept of cross-price elasticity and substitution of goods; both of which are highly relevant in analyzing rice market dynamics.

The underlying hypothesis posits that premium rice prices are positively influenced by their lagged values, reflecting persistence in price movements. Similarly, SPHP rice prices–both current and lagged–are expected to exert a positive effect, in line with the notion of substitution between premium and SPHP rice. Importantly, missing data do not imply a zero value; hence, estimation is carried out using unbalanced panel regression techniques.

2.4. Estimation and Model Selection

The estimation process employs three panel regression techniques: (1) Pooled Least Squares (PLS), (2) Fixed Effects Model (FEM), and (3) Random Effects Model (REM). The next step is model selection, conducted using (1) Lagrange Multiplier test (Breusch-Pagan), (2) Chow test (F-statistic), and (3) Hausman test (Chi-square) with the test criteria described in Table 1.

Table 1. Best model selection test criteria (with α = 0.05).

Model test	Probability	Conclusion
Lagrange multiplier test (Breusch-Pagan, both)	> α	Use pooled least square
	< α	Use random effects model
Chow test (statistic-F)	> α	Use pooled least square
	< α	Use fixed effects model
Hausman test (chi-sq stat.)	> α	Use random effects model
	< α	Use fixed effects model

2.5. Model Validation

The model feasibility test is employed to ensure that the estimated model is reliable, valid, and free from bias. A model deemed feasible can then be used for subsequent stages of analysis.

2.5.1. Residual Test

The residual test is conducted to examine whether the regression assumptions are satisfied, with the aim of ensuring that the regression model is both valid and unbiased. This study applies only two diagnostic tests–residual normality and heteroskedasticity–as the primary basis for verifying regression assumptions.

The residual normality test is carried out using the Jarque–Bera test to determine whether the residuals are normally distributed. The residual normality test is carried out using the Jarque–Bera test to determine whether the residuals are normally distributed. The heteroskedasticity test is conducted using the Glejser test to determine whether the residual variance is constant. The Glejser test regresses the absolute value of the residuals against the independent variables; if the residual variance is non-constant, the absolute residuals will be significantly affected by the independent variables (exogenous).

This study prioritizes the substance and relevance of the model; therefore, only the residual normality and heteroskedasticity tests are employed as the basis for assumption testing. A multicollinearity test is not performed, as the selected variables are inherently correlated. The study assumes a positive correlation between premium rice prices and SPHP rice prices, which underpins the model specification. Moreover, given that a dynamic panel model is utilized, price variables in the current and previous periods are assumed to be correlated. An autocorrelation test is also omitted because the study employs nominal price data, which is inherently influenced by inflation. Inflation, in turn, exerts a substantial effect on price fluctuations over time and consequently affects the residuals.

2.6. Model Feasibility Test (Goodness of Fit)

The model feasibility test (goodness of fit) is used to ensure that the model is appropriate for use. This study employs the ANOVA test and the coefficient of determination (R^2) as the basis for evaluating model feasibility. The R^2 value is used to indicate how well the model explains the variance of the dependent variable. The ANOVA test is applied to determine the model's feasibility by examining whether the coefficients significantly explain the relationship between the independent and dependent variables.

2.7. Model Interpretation

The interpretation of the model is based on the results of the t-test (with $\alpha = 0.05$). As the model employs a double-log specification, estimated coefficients represent elasticities–that is, the percentage change in premium rice prices in response to a 1% change in explanatory variables.

3. RESULTS AND DISCUSSION

3.1. Model Estimation Results

The model was estimated using panel data regression with the fixed effects estimation method (PLS). The choice of estimation technique was determined based on a series of model specification tests, including the Chow test, the Hausman test, and the Lagrange Multiplier (LM) test (see Table 2). The results of the panel regression estimation are presented in Table 4.

Table 2. Results from model specification tests.

Model test	Stat.	Prob.	Conclusion
Lagrange multiplier test (Breusch-Pagan, both)	0.6433	0.422	Use pooled least square
Chow test (statistic-F)	1.946	0.002	Use fixed effects model*
Hausman test (chi-sq stat.)	23.575	0.000	Use fixed effects model*

Notes: *Final conclusion of the test.

Based on the fixed effects estimation, the F-statistical probability value was found to be 0.000, indicating that the model is statistically valid. The F-test results confirm that the exogenous variables, collectively, exert a significant influence on the endogenous variable, suggesting that at least one of the exogenous variables significantly affects the dependent variable.

The adjusted coefficient of determination (adjusted R^2) was 0.983, meaning that the variation in exogenous variables explains 98.3% of the variation in the endogenous variable. While this indicates a very

strong explanatory power, it also raises concerns about potential multicollinearity. To address this, a correlation analysis was conducted among the exogenous variables, as presented in Table 3.

Table 3. Correlation among the exogenous variables.

	$PRP_{t-1,ij}$	$SRP_{t,ij}$	$SRP_{t-1,ij}$
$PRP_{t-1,ij}$	1.000	0.612	0.578
$SRP_{t,ij}$	0.612	1.000	0.937
$SRP_{t-1,ij}$	0.578	0.937	1.000

Notes: Perfect correlation (1.00); very high correlation (0.80–0.99); high correlation (0.60–0.79); medium correlation (0.40–0.59); low correlation (0.20–0.39); very low correlation (0.01–0.19); no correlation (0.00).

The results in Table 3 show high correlation between premium rice price one month prior for individual i at time j ($PRP_{t-1,ij}$) and SPHP rice price for individual i at time j ($SRP_{t,ij}$), with a correlation coefficient of 0.612. This is plausible, as both variables represent consumer rice prices (albeit of different qualities), which are likely derived from the same production base but differentiated by quality standards. Additionally, macroeconomic factors tend to drive parallel price fluctuations across both rice types.

A particularly strong correlation was also observed between premium rice price one month prior for individual i at time j ($PRP_{t-1,ij}$) and SPHP rice price one month prior for individual i at time j ($SRP_{t-1,ij}$); with 0.937correlation score. This is unsurprising, given that both represent rice prices from the same product category (SPHP rice), differentiated only by time.

Overall, multicollinearity should not be considered a serious concern in this study, as the observed correlations are inherent to the nature of the variables examined. Moreover, considering the research objective, a pragmatic compromise regarding multicollinearity is reasonable. The model can therefore be regarded as appropriate for further analysis.

With respect to residual distribution, although normality was not strictly achieved, the estimators remain BLUE and are asymptotically normally distributed under the Gauss–Markov theorem. Given the large sample size (34 cities/regencies in East Java Province over the period June 2024–May 2025), inferences based on the t-test remain valid [14].

Table 4. Estimation output using fixed effect model.

Variables	Notation	Estimation coefficient / Elasticity	t-stats	Prob.
Premium rice price one month prior for individual i at time j	$PRP_{t-1,ij}$	0.780564	21.23	0.000*
SPHP rice price for individual i at time j	$SRP_{t,ij}$	0.060256	80.648	0.517
SPHP rice price one month prior for individual i at time j	$SRP_{t-1,ij}$	-0.031745	-0.533	0.594
Constant	C	1.861646	2.202	0.028*
R^2	0.985	F-stats	571.730	
Adjusted R^2	0.983	Prob. (F-stats)	0.000*	

Notes: *Significant at α = 0.05.

The estimation results in Table 4 indicate that only the premium rice price one month prior ($PRP_{t-1,ij}$) has a significant effect on the premium rice price. In contrast, the SPHP rice price–both in the current period and in the previous period–does not significantly influence the premium rice price. Further discussion will be carried out based on the results of the analysis.

3.2. The Effect of Previous Period Premium Rice Prices on Premium Rice Prices

The analysis reveals that the price of premium rice in the previous month significantly influences its current price. This finding aligns with the theoretical framework of price stickiness, where past prices serve as a reference point for market actors in setting present prices [15]. Agricultural commodity prices often exhibit persistence because both producers and traders adjust their expectations based on past price movements. In this case, the strong correlation suggests that historical price information plays a crucial role in shaping current premium rice prices, reinforcing the idea that rice markets in East Java are highly path-dependent [15], [16], [17], [18].

Moreover, the finding supports the notion of price transmission within the same commodity over time. As highlighted in studies on staple food markets, lagged prices frequently act as benchmarks that reduce uncertainty and facilitate decision-making among traders and retailers. This behavior reflects not only market inertia but also the limited flexibility of both supply and demand in the rice sector. Given that rice is a staple with relatively inelastic demand, consumers are less responsive to price fluctuations, thereby reinforcing the persistence of past price trends into the present [7], [15], [16], [17], [19], [20], [21].

Previous empirical research has also demonstrated similar outcomes. Rice prices in Southeast Asia tend to display a strong degree of serial correlation due to both structural and policy-related factors [15], [21]. The dominance of rice as a staple commodity makes its pricing less volatile compared to another perishable food items; while in rice market, past price levels serving as an anchor. Thus, the results of this study contribute further evidence that the rice market in East Java is influenced more by intertemporal price dynamics rather than immediate supply-demand shocks [7], [15], [22].

3.3. The Effect of SPHP Rice Prices on Premium Rice Prices

The empirical results indicate that the price of SPHP rice, whether at the current period or with a one-month lag, does not exert a statistically significant influence on the premium rice price in East Java. This finding suggests that the government's intervention through the SPHP program, which is primarily designed to stabilize the supply and affordability of medium-quality rice, does not transmit directly to the premium rice market segment. From a theoretical perspective, this outcome aligns with the concept of segmented markets, where different consumer groups exhibit distinct demand preferences and price sensitivities. Premium rice consumers often prioritize attributes such as taste, texture, and brand reputation over price considerations, making them less responsive to fluctuations in government-subsidized rice [15], [23], [24].

This finding also reinforces the view that price stabilization mechanisms targeting staple or medium-quality rice function more effectively within the lower-income consumer segment rather than the broader rice market. Previous research has highlighted that price interventions are more impactful when the targeted commodity is closely substitutable with other products in the same segment. Since SPHP rice and premium rice cater to different market strata, the absence of substitutability weakens the transmission channel, limiting the spillover effect of the SPHP policy on premium rice pricing [15], [19], [20], [23], [24].

Moreover, the insignificance of the relationship may reflect the limited market share of SPHP rice in relation to the overall rice market. Although SPHP plays a crucial role in ensuring affordability for vulnerable households, its proportion relative to total rice consumption remains modest. Thus, even substantial government efforts to stabilize SPHP prices may not generate sufficient market pressure to influence premium rice prices, which are more strongly driven by broader supply-demand dynamics and market expectations [7], [15], [19], [20].

In addition, the findings suggest a need to revisit assumptions regarding the effectiveness of uniform price interventions across different rice categories. While SPHP may successfully cushion volatility in the medium rice market, policymakers should not expect automatic spillover benefits to premium rice. Instead, interventions in the premium segment may require alternative strategies, such as supply chain efficiency improvements, branding regulations, or quality-based incentives, to influence pricing behavior. This distinction emphasizes that a "one-size-fits-all" policy approach may not adequately address the complexities of Indonesia's rice market structure [7], [20], [25], [26].

At the policy level, the persistence of premium rice prices implies that interventions such as the SPHP

program may take time to demonstrate significant effects. Since current price formation is heavily dependent on past prices, policymakers must recognize the lagged nature of such interventions. This underlines the importance of consistent and sustained implementation of stabilization programs to ensure that their effects are not only immediate but also embedded in future market expectations. In this regard, the results highlight the necessity of integrating both short-term market operations and long-term structural policies to improve rice price stability in East Java [7], [15].

3.4. Further Discussion: Policy Implication

The premium rice market in Indonesia exhibits distinctive characteristics, particularly in its strong attachment to past price movements. This persistence is reflected in the presence of serial correlation, indicating that premium rice prices are relatively sticky and resistant to significant downward adjustments, even in the face of government market interventions. Previous price levels also shape price expectations among both consumers and traders, reinforcing the adaptive expectation mechanism and sustaining prices at relatively high levels [15], [19].

Still, the premium rice segment is dominated by a certain well-established brand, controlled by large-scale firms. These firms take the role as distributors and producers in the premium rice market. This concentration grants certain firms substantial market power, enabling them to exert influence over pricing strategies and market outcomes. As a result, price stickiness is further amplified, with premium rice prices becoming less elastic to changes in supply and demand compared to other rice categories [23], [24], [27].

From the demand side, the premium rice market reveals a clear segmentation shaped by consumers purchasing power, brand preferences, and quality perceptions. Consumers of premium rice are generally drawn from the middle- and upper-income groups, who place strong emphasis on quality attributes such as taste, aroma, and brand image. This creates price-inelastic demand; as these consumers are less likely to switch to alternative rice types despite increases in price. Substantially, market segmentation limits the substitutability of premium rice with SPHP or medium-quality rice. Consequently, the government's efforts to distribute SPHP rice have had no significant impact in reducing premium rice prices [10], [11], [23], [24], [27], [28].

Indonesia's rice market shares similarities with those of other Southeast Asian countries such as Thailand and Vietnam; where consumer preferences for quality and branding play a critical role in price formation. However, Indonesia demonstrates unique features, most notably the dominance of a few major brands that produced and distributed by large-scale firms. Premium rice market dominantly shaped by the firms supply chain networks. While in other countries premium rice prices are influenced by export dynamics, international quality standards, and global demand. These differences render the Indonesian premium rice market less sensitive to food price stabilization policies; highlighting the need for tailored interventions [19], [20].

The findings of this study suggest that price control policies for premium rice must consider the unique characteristics of this market. The distribution of SPHP rice has been shown to be ineffective for lowering premium rice prices; due to the segmented nature of the rice market. Relying solely on SPHP distribution as a price stabilization tool for premium rice segment is risk to fail.

The inability of SPHP rice to suppress premium rice prices is evident from the dynamic price movements illustrated in Figure 1. Although this study does not provide detailed data on the quantities of premium and SPHP rice distributed in the market, the available price data strongly suggest that the SPHP program has failed to exert downward pressure on premium rice prices. Moreover, Figure 1 highlights that the two commodities occupy distinct market segments, reinforcing the argument that SPHP rice cannot function as an effective substitute for premium rice.

Market operations aimed at stabilizing premium rice prices should directly involve premium rice itself, rather than depending on SPHP rice. This is crucial because premium rice consumers exhibit distinct preferences and are generally unwilling to substitute with other rice types, even when faced with substantial price differences. Consequently, direct interventions in the premium rice segment are more likely to yield tangible impacts on price stabilization and on sustaining household purchasing power in this market [23], [24], [27].

Furthermore, the government should reassess and adjust the MRP for premium rice to better align with actual market conditions and to function effectively as a price control instrument. Such adjustments should be based on production costs, distribution margins, and fair profit levels for traders and producers. A realistic and well-calibrated MRP can help ensure consumer affordability while minimizing the risk of market distortions that could otherwise reduce incentives for premium rice producers [12], [13], [29].

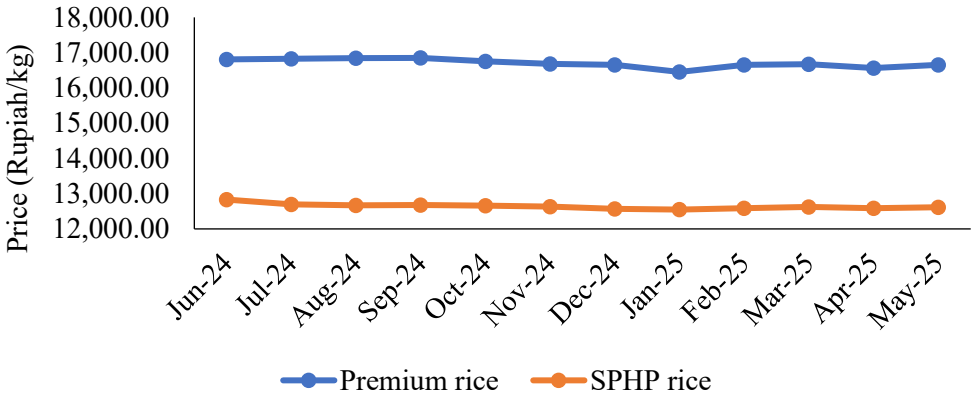

Figure 1. Price dynamics of Indonesia premium rice and SPHP rice.

Finally, the monitoring of premium rice price and distribution must be strengthened. This includes tackling potential price collusion and cartel practices among dominant market players. Stronger regulatory enforcement in distribution channels is essential to ensure that premium rice prices reflect actual market dynamics rather than strategic manipulation. By combining these measures, the government can enhance the effectiveness of its policies in stabilizing premium rice prices while avoiding excessive market distortions [12], [13], [29], [30].

4. CONCLUSION

This study examined the effectiveness of the SPHP rice policy in influencing premium rice prices in East Java Province. The results of the dynamic panel regression show that only the previous period's premium rice price significantly affects current premium rice prices, reflecting the persistence of price stickiness and adaptive expectations. In contrast, SPHP rice prices, both current and lagged, do not significantly influence premium rice prices. These findings confirm that the SPHP program has limited impact on the premium rice segment, primarily due to strong market segmentation and the dominance of consumer preferences for quality and brand.

From a policy standpoint, the evidence suggests that relying solely on SPHP rice distribution as a stabilization tool for premium rice prices is ineffective. More targeted measures, such as conducting market operations with premium rice, recalibrating the HET, and strengthening oversight to prevent price collusion, are needed to address the unique dynamics of the premium rice market. Designing differentiated and evidence-based policies that acknowledge these structural characteristics will be crucial for enhancing the effectiveness of rice price stabilization in Indonesia.

AUTHOR CONTRIBUTION

Aditya Arief Rachmadhan: Writing (original draft, review & editing), conceptualization (theoretically and practically), investigation and data mining, analysis (statistically and theoretically concept). **Prasmita Dian Wijayati**: Writing (original draft and review), conceptualization (theoretically and practically), analysis (theoretically concept).

CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest to declare.

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