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Article

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GENERAL & APPLIED ECONOMICS | RESEARCH ARTICLE

Retail trader pricing behavior in the traditional rice market: A micro view for curbing inflation

Feryanto^{1*}, Harianto¹ and Herawati¹

Abstract: The price of rice at the retail level affects consumer welfare and influences inflation. The research objective was to study rice retail trader pricing behavior in traditional markets. This study employed an econometric model consisting of six equations of price spread between the retail market level and wholesale level of different rice qualities and grades. To overcome endogeneity problems due to the use of several equations that could cause potential bias, the simultaneous method with the 3SLS approach was deemed appropriate to use to obtain consistent and efficient coefficient estimates. The results show that, by examining the behavior of price spreads in the model, it can be deduced that rice retailers in the traditional market applied a price stabilization strategy. A lower price spread responded to an increase in price at the wholesale level. Rice retailers in traditional markets also implemented a price-averaging strategy. The results of this study have important policy implications for reducing food price volatility and its impact on inflation. That is, a price policy aimed at price stabilization at the retail level, as in this study, will be more effective if the price stabilization is focused on the wholesale level. However, if the pricing policy continues to be applied at the retail level, it must consider the relationships between different rice qualities and prices. This study also highlights the need for more intensive research on pricing behavior at the wholesale level.

Subjects: Macroeconomics; Microeconomics; Econometrics; Development Economics

Keywords: COVID-19; inflation; price stabilization; rice; traditional market

JEL classifications: E31; E60; D40

1. Introduction

Rice is an important commodity in Indonesia. It occupies an important position in household expenditure, and its price may influence poverty levels and household welfare (McCulloch, 2008;

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Suryadi et al., 2014). An increase in the price of rice will significantly reduce households' purchasing power. The importance of rice in household budgets is also demonstrated by the effect of rice prices on the demand for other food commodities. When the price of rice increases, the demand for other food commodities decreases. However, the demand for rice tends to increase when the prices of other food commodities increase (Hafizah et al., 2020). There is an asymmetry in the effect of cross prices between rice and other food commodities. This shows that households tend to prioritize the fulfillment of their rice consumption needs over other food commodities.

On the supply side, rice also occupies an important position because most small landholder farmers run rice farming as their main source of income. Fluctuations in rice prices at the farm level have a negative impact on rice farming productivity due to increased price risk. The behavior of rice prices at the retail level certainly affects paddy prices at the farmer level. Prices at the retail level are transmitted to the farm gate price level (Makbul & Ratnaningtyas, 2017; Varela et al., 2012). Research by Mgale et al. (2022) in Tanzania showed that prices in surplus areas are more volatile than prices in scarce areas, which also means that farmers face higher price risks than consumers do. The increasing volatility in food prices at the farm level affects food security, but based on research by Lundberg and Abman (2022), it also negatively influences efforts to preserve forests and the environment.

Rice is often referred to as a wage good because its price is considered to be one of the components in determining regional minimum wages. If the price of rice increases, the pressure on companies to increase their workers' wages also increases. The importance of rice as a commodity for the economy is also reflected in the attention given by Bank Indonesia to the dynamics of rice prices in the market. Periodically, the prices of rice and other important food commodities are monitored and recorded for publication by the PIHPS (*Pusat Informasi Harga Pangan Strategis*, Center for Strategic Food Prices Information) so that the public can access the information at any time. Rice and other staple foods are categorized as volatile foods because the dynamics of their price movements contribute significantly to the inflation rate. Thus, understanding price behavior at the retail level is integral to inflation control. Moreover, the government is paying great attention to the rice economy through various policies implemented at both the farmer and retail market levels.

The study of pricing in the retail market has received considerable attention from economists. Salop and Stiglitz (1977) examined the relationship between retail pricing and search costs by comparing consumers with high search costs and consumers with low search costs. Varian (1980) attempted to build a theory to explain price dispersion in the retail market, both spatially and temporally, based on dynamic competition between retailers. Empirically, Volpe et al. (2021) studied supermarket pricing and promotional behavior. This study is expected to contribute to the literature on the pricing behaviors of food retailers in traditional markets. In developing countries, traditional markets still have an important role for households buying the food they need. Retail rice traders' price-setting behaviors in traditional markets can directly affect household welfare. Various studies on food prices in Indonesia placed more emphasis on price transmission along the marketing chain rather than looking specifically at the pricing behaviors of traders (Makbul & Ratnaningtyas, 2017; Sinaga et al., 2020).

The dynamics of food prices, especially those of rice in developing countries, are strongly influenced by differences in market structure and demand characteristics (Harianto et al., 2022; Makbul & Ratnaningtyas, 2017; Sinaga et al., 2020). In addition, the shock in the economy will affect price behavior, especially one caused by the COVID-19 pandemic that first occurred in the end of 2019. The retail market is an important point to observe because the retail market or traditional market is the final market used by consumers; thus, prices that are received by consumers will affect inflation. Fluctuations or changes in price that are quite large will affect the inflation rate. Therefore, the government's efforts to maintain price stability can be carried out with attention to price behavior at the retail market level (Respatiadi & Nabila, 2018).

The purpose of this study was to analyze the pricing behaviors of rice retailers in a traditional market set. However, the pricing behaviors of retailers were observed neither directly nor based on data at the retail level, but rather by looking at the behaviors of the price spreads between wholesalers and retailers. The behaviors of these price spreads can reflect the behaviors of retail traders in setting their prices because they involve marketing costs and profit margins. If marketing costs tend to be beyond retailers' control, this is not the case with profit margins. Retailers can stabilize the selling prices of their products by increasing or decreasing their profit margins. Price stabilization is needed in the midst of market conditions at the local level, namely, at a certain physical radius, which tends to be oligopolistic. Thus, specifically, this research sought to determine whether the price stabilization strategy implemented at the retail trader level and the average price change have significant effects on the control of food inflation. The results of this study are expected to be useful for formulating policies aimed at stabilizing food prices, which, in essence, are also efforts to suppress the inflation rate in the economy.

2. Literature review

Many studies have been conducted on the rice economy in Indonesia. Research at the farmer level occupies a large proportion, both in technical aspects as well as in social and economic aspects. Rice farming has approached its frontier production level (Heriqbaldi et al., 2015), so an increase in production can be achieved by expanding the rice planting area and increasing productivity through cultivation technology improvement. Various subsidies such as fertilizer subsidies, seed subsidies, and subsidies on credit interest are provided to increase farm productivity (Siagian & Soetjipto, 2020). It has long been realized that the government's self-sufficiency policy tends not to significantly increase production and places a high burden on the government budget, which creates economic inefficiency (Nuryanti et al., 2017; Robinson et al., 1997). The condition of rice production at the farm level, which is already approaching its frontier, makes the price of rice at the retail level vulnerable to shocks that come from the domestic supply side and international rice market fluctuations.

Rice price fluctuations in the domestic market are also influenced by the demand for rice, which tends to have low elasticity. Various studies have shown that the elasticity of the demand for rice is well below one (Hafizah et al., 2020). Low price elasticity causes large fluctuations in rice prices when there is an increase or decrease in rice supply. The government attempted to stabilize the price of rice in the market through interventions by increasing its supply to the market. The Indonesian National Logistics Agency (Bulog) has one of its functions to ensure the stability of rice prices in the market through market operations. The policy of stabilizing rice prices at the farm and retail levels requires high public financing. The cost of stabilization, which is partly borne through the state budget, certainly creates a higher burden in the midst of competition for budget with infrastructure construction, defense equipment purchases, subsidies for low-income groups, climate change mitigation (Baig et al., 2022; Rehman et al., 2022), and overcoming the COVID-19 pandemic (J. Huang, 2020a).

There is relatively little research on pricing behavior at the retail market level in Indonesia, especially in determining the prices of food commodities. The assumptions used for pricing primary food commodities at the retail level are that traders act as price takers and that market prices are fully determined by the forces of market demand and supply. Various studies have shown that retail traders in the market have certain control over their pricing strategies (Marinescu et al., 2010).

Food retailers can be said to be multiproduct firms (Li & Sexton, 2013), and so are rice retailers. In this case, these rice retailers sell more than one type of rice products in terms of quality. From the production viewpoint, each of these quality-based types of rice can be considered to be a separate product because retailers procure rice from rice wholesalers. However, on the demand side, different types of rice quality-wise are related with one another. The price set for rice of a certain quality affects the quantities sold for rice of other qualities. If the effect of changes in the

price of rice of a certain quality on the sales of rice of other qualities is not considered, the pricing will not be optimal. Assume that a retailer sells the same product with different qualities, then the marginal revenue to be gained is given below:

$$\text{the } MR_L = \frac{\partial TR}{\partial Q_L} = \frac{\partial TR_L}{\partial Q_L} + \frac{\partial TR_H}{\partial Q_L} \quad (1)$$

$$\text{the } MR_H = \frac{\partial TR}{\partial Q_H} = \frac{\partial TR_H}{\partial Q_H} + \frac{\partial TR_L}{\partial Q_H} \quad (2)$$

where MR is the marginal revenue, TR is the marginal cost, and L and H are low- and high-quality products, respectively. If the demands for low- and high-quality products substitute for one another, $\partial TR_H / \partial Q_L$ and $\partial TR_L / \partial Q_H$ will be negative. If this substitution effect is ignored in decision-making, then the marginal revenue will be overestimated, and consequently, the pricing for each quality will not be optimal.

Product pricing at the retail level is not entirely dependent on random factors, such as shocks on the supply and demand sides (Pesendorfer, 2002). Using the static, discrete game of incomplete information method, Ellickson and Misra (2006) showed evidence of a cluster of price strategies carried out by supermarkets through price decisions that are in line with their competitors. The players in the modern market generally sell not only one type of food, so they can be considered to be multiproduct companies. The charged prices may be interrelated or separate from each other, depending on the pricing strategy implemented. Hosken and Reiffen (2001) found that price changes for perishable goods are significantly smaller than those for durable goods and that price changes are negatively correlated.

Pricing strategies for various types of products have been studied extensively. These include mark-up pricing, fixed pricing, periodic sales, price discrimination, price bundling, and high-low pricing strategies. The factors that determine the choice of these strategies and their effects on consumer purchasing decision, too, have been investigated (Ali & Anwar, 2021; Kienzler & Kowalkowski, 2017). Research has shown that factors such as inventory, uncertain demand, competition, and perishable characteristics play an important role in pricing (Agi & Soni, 2020). Customer preferences represented by the variables of perishable product quality, distance to retailers, and product prices have been recognized as important factors in modeling consumer behavior, which is important for retailer pricing strategies (Ashrafimoghari & Suchow, 2022). The willingness of consumers to pay for perishable food products decreases as the expiration date gets closer (Chung, 2019). Chang et al. (2016) proposed an agent-based simulation model to develop best-practice dynamic pricing strategies for retailers. This pricing model at the retail level requires relatively detailed and extensive data at the retail level, which are generally not available or accessible to researchers.

A menu cost occurs when a company changes the price of a product or the prices of products it sells. Menu cost is an economic term used to describe the cost incurred by a company when changing the price of a product it sells. The amount of menu costs incurred depends on whether and when prices change and whether the company needs to reprint its menu, update its price list, contact its distribution network, manually re-mark merchandise on shelves, or announce the price changes to customers. Multiproduct companies have economies of scope in terms of menu costs. This means that the costs of changing prices increase monotonically with the number of types of goods, and cost savings increase when more types of goods are changed simultaneously (Bhattari & Schoenle, 2014). Therefore, actors in the retail food market not only take into account the effect of changes in a product's price on the product's revenue but also consider the impact of these price changes on the company's overall revenue. For the company, it is important to maximize its total profit not just from certain types of products. The pricing strategy chosen will affect consumers'

perceptions of the product prices offered by a company compared to its competitors (Danziger et al., 2014).

Rice traders at the retail level in traditional markets do not fully act as price takers but can set prices to compete with other retailers in the same market location in attracting consumers. At the same location in a traditional market, each trader knows who their competitors are. Therefore, in this study, it was hypothesized that rice retailers in traditional markets try to stabilize their selling prices when price shocks occur from the wholesale level. The rice sold by a retailer may differ in quality or variety. To be able to compete with their competitors, it was also hypothesized in this study that rice traders at the retail level also apply a mix pricing strategy in the form of price averaging.

3. Research methods

Indonesia's rice retail market is classified into traditional and modern retail markets. Traditional markets generally have a bargaining process between sellers and buyers, the products sold can be packaged or unpackaged, and either the public or local government manages the markets. Meanwhile, modern retail markets are characterized by the absence of a bargaining process, packaged products, and product prices clearly stated on the packaging or shelves where the products are placed. Modern retail markets consist of supermarkets, minimarkets, or specialty stores specializing in certain products.

In general, there are several rice sellers in a traditional market at a certain location, making it relatively easy for buyers to compare prices between one seller and another in that market. The price difference between traditional markets in the same area, but at different locations, is generally insignificant, so it is not economical for buyers to compare rice prices between retailers trading in different market locations. As a result, oligopolistic competition exists among rice retailers in the same market location. This study used data on rice prices at the retail level in traditional markets. Traditional markets were chosen because they are the preference of households in the lower middle-income category to buy rice. In traditional markets, rice traders can negotiate prices with buyers, and pricing is more flexible than in modern markets.

3.1. Estimation model

Based on the quality, rice products at the retail level can be divided into six categories: low-quality, grade I rice; low-quality, grade II rice; medium-quality, grade I rice; medium-quality, grade II rice; super-quality, grade I rice; and super-quality, grade II rice. The quality of rice is determined by the rice characteristics, such as the percentage of broken grains, chalkiness, dirt, and long or short grain type of rice (H. Harianto et al., 2019).

Observations of prices were carried out during the COVID-19 pandemic that was still on going in Indonesia. The nature of the SARS-Cov-2 virus, which easily spreads through various means of human contact (C. Huang et al., 2020b; Chan et al., 2020; Liu et al., 2020), has led to government policies to limit people's economic activities. Across multiple countries, the COVID-19 pandemic has significantly disrupted supply chains of agricultural products (J. Huang, 2020a; Pan et al., 2020; Urumugam et al., 2020). Therefore, in this study, a dummy variable was included to capture the effect of the COVID-19 pandemic on retail traders' price strategies.

The research model adopted is one by Griffith et al. (1992) as presented in the following equations:

$$PS_{L1t} = \alpha_0 + \alpha_1 PW_{L1t} + \alpha_2 LPW_{L1t} + \alpha_3 PS_{L2t} + \alpha_4 PS_{M1t} + \alpha_5 PS_{M2t} + \alpha_6 PS_{S1t} + \alpha_7 PS_{S2t} + \alpha_8 LPS_{L1t} + \alpha_9 COVID + \varepsilon_{L1t} \quad (3)$$

$$PS_{L2t} = \beta_0 + \beta_1 PW_{L2t} + \beta_2 LPW_{L2t} + \beta_3 PS_{L1t} + \beta_4 PS_{M1t} + \beta_5 PS_{M2t} + \beta_6 PS_{S1t} + \beta_7 PS_{S2t} + \beta_8 LPS_{L2t} + \beta_9 COVID + \varepsilon_{L2t} \quad (4)$$

$$PS_{M1t} = \gamma_0 + \gamma_1 PW_{M1t} + \gamma_2 LPW_{M1t} + \gamma_3 PS_{L1t} + \gamma_4 PS_{L2t} + \gamma_5 PS_{M2t} + \gamma_6 PS_{S1t} + \gamma_7 PS_{S2t} + \gamma_8 LPS_{M1t} + \gamma_9 COVID + \varepsilon_{M1t} \quad (5)$$

$$PS_{M2t} = \delta_0 + \delta_1 PW_{M2t} + \delta_2 LPW_{M2t} + \delta_3 PS_{L1t} + \delta_4 PS_{L2t} + \delta_5 PS_{M1t} + \delta_6 PS_{S1t} + \delta_7 PS_{S2t} + \delta_8 LPS_{M2t} + \delta_9 COVID + \varepsilon_{M2t} \quad (6)$$

$$PS_{S1t} = \tau_0 + \tau_1 PW_{S1t} + \tau_2 LPW_{S1t} + \tau_3 PS_{L1t} + \tau_4 PS_{L2t} + \tau_5 PS_{M1t} + \tau_6 PS_{M2t} + \tau_7 PS_{S2t} + \tau_8 LPS_{S1t} + \tau_9 COVID + \varepsilon_{S1t} \quad (7)$$

$$PS_{S2t} = \rho_0 + \rho_1 PW_{S2t} + \rho_2 LPW_{S2t} + \rho_3 PS_{L1t} + \rho_4 PS_{L2t} + \rho_5 PS_{M1t} + \rho_6 PS_{M2t} + \rho_7 PS_{S1t} + \rho_8 LPS_{S2t} + \rho_9 COVID + \varepsilon_{S2t} \quad (8)$$

where PS is a price spread (retail price—wholesale price), PW is a wholesale price, LPW is a wholesale price lagged by one period, LPS is a price spread lagged by one period, subscripts $L1$, $L2$, $M1$, $M2$, $S1$, and $S2$ stand for low-quality, grade I rice ($L1$), low-quality, grade II rice ($L2$), medium-quality, grade I rice ($M1$), medium-quality, grade II rice ($M2$), super-quality, grade I rice ($S1$), and super-quality, grade II rice ($S2$), respectively, $COVID$ is a dummy variable ($COVID = 0$, before the implementation of the government policy to limit people's activities and movement; $COVID = 1$, otherwise), and subscript t is a time series ($t = 1, 2, 3, \dots, n$).

If retailers apply a price stabilization strategy for the six qualities of rice, then the hypothesis tested in this study is that each product price at the wholesale level has a significant and negative effect on marketing margins or price spreads, or that the regression coefficients α_1 , β_1 , γ_1 , δ_1 , τ_1 , and ρ_1 are less than 0 (negative), while the effect of the price lag at the wholesale level is positive, with the coefficients α_2 , β_2 , γ_2 , δ_2 , τ_2 , and ρ_2 being positive. If the wholesale price trend increases, the price spread expands to balance the effects of the previous period. In the long run, prices at the retail level follow the same trend as the wholesale price trend. The hypothesis for the practice of price averaging is that the effect of price spreads on other products are negative; that is, the coefficients of the explanatory variables PS_{L1} , PS_{L2} , PS_{M1} , PS_{M2} , PS_{S1} , and PS_{S2} are negative. If the price spread for rice of a certain quality and grade (independent variable) increases, then the price spreads for the other rice qualities and grades (dependent variable) will decrease, resulting in an even distribution of prices for all qualities and grades of products. The lag price spread variable for one period was included in the model based on the assumption of partial adjustment. In this study, daily data were used so that changes in price spread due to changes in the independent variables did not occur immediately. In other words, there was still an influence from the previous price spread value on the current price spread. Thus, the regression coefficients α_8 , β_8 , γ_8 , δ_8 , τ_8 , and ρ_8 were expected to be positive. The $COVID$ dummy variable could not be identified *a priori* because during the $COVID-19$ pandemic, not only did marketing costs change, but retailers might also change their business profit margins so that the final marketing margins could be positive or negative.

3.2. Data and methods of analysis

We used daily price data for the six rice qualities to test the proposed hypotheses. Data were collected from March 2019 to April 2021. All product prices at the wholesaler and retailer levels were converted into the same weight (IDR per kilogram). The data were collected from the PIHPS of Bank Indonesia, in which case the daily data on the six qualities of rice are part of the price

monitoring by Bank Indonesia for foodstuffs that are considered strategic, especially in their influence on the inflation rate. The data are routinely published on the PIHPS website.

This research model consists of six estimation equations, each with an independent variable that is also a dependent variable in other equations. The presence of endogeneity in these equations makes the OLS method unsuitable for the analysis. Using the OLS method despite endogeneity issues can lead to potential bias and inaccurate conclusions. Hence, simultaneous methods such as 2SLS or 3SLS are more appropriate for obtaining consistent and efficient coefficient estimates (Abdallah et al., 2015; Hausman et al., 1987). Additionally, this study assumes that retailers are multiproduct companies where price decisions and spreads are jointly determined. Thus, three of the equations are considered to be simultaneous equations. Since there is a high probability of contemporaneous correlation between the error terms of the equations in simultaneous equations, the 3SLS method is preferable to 2SLS as it can account for the cross-equation error structures that occur (Judge et al., 1985).

4. Results and discussion

The dynamics of food prices in the market are affected by differences in the market structure and demand characteristics. The demand for a product at the retail market level is direct, and the market demand below can be derived. Table 1 presents the rice price pattern, average price, price spread, and coefficient variation for each rice quality at the wholesale and retail levels, particularly before and during the COVID-19 pandemic. In general, rice prices in the observed markets for all qualities increased during the COVID-19 pandemic. However, prices tended to fluctuate more before the pandemic than during it. This is indicated by the coefficient of variation of price, which was smaller during the COVID-19 pandemic than before the pandemic. This shows that the pandemic seemed to have lowered the price risk faced by traders. This might be due to the changing behavior of traders during the pandemic, which focused more on maintaining supply after unintended disruption at the beginning of the pandemic. In addition, during the pandemic, the Indonesian government was more concerned with ensuring supply stability in the market through various strategies, such as optimizing the distribution of rice along the chain.

In this study, the retail rice market was assumed to be imperfect. At a certain level, each retailer can determine prices and not act as a price taker because retailers can also provide price discounts or implement other marketing strategies that can lure customers to their stores loyally. In setting their prices, retailers try to give the impression of stable prices because they think consumers prefer stable prices. To change a product price, retailers need to pay attention to demand conditions (Cant et al., 2016) and consider the costs that arise from the price change. Meanwhile, to disguise some price variability by keeping the selling price of the product relatively unchanged in the event of price fluctuations at the wholesale level, retailers make adjustments in marketing margins.

Table 2 presents the regression results for the model proposed in this study. The research model has adequate goodness of fit. The R-squared values of all the equations are above 50 percent. The model can explain price spread variations between the retail and wholesale market levels. Based on the value of chi-square statistics, it can be said that the independent variables employed in the model influenced the price spread between the retail and the wholesaler market levels for all types of rice quality and grade.

The results of the estimation of the research model also indicate that rice retailers in traditional markets practiced price stabilization, which confirms the research hypothesis. For all rice qualities presented in the model, the coefficients of the wholesale price variable are positive and statistically significant. When the wholesale price increased, the price spread between the retail and wholesale markets decreased. If it is considered that marketing costs between the two markets did not change, then what happened was that traders at the retail level did not transmit all of

Table 1. The mean and coefficient variation values of rice prices and price spread for each rice quality at retail and wholesale levels

Products, Prices, and Price Spreads	Before COVID-19 Pandemic		During COVID-19 Pandemic	
	Mean (IDR)	CV* (%)	Mean (IDR)	CV* (%)
Low-quality, grade I rice (L1)				
(1) Wholesale price	9 830	1.23	9 887	0.87
(2) Retail price	10 723	1.39	10 800	0.50
(3) Price spread	934	17.17	913	8.16
Low-quality, grade II rice (L2)				
(1) Wholesale price	9 653	1.09	9 755	0.55
(2) Retail price	10 342	0.94	10 436	0.42
(3) Price spread	689	10.77	681	8.71
Medium-quality, grade I rice (M1)				
(1) Wholesale price	10 817	0.88	10 837	1.26
(2) Retail price	11 836	1.03	11 859	0.48
(3) Price spread	1 019	11.88	1 022	9.12
Medium-quality, grade II rice (M2)				
(1) Wholesale price	10 591	0.80	10 617	0.79
(2) Retail price	11 641	7.98	11 648	0.43
(3) Price spread	1 049	11.94	1 022	9.12
Super-quality, grade I rice (S3)				
(1) Wholesale price	11 996	0.61	12 039	0.56
(2) Retail price	13 079	0.76	13 118	0.30
(3) Price spread	1 083	9.10	1 079	4.09
Super-quality, grade II rice (S3)				
(1) Wholesale price	11 707	0.48	11 750	0.53
(2) Retail price	12 642	0.66	12 712	0.53
(3) Price spread	935	8.75	963	8.38

Note: *Coefficient Variation (CV) = (Standard Deviation/Mean) x 100

these increases to their selling prices. In other words, retailers reduced their profit margins when the price at the wholesale level increased.

On the other hand, retailers would increase the profit margin when the price at the wholesale level decreased and the price spread increased. However, in the long run, retailers adjusted the

Table 2. The estimation results of the research model

Variable	PS_{L1}	PS_{L2}	PS_{M1}	PS_{M2}	PS_{S1}	PS_{S2}
PW_{L1}	-0.632***					
PW_{L2}		-0.851***				
PW_{M1}			-0.731***			
PW_{M2}				-0.953***		
PW_{S1}					-0.933***	
PW_{S2}						-0.494***
LPW_{L1}	0.316***					-
LPW_{L2}		0.643***				
LPW_{M1}			0.318***			
LPW_{M2}				0.845***		
LPW_{S1}					0.514***	
LPW_{S2}						0.229*
PS_{L1}		0.091***	0.094**	0.352***	-0.011	0.295***
PS_{L2}	0.047		-0.097***	-0.113**	-0.042	-0.010
PS_{M1}	-0.263***	-0.049		0.198***	-0.168***	-0.168***
PS_{M2}	0.739***	0.079*	0.550***		0.340***	0.134**
PS_{S1}	-0.098	0.090**	0.080	0.127**		0.272***
PS_{S2}	0.610***	0.1462**	-0.172**	-0.020	0.253***	
LPS_{L2}	0.112***					
LPS_{L2}		0.426***				
LPS_{M2}			0.165***			
LPS_{M2}				0.102**		
LPS_{S1}					0.195***	
LPS_{S2}						0.170***
COVID	32.756***	13.037***	22.937***	-18.713***	15.109***	32.055***
Constanta	2.896***	2.055***	4.794***	1.526***	5.517***	3.349***
"R-square"	0.730	0.689	0.795	0.754	0.533	0.600
Chi-square	1.102***	1.092***	1.965***	844***	614***	526***

Note: ***Sig < 0.01; **Sig < 0.05; *Sig < 0.10

selling price to price movements at the wholesale level. The coefficient indicates this on the price lag variable at the wholesale level, which is positive and significant.

This price behavior in the retail market has important implications for efforts to stabilize rice prices and, at the same time, for efforts to suppress the inflation rate by preventing food price increases. The government's price policy to stabilize rice prices is generally applied at the retail level (Respatiadi & Nabila, 2018). If there is a price increase, it is more appropriate if the price stabilization policy is aimed at the wholesale level and not directly at the retail level. Based on the results of this study, stable prices have become a part of pricing strategy. On the other hand, wholesalers can move the changes within the downstream and upstream markets. There are also far fewer players within the discount showcase than within the retail showcase, so the toll taken in executing a stabilization cost approach is additionally lower. One way to stabilize the advertising cost at the discount level is through the purport approach (Mgale et al., 2022). When the flow of rice from the producer level is inadequate and price hikes at the wholesale level are to be avoided, rice imports are needed so that prices do not spike at the consumer level.

Retailers can also give the impression of stable product prices by averaging the selling prices of the rice that they sell across various qualities and grades. Price averaging can be performed by keeping the price spread of rice of a certain quality constant while increasing the price spreads of other rice qualities. Price averaging is conducted for groups of food products that are related to one another, both in substitution and complementarity terms. Based on the estimation results of the research model presented in Table 2, the price spread coefficients of the other rice quality variables tend to be positive if two types of rice share the same quality but differ in grade. On the other hand, if two types of rice are of different qualities and relatively close in category, e.g., low-quality rice and medium-quality rice or medium-quality rice and super-quality rice, the coefficients of the price spread variables tend to be negative. This reinforces the notion that rice retailers in the traditional market implemented a price-averaging strategy for rice of different qualities. However, in the long term, the price spread would adjust to the prevailing trend. This condition is indicated by the lag variable coefficient of the price spread, which is positive and significant.

The price-averaging behavior of rice retailers in the traditional market also has important policy implications for overcoming the effect of rising rice prices on inflation. Households in Indonesia, especially those in lower- and middle-income brackets, generally consume medium- and low-quality rice. If the government imposes a price policy on only one of the qualities of rice, traders at the retail level could, to some extent, minimize the negative impact of the price policy through changes to the price spread. Therefore, the price policy aimed at stabilizing the price of rice of a certain quality also needs to pay attention to its effect on the prices of rice of other qualities. Moreover, rice traders in the traditional market also can mix rice of two different qualities, e.g., low-quality rice and medium-quality rice, and charge the price of medium-quality rice for the mixed rice. The absence of rice quality indicators that are clear, measurable, and easily understood by consumers puts consumers in a weak position in the price search process.

The COVID-19 pandemic has affected the supply chain of agricultural products (J. Huang, 2020a). It affects the availability of labor and the movement of goods due to restrictions on activities and interactions between humans. The impact of the COVID-19 pandemic on the rice market is shown in Table 2, where the coefficients of the COVID variable generally have positive signs and are statistically significant. The results of this study strengthen the notion that the COVID-19 pandemic has increased the marketing costs of agricultural products. Government policies aimed at facilitating the flow of agricultural products between producer and consumer areas can have a positive impact on efforts to ensure stable food prices during the COVID-19 pandemic.

5. Conclusion and recommendations

Rice retailers in traditional markets are proven to have a role in controlling rice prices. They apply a price stabilization strategy for the rice of all qualities they sell. The price spread between the retail and wholesale market levels changes negatively with price increases at the wholesale level. However, in the long run, retail prices adjust as wholesale prices change. Rice retailers in traditional markets also use average prices. The price spread of rice of a certain quality gives a negative response to changes in the spread of prices for other qualities. The findings from this study indicate that differences in the quality of rice in the market will affect the price of rice of different qualities. The shocks that hit the economy, especially one caused by the COVID-19 pandemic, have implications for increasing the price difference between the retail and wholesale markets.

The study results have important policy implications for reducing food price volatility and its effects on inflation. The price policy aimed at stabilizing prices at the retail level, as currently in effect, will be more effective if the stabilization is focused on prices at the wholesale level. However, if the price policy is still carried out at the retail level, the policy should pay attention to the linkages between the prices of rice of different qualities. The price policy, which currently only applies to medium-quality rice, should also be applied to premium-quality rice. In addition, policies to realize and maintain the stability of food prices, especially government rice, can be

complemented by stock management based on government rice reserves and traders so that the high price differences at different market levels can be suppressed and controlled.

The limitation of this study is that it does not include the reaction of wholesalers to the pricing behavior of retailers, and vice versa. Rice wholesalers generally have a greater bargaining position, not only in dealing with retailers, but also with rice producers. Future studies need to examine more deeply the pricing behavior at the wholesale level and how it affects prices at the level of paddy farmers and rice retailers.

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