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The Impact of Market Power on Soybean Price in Indonesia

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Abstract- The purpose of this study is to analyze the impact of the market power on soybeans price. This study uses data from time series (1989-2008) were analyzed by the model approach of oligopoly Appelbaum - Schroeter. The study found that market power have a significant impact on the increase in prices in the market of soybeans, the market power have a considerable impact on the increase in prices to the wholesale entry soybeans industry, but relatively little impact on the rise in prices of soybeans products processed as industrial production. Therefore, the policies of prices established by the Government has to take into account the forces of the market, pricing policies will be less effective in elasticity conjectural is relatively high, demand is highly inelastic, and the market is the proper functioning of the policy.

Keywords: Marketing, soybean, market power, industry, conjectural elasticity

INTRODUCTION

Soybean is one of important food commodity in Indonesia. The growth of soybeans demand has been very significant for recent years especially for consumption and raw material for industry. The needs of soybeans nowadays is reaching 2,3 ton per year, while the soybeans production only reach 35-40% from the whole the soybeans needed, so the rest is fulfilled by importing the soybeans from another country. It is difficult to increase the production of local soybeans because of less favorable situation of marketing for the local farmer.

The soybeans marketing is controlled by province, city, and district retailer and also the industrial sector which is used soybeans as the raw material. Those four market participants affect the distribution mechanism of local and imported soybeans trade (Purwoko dan Sayaka, 1992; Zulham dan Yumm, 1996; Kasryno dkk.,2005). The domination of soybeans marketing by several market sellers indicates oligopoly on the soybeans trading. Oligopoly will determine the price if the marginal cost is equal to the revenue. The main effect of oligopoly is reducing output, increasing price, and creating more profit. The power of oligopoly will appear stronger in the inelastic demand (Sheperd.W.G 1990 ; Scherer F.M et. al., 1990; Tirole, 1994; Chalil, *et al.*, 2006). It is possible to analyze the price from its conjectural aspect in order to find the power of oligopoly in determining the price (Wann and Sexton, 1992; Jeevika Weerahewa, 2003).

The structure of Soybean industrial market structure is also categorized into oligopsony with the concentration ratio of our firm (CR4) = 44.03 percent. It shows that some of the soybean industries controlled soybeans marketing.

Through the oligopsony the effort of industry to make a profit is getting a cheap input as a result the soybean prices
at farmer level tends constantly pressured to obtain cheap soybean prices. The existence of market power in influencing the price of soybean industry can be known from the elasticity of its conjectural.

The objective of government policies towards soybeans trade such as decision for basic price of soybeans, import tariffs, import volume settings and import soybean price for domestic consumer, is to maintain stability in domestic soybean prices at a certain level to provide incentives to farmers in order to increase its production and to provide more incentives to soybean industry. Policies set by the government has not taken into account the influence of market power in determining the price of soybeans, in fact soybean production is continually decreased and it is imported continually to fulfill soybeans domestic demand, soybean self-sufficiency program which is proclaimed by the government will be difficult to achieve. The problem of this study is how much market power of soybeans affects soybeans price in inputs and outputs market. Then, objective of this study is to analyze the effect of market power on soybeans price in the input and output market.

MATERIALS AND METHODS

A. Formula

Soybean Pricing

Soybean marketing is dominated by soybeans industry and wholesalers. Determination of price by market participants to gain the maximum benefit is decided by the function of input costs and output. To determine the behavior of soybean industry in determining the prices the writer uses the model introduced by Appelbaum (1982) and Schroeter (1998.) The Appelbaum-Schroeter model shows that all companies operate at equilibrium level, the same marginal cost of raw material level and conjectural elasticity and the company set the same price level for the input and output. This condition is expressed as (1)

$$P(1+\frac{\theta}{\eta}) = \frac{P_{gk}}{\tau}(1+\frac{\theta}{e}) + MC' \qquad (1)$$

P is output price output, θ is conjectural elasticity, η is output demand price elasticity, PGK is input prices, τ is the conversion of input into output, e is the price elasticity of input supply and MC ' is marginal cost. Condition of equation (1) can not be guaranteed to achieve equilibrium level, however it needs the other condition namely the equilibrium conditions in input and output markets.

The equilibrium condition in input market requires the total supply of inputs equal to the total demand. The demand for input company materials can be determined within the model, so the total demand is the summarizing of all input demand. This is shown in equation (2).

$$X_r = \sum_j X_i^j = \sum_j \frac{Y^j}{\tau} \qquad (2)$$

If input supply function can be expressed as (2), so the equation (3) shows the condition of equilibrium in this market.

$$X_r = g(P_{gk}) \qquad (3)$$

$$\sum_j \frac{Y^j}{\tau} = g\left(P_{gk_r}\right) \qquad (4)$$

In the output market, the balance between demand and supply must be fulfilled. The company output supply specified in the output model (y = ZQ). If it is defined to function of consumer demand for i output formed as (5), then the equilibrium condition in the input market is shown in (6)

$$Y = f(P) \qquad (5)$$

$$\sum_j Y^j = f(P) \qquad (6)$$

System of equations (1), (5) and (7) provide sufficient and necessary conditions for equilibrium in imperfectly competitive markets. Since there are three unknown variables (i.e. P, PGK and output levels defined by ∂ c (PGK, Yi / ∂ Y) and three equations, there is also a unique solution.

As mentioned in the previous explanation, price and number of input and output in imperfectly competitive markets can simultaneously be determined by equation (1), (4) and (6). Appelbaum-Schroeter condition is when input supply and demand for the output is associated to supply and demand elasticity. In this case, the function of demand and supply can be determined simultaneously because the company's in profit maximization condition or Schroeter Appelbaum condition.

In a perfectly competitive market, companies conjectural elasticity (θj) is zero. The condition in equation (1) is reduced into (7) where the company has no market power to influence prices.

$$P = \frac{P_{gk}}{\tau} + MC' \qquad (7)$$

Next, equation (7), (4) and (7) are not linked to one another, when the company has no market power to control market prices, the condition (7) is no longer needed in a competitive market / perfect competition. The prices here are determined purely from the strength of demand and supply. Only the analysis of the functions on demand and supply are practically necessary for the determination of prices in this market type.

B. Statistical Analyses

Research Data

The research is conducted in East Java, since East Java is the main areas of soybean production in Indonesia. The writer used the statistical time series data (1989-2008) obtained from the Central Bureau of Statistics, Ministry of Agriculture and related agencies. The data is estimated using OLS (Ordinary Least Square). Before the data is estimated, every variable is tested its stationary condition by using the ADF test (Augmented Dickey-Fuller Test).

Model Analyses

Analysis of soybean pricing starts from the assumption made when supply is equal to demand, so it is necessary to do the estimation of soybean supply, processed soybean product demand and soybeans demand for animal feed. The soybeans supply is stated in (8)

$$Qs = f(P_{gk}, Q_{simp}, P_n, F, T, e) \qquad (8)$$

where: Q_s is soybean supply level / grade used in the

soybean industry, P_{gk} is wholesale price of soybean in East Java, Q_{simp} is number of imported soybeans, P_n is the retail price of urea fertilizer, F is total annual rainfall., T is time trend, is e error term.

The price elasticity of soybeans supply is obtained by multiplying the formation (8) related to the price of soybean (P_{gk}) with the price itself. The Equation (8) shows the price elasticity of soybean supply

.

$$er = \alpha 1 \quad (9)$$

A functional form of supply well-known as constant price elasticity is categorized into Cobb-Douglas type. This study adopts the functional form related to soybean supply. Equation (10) explicitly shows the market supply of soybean seeds.

$$Qs = a_r P_{gk}^{\alpha 1} Q_{1mp}^{\alpha 2} P_n^{\alpha 3} F^{\alpha 4} T^{\alpha 5} e^6 \qquad (10)$$

Where. a_r is constant, is $\alpha\iota$ = parameter related to the determinants of supply

Equation (11) declares function of total market demand for processed soybean
products.

$$(Q_{ds} + Q_{\dim p} - \Delta S) = f(P_t, P_{po}, I, e) \quad (11)$$

where, Q_{ds} is number of refined product supply of soybeans by the company, Q_{dsimp} is volume of processed oy,products that are imported, ΔS is change in stock of processed soybean, $\boldsymbol{P_t}$ is price of processed products from soybean., P_{po} is price of processed products from other materials, I is income per capita consumer, e is mistake

By following the same function as soybean seed supply, the demand function for processed products from soybeans is shown in (12)

$$(Q_{ds} + Q_{dsimp} \_ + \Delta S) = a_t P_t^{\beta^1}, P_{po}^{\beta^2}, I^{\beta^3}, e^{\beta^0} \quad (12)$$

Where, a_t is constant, β_i is parameter associated to the determinant/determinants of demand Livestock sector requires a food from soybeans for food production. Besides the price of food, other factors also may influence the demand for feed from soybeans. The other raw input to the production of animal food includes material from the fish and corn. Equation (13) declare function of market demand for food from soybeans.

$$(Q_{dp} + Q_{dpimp}) = f(P_{pk}, P_{jg}, P_{ik}, T, e_m) \quad (13)$$

Where $Q_{dp}$is total animal food demand from soybeans faced by the company's processed products from soybean, Q_{dpimp} is the amount of animal food from imported soybean, P_{pk} is wholesale price of soybean animal food, P_{jg} is wholesale price of corn, P_{ik} is fish price, T is time trend, e_m is error amount

This demand function can be written in logarithmic presented in (14).

$$(Q_{dp} + Q_{dpimp}) = a_s . P_{pk}^{Y_1} . P_{jg}^{Y_2} . P_{ik}^{Y_3} . T^{Y_4} .. \varepsilon^{e_m} \qquad (14)$$

Where, a_s is constant scale, y_l is parameter related to the determinant / determinants of demand

The theoretical model distinguishes the input material costs among other inputs. Appelbaum (1984), Schröter (1988) as well as Wann and Sexton (1992) suggest that Leontief financing function is generalized and assumed as an output linear function. It displays a constant marginal costs on non-industrial material cost. The functional form of non-material costs is expressed as a (15)

$$TC = \omega_0 + \omega_1 . Q_d' \qquad (15)$$

Where TC, is the total cost of refined products from soybean processing, ω_0 is the total fixed costs, ω_1 is the marginal cost of non-material inputs, Q_d is the total output of refined products from soybean processing.

From equation (15), ω1 is the non-material input marginal cost which is not coming from the soybean, it is the result of equation differentiation (15) to the output (i_e, Q_d) or the MC.

As mentioned in earlier section, there are two requirement conditions to achieve the market equilibrium. This balance is Schroeter Appelbaum and general market equilibrium conditions

After getting elasticity of commodity markets supply and demand and also marginal cost of non-material inputs, Schroeter Appelbaum condition can be determined as (16)

$$\frac{P_t . \tau_1}{\tau_t}(1 + \frac{\theta_s}{\beta_1}) + P_s(1 + \frac{\theta_s}{y_1}) = \frac{P_{gk}}{\tau_s}(1 + \frac{\theta_{s1}}{\alpha_1}).(1 - \frac{Q_{simp}}{Qs} \quad (16)$$

Where τ_t conversion ratio of processed soybean products, τ_s is conversion ratio of animal food from soybean.

To fulfill those conditions, the conjectural elasticity can be identified. Appelbaum (1984), Schröter (1988), as well as Wann and Sexton (1992) showed that the elasticity conjectural determined by exogenous variables, elasticity conjectural defined as (17).

$$\theta_s = \theta_0 + \theta_1 + PPI\,\theta_2 . r \qquad (17)$$

Where θs = (∂ Qd / ∂ Qdj), (Qdj / Qd), the elasticity of the company conjectural, θ1 is parameter related to the determinants of conjectural elasticity, PPI is producer price index for industrial inputs, r is rate of interest.

Additional import of tax policy has effectively been taken by the government, so the animal food producer can import the soybean as much as they need. Therefore, the market demand is perfectly elastic. The industry does

not have the power to determine market price of animal food from soybean material. Industry must accept the market price plus an additional tax. So, it is important to add D variable to this condition. D value is zero when the additional tax is effective and the value is one in another year.

By substituting (17) into (16), it is obtained a complete condition of Schroeter Appelbaum in (18).

$$\frac{P_t.\tau_1}{\tau_t}(1+\frac{\theta_0+\theta_1.PPI+\theta_2.r}{\beta_s})+P_s(1+D.\frac{\theta_0+\theta_1.PPI+\theta_2.r}{y_s}) = \frac{P_{gk}}{\tau_s}(1+\frac{\theta_0+\theta_1.PPI+\theta_2.r}{\alpha_1}).(1-\frac{Q_{simp}}{Q_s}))+MC' \quad (18)$$

Conducting simulating changes of conjectural elasticity, supply elasticity, demand elasticity, soybean imports, import tariffs and local soybean production into the model 18 is to determine the effect of an oligopoly market power on prices of soybean in Indonesia.

RESULTS AND DISCUSSIONS

The Impact of Market Power

To determine the effect of market power on prices of soybean, it is important to carry out a simulation of market power those are changing of conjectural elasticity, and other variables that greatly affect the market power in influencing price such as soybean supply price elasticity, price elasticity of demand for refined products from soybean, elasticity of demand price of animal food products made of soy, changing in soybean import, import tariffs, and local soybean production.

The Changes of Conjectural Elasticity

The effect of market power which affects the market price of soybean can be known from the conjectural elasticity, if the conjectural elasticity of industry does not equal to zero it means that the industry has the power to influence market prices in both sector, the input and output markets. The conjectural elasticity of processed soybean products industry is not equal to zero, but it is relatively small = 0.0209, it means soybean industry has a relatively small market power against the market price of soybeans in the input and output market.

Market power in soybean market can cause the price of soybeans at the farmer level tends to be cheaper, because the industry efforts to obtain the maximum profit pushes soybean prices in input markets, but instead of soybean prices in the wholesale level tends to rise. Table 1 and Figure 1 shows that without consideration of market power or zero conjectural elasticity of soybean wholesale prices in input markets is down to 29.92 percent and it does not affect the price of refined products on the output market. When market power is considered, conjectural elasticity does not equal to zero, soybean prices in the wholesale input market rises 57.79 percent, it shows that soybean market is dominated by several large industries and wholesalers, and in output markets, the price of processed soybean products rise 1, 82 percent and price of animal food products from soybeans rise only 0.02 percent, it indicates the intense competition among the soybean industries.

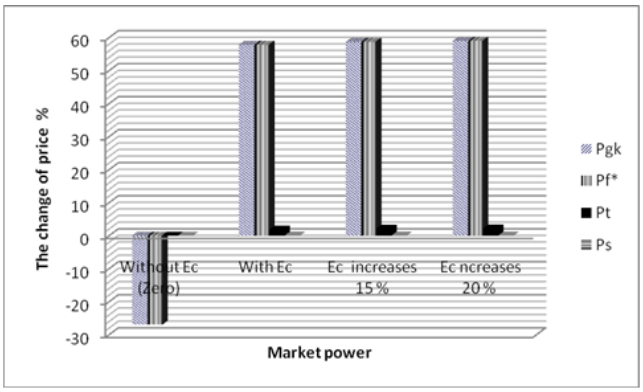

Fig.1 The Impact of Market Power on Soyben Price

Table1
Simulation Results of The Effect of Conjectural Elasticity Changes to The Soybean Price

Variable	The change of Price (%)			
	P_{gk}	P_{f*}	P_t	P_s
E_c 0 (Zero)	-26.92	-26.92	0.00	0.00
With E_c	57.79	57.79	1.82	0.02
E_c increases 15 %	58.68	58.58	2.09	0.03
E_c increases 20 %	58.98	58.98	2.18	0.04

Source: Result of Simulation Analysis

Note :)* It is assumed that marketing margin in wholesaler level is 26,14%

Ec is conjectural elasticity, P_{gk} is soybean price in wholesaler level, P_f * is soybean price in farmer level, P_t is processed soybean price, P_s is animal food price made of soybean

The increasing of conjectural elasticity up to 15-20 percent gives an effect to soybean price in the wholesale output market is rose from 58.68 to 58.98 percent, while price of processed soybean products in the output market is rose from 2.09 to 2.18 percent and the price of animal food products from soybean is 0.03 percent. The Soybean prices at the farmer level should rise from USD 3741.01 / kg to $ 3762.97 / kg and USD 3770.01 / kg, however the influence of market power prices at farmer level makes the price tends to be stagnant. Therefore, pricing policies set by the government needs to take into account in market power,

because it will not be effective if market power condition gets high conjectural elasticity.

The Changes of Soybean Supply Price Elasticity

The Changes of Soybean Price Supply Elasticity has a significant effect on the wholesale price of soybeans, and relatively insignificant to the rising prices for industrial output. In Table 2, it shows the decreasing of soybean price up to 15-20 percent and it has an effect to soybean prices in wholesale level which is increased from 58.84 to 59.28 percent however it does not five any effect to the rising prices of processed soybean products and animal food made of soybean. At low price elasticity it will increase the market power to the raise of the soybeans price in wholesale level. Because the reduction percentage of input used by industry is smaller than the increasing in wholesale price of soybeans, the smaller price elasticity on supply, the greater ability of market participants to raise the price of soybean.

Table 2
The Effect of Market Power Changes Influenced by Supply Elasticity (q_s), Processed Soybean Product Demand (q_{d1}), Animal Food Made of Soybean (q_{d2}) and Local Soybean Production (q_l) to Soybean Price in Input and Output Market

Canging Effect	The change of Price (%)			
	P_{gk}	P_{f*}	P_t	P_s
Qs -15 %	58.84	58.84	1.82	0.02
Qs -20 %	59.28	59.28	1.82	0.02
Qd_1-15 %	57.79	57.79	2.14	0.02
Qd_1-20 %	57.79	57.79	2.27	0.02
Qd_2 -15 %	57.79	57.79	1.82	0.03
Qd_2 -20 %	57.79	57.79	1.82	0.04
Q_L-15 %	44.67	44.67	1.82	0.02
Q_L -20 %	39.94	39.94	1.82	0.02

Source: result of simulation analysis

The changes of Processed Soybean Demand Price Elasticity

The Changes in demand price elasticity for processed soybean products gives a relatively small effect on the strength of industry to increase output price and it does not have any effect on increasing soybean price wholesale. Table 2 shows that price elasticity decline up to 15-20 percent, the industrial sector is only able to increase the price of it output from 2.14 to 2.27 percent. It shows that there is tight competition among industrial processed soybean products and they also consider that is a primary needs, so they tend to obey the ability of society to buy and the continuity of production. The simulation result shows there is a tendency that the smaller demand price elasticity, the greater industry's ability to raise the price of processed soybean products.

The Changes of Demand Elasticity Price Supply of Animal Food from Soybean

The changes of demand elasticity price supply of animal food from soybean gives relatively small effect to its price as an output and it does not give any effect to the price of soybean in wholesale level for the input. At a low price elasticity of demand, it will increase the industry power to raise the price of animal food from soybean more expensive however because of the intense competition in that industry, It makes the price tends to be low. Table 2 shows the decreasing of demand price elasticity up to 15-20 percent, it only increases food prices 0.03 to 0.04 percent. The simulation result shows the smaller demand price elasticity, here is a greater tendency of industry's ability to raise the price of animal food made of soybeans.

The Changes of Soybean Production

The interesting phenomenon is the decreasing of soybean production by the farmers, this should be raising the domestic price of soybeans, but on the contrary the decreasing soybean production followed by a decline in soybean prices. Table 2 shows that the decreasing of soybean production about 15 and 20 percent gives the effect on rising price of soybeans in wholesaler level about 44.67 and 39.94 percent. The lower production of soybean, the cheaper price in farmer level, because soybean import is happened continually to fulfill the domestic demand. Indeed, the government must make a policy regarding to the limitation of soybean import until reaching the remarkable price to the farmer.

The Changes in Soybean Imports

The Increasing of soybean imports gives the effect to the decreasing of domestic soybean prices, but it does not have any effect on reducing the price of processed soybean products and animal food products from soybeans. Table 3 shows the increasing of soybean imports is 15 percent and it gives an effect on decreasing of soybean prices is 25.51 percent. The simulation results shows the higher imports of soybeans, the cheaper of soybean price but the market power in determining the soybean price is decreasing. It can be shown from the table that the increasing of soybean import is 20%, the price of wholesales soybean will decrease 14,75 %. The higher imports, the market power will be lower in determining the input prices and if import activity continues to rise, there is a possibility that the people who get in charge in the market can be functioned as the price recipients.

Table 3.
The Impact of Market Power Changes, Due to Imports and Import Tarif on Soybean Price in Input and Output Markets

Canging Effect	The change of Price (%)			
	P_{gk}	P_f	P_t	P_s
Import changes + 15 %	25.51	25.51	1.82	1.82
Import changes + 20 %	14.75	14.75	1.82	1.82
Import tariff + 15 %	77.83	77.83	0.02	0.02
Import tariff + 20 %	84.51	84.51	0.02	0.02

Source: result of simulation analysis

The Changes of Imports Soybean Tariff

One of the government's efforts to increase soybean prices is deciding certain tariffs for imported soybean. In Table 3, it is showed that import tariffs is effective to increase the price of soybean. The increasing rate is 15-20 percent and it gives effect on soybean prices in the domestic wholesale from 77.83 to 84.51 percent. This increasing price may not be enjoyed by farmers because soybean marketing margin between the price in farmer level and wholesaler level is very high. It is about 26.14 percent in average, so the rise in soybean prices due to higher import tariffs is actually enjoyed by wholesalers. High government tariffs on soybean imports would lead to unrest among the soybean industry and threaten the continuity of their business, therefore, the import tariff policy should take into account market power. If it is without considering of market power, tarif policy will not meet the target in expected soybean price.

CONCLUSIONS

Market power has a significant impact to the rising of soybean price especially for the soybean price in wholesale level as an input of industry. However, it gives relatively insignificant effect to the price of processed soybean product as an output of industry. The increasing of conjectural elasticity about 15-20 percent will cause the rising of soybean price in wholesale level from 58.68 to 58.98 percent. It is also affected the processed soybean price from 2.09 to 2.18 percent and the animal food price made of soybean from 0.03 to 0.04 percent.

It is suggested that pricing policies set by the government needs to take into account market power. The pricing policy will be less effective at high conjectural elasticity. Government policy needs to take a well-functioning market to boost local soybean production and soybean industry development.

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