

PROCUREMENT PRICE LEVEL ACCEPTABLE TO BOTH FARM PRODUCERS AND PROCESSORS

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Abstrakt

The aim of the paper is to demonstrate that for a given procurement price there is a certain equality accepting mutual benefits for both farm producers and agri-food processors. This allows transactions to be made at the procurement price level which is allowable and mutually acceptable due to the benefits. The benefits do not have to be equal, hence the concept of acceptable inequalities. The paper shows the basis for expecting the procurement price level, and therefore the benefits from the producer's and processor's point of view. They result from their maximised goal functions. Both parties are price-takers for the procurement price established on the purchase market, with a reference to price determination at the administrative level. The hypothesis about the acceptable inequality is proven in logical and formal analysis with the use of algebra notations and rules. By and large, this has not been addressed in the literature.

Keywords: acceptable procurement price level, acceptable inequalities, farm producers' goal function, processors' goal function.

JEL codes: D20, D24, Q11, Q12.

Scientific and cognitive problem

The question arises as to what makes the parties to a purchase/sale transaction agree to a given price, regardless of the product and form of this transaction,. The answer may vary depending on the structure of the market, including the conditions of competitive or monopolistic equilibrium and the type of the subject of transaction. It is a topic in and of itself. In this article, however, we will limit ourselves to

the market of the purchase of agricultural products; a market which to some extent resembles the assumptions of a competitive equilibrium. Briefly, but taking into account the essence of this type of market, the price of a product being the subject of transaction is an exogenous variable for both parties. Both parties are in fact price-takers. Exogenous denotes a variable developed beyond the parties and not affected by the actions of any party. This is usually referred to as the equilibrium price. Referring to this price often allows for answering the key question. Usually, the answer is that the parties agree to a given price in a purchase/sale transaction because that is the equilibrium price. Obviously, this is not a fully explanatory answer – it is tautological and superficial. There has to be a more logical explanation, i.e. why they agree to this price as the basis of the transaction, assuming that the price is given to both parties. It must be related to mutual benefits in the context of their own goals. This question is the basis for formulating a research hypothesis. At the same time, the answer to this question is the objective of the analysis in this article.

There is also the question as to whether the logic of the mutually beneficial, as it may be supposed, consent to the transaction price, assumed to be the equilibrium price, does not affect the equilibrium price itself. Usually, it is answered quite cursorily that the equilibrium price results from demand matching supply, but it is only a mechanical comparison, not an explanation of the reasons or mechanism of this price. Similarly, known relations and regularities with regard to changes in demand and supply in relation to changes in price are of a more mechanical nature. This problem is not addressed in the article. However, we analytically explain the conditions that allow both parties to agree to a given price in a transaction. This is a broader objective of this article.

We refer to the first issue, i.e. explaining the reasons underlying the consent of both parties to the transaction to a given price of a product. This is discussed in relation to the product procurement price on the agricultural market, in a general and abstract sense. We believe that this has a theoretical and cognitive significance as well as very practical one for understanding the basis for determining a specific procurement price on a given agricultural market or the market for a given agricultural product. This is usually a market for a homogeneous product and, as already mentioned, with conditions more or less similar to those of a competitive equilibrium. The latter feature of the market is an analytical assumption.

In journalism and popular studies, but also in scientific literature, the issue of the procurement price level is often raised. Usually, it is indicated that farm producers are to some extent the injured party in the procurement, i.e. in the purchase/sale transactions described herein. We are not verifying this view but are only referring to it in order to emphasise the importance of this issue. The purpose of the analysis is only to explain the logic behind making purchase/sale transactions at given procurement prices, which are in fact equilibrium prices for both parties to the transaction. If this reasoning was to be considered convincing and true, it may be helpful in designing (predicting) the behaviours of agricultural market entities, including determining the terms of contracts in the era of contract agriculture. It can also be useful for assessing and projecting the situation on a given agricultural market,

as well as for determining changes in the profitability of production in both discussed entities. This can also apply to the achievement of added value and margins in the food chain, as it is currently expressed. Moreover, these are not only economic issues, but they also have a political dimension.

We hypothesise that the purchase/sale transactions carried out at a given procurement price result from mutual benefits for both farm producers and processors. We apply the analysis to these two entities. These benefits do not have to be and are not always equal, but they must be mutual. In a sense, we are referring to the ideas by Hurwicz regarding the design of economic mechanisms, obviously not in the form of advanced mathematics and not in the convention of game theory. The basis for the proof or verification of this hypothesis constitutes the logical and formal analysis.

Literature on the subject

A direct reference to the problem and approach presented in this article is hard to find or is actually missing in literature. In particular, there is no reference literature for the procurement price. To some extent, the issue of consumer and producer surplus may be a reference in the sense of counting them as differences between a potentially and subjectively acceptable price of a product and its actual market price. It is an important issue in microeconomics presented analytically and graphically (Varian, 2003; Czarny, 2006; Rembisz and Sielska, 2015), in the optimisation calculus (Maruyama and Sonda, 2011) or as the relation between the consumer's surplus and producer's extraordinary profit (Łyszkiewicz, 2000).

In terms of the line of thinking and much simplified, certain inspirations can be applied to the design of economic mechanisms (Hurwicz and Reiter, 2004). This concept is included in the convention of game theory, reaction and pay-off functions, or the expected benefit function. Players send signals to themselves and to the headquarters to achieve the designed benefits. A certain equilibrium price is set in relation to the market players' utility functions (Frączek, 2010). To put it simply, this idea can be related to the expectations of agricultural market entities towards own benefits at a given procurement price level. The market mechanism (headquarters), as we assume, is used to achieve the desired result, i.e. the benefits from the relation of own expectations to a given procurement price level. Similarly to the referenced approach, a certain game can be applied here, which we do not undertake. The most important assumption, inspired by this concept, is that designing behaviours is related to the realisation of the subject's goal function. In our case, these are the goal functions of a farm producer and a processor. This assumption is the starting point in our opinion. In the context of games and acceptable inequalities, these ideas are presented synthetically in Jasiński (2009). We adopt and develop his Polish definition of acceptable inequality. The issues of market efficiency and failure, and in particular information asymmetry, preference function and collective decisions (Giza, 2013) can be, to some extent, a reference to the analysis in this article.

The majority of literature related to the issue of procurement price concerns mainly the determinants and conditions of its development (discovery) and the reasons for

its changes, including fundamental and general relationships and conditions (O'Hara, 1995; Lindsay, 1984). The literature on agricultural economics deals primarily with explaining its development on the basis of basic market laws and regularities, as well as administrative and intervention measures (Hudson, 2007; Tomek and Kaiser 2014; Drummond and Goodwin, 2011). The issue of consent to the procurement price level, in the context of the benefits of both parties to the transaction, in the agricultural market has not been raised by the well-known agricultural economists dealing with the agricultural market. The papers of the abovementioned agricultural economists discuss specific regularities concerning the procurement price development related to the price cobweb model (the price cobweb model is presented in a general sense and in a modern way by Jakimowicz, 2010) or to the King effect. Certain issues of formation of price relations between processors and producers, and thus the problem of the analysis can be found in the context of the study of margins in the food industry (Kufel-Gajda, 2019). However, there are few theoretical papers on procurement prices in contrast to empirical ones, which predominate, mainly including the market analyses of procurement price development and their possible determinants. The approach presented in this article fills in the gap in the analysis of the development of the procurement price level, mutually beneficial for processors and farm producers.

Approach

We refer to the procurement price from the point of view of both farm producers and processors, but only in terms of their possible benefits from the purchase/sale transaction at a given market procurement price level. Each of these entities compares the same procurement price level to a different basis. Each of these entities has different expectations (preferences) regarding the procurement price level. This is due to the fact that the procurement price plays a different role for each of these two entities. More precisely, it is located differently in the goal function of both of these entities and because of this there is a different variable in the maximisation of this goal function for these entities. Hence, we briefly relate the procurement price to this issue at the beginning, i.e. the goal function of a given entity – farm producers and processors. The mechanism that they use to meet their expectations as to the price level, the point of reference to it, i.e. to its level, is the agricultural market, presumably – in a competitive equilibrium.¹ Discussion on the issue of maximising the goal function is only a starting point for establishing the basis for referring to the procurement price level by both entities. The maximisation of an entity's goal function is at the heart of microeconomics.

For a farm producer, the procurement price or the price of an agricultural product (p_y) in our approach is the price received. It is the revenue variable as the basis for maximising the goal function which is the income. Obviously, the farm producer is the price-taker. For an agri-food processor, the same price (p_y) is the price paid. It is the variable of a cost constraint in maximising the goal function which

¹ The concept and conditions of competitive equilibrium are presented in essence in a modern way by Woźny (2016).

is the profit (which can be achieved by minimising expenditure on a given effect or vice versa, here we assume the latter method implicitly). The processor is also the price-taker. From these points of view, we assume that both entities refer to a given procurement price level. We ignore all issues in the analysis, e.g. the procurement price of a product may be paid by a purchasing company. We assume that the analysed procurement price in terms of its level is the equilibrium price. Hence, the obvious expectations regarding the procurement price level in relation to own preferences which in the basis result from maximising income of the farm producer and minimising the purchase cost of the processor.

We stay in the categories and generality of the reasoning typical for microeconomics and academic agricultural economics. We apply an analytical approach using the symbolism and mathematical objects, but without the excessive rigours of mathematical analysis. All analytical formulas are original, except for the marked references from the literature. We stay in the neoclassical trend in the sense of the assumption of rationality of both entities and the regulatory function of the market. Empirical verification of the hypothesis presented in the article is a quite complex issue, although it is possible to make such an attempt in a separate article. It is also obvious that the introduced conditions as to the consent of both parties to the procurement price level explain – to some extent – the formation of a given level of this price on the market. Thus, they explain the causal relationship, as this procurement price level is in fact the result of such decisions of a group of its entities, i.e. farm producers and processors. However, it is a separate problem not addressed in this article.

The assumptions that these entities are price-takers may be debatable, especially in the case of the processor. The processor may have a more or less monopolistic position on local or regional markets, and thus may be a “price-giver.” However, this does not change the essence of reasoning. It may have an impact on the distribution of benefits in acceptable inequalities determined further. However, we do not refer to this aspect in the analysis and we do not analyse the symmetry of the benefits distribution.²

The reasoning is theoretical, with stylised elements and hypothetical assumptions to achieve the cognitive and theoretical objectives related to the hypothesis.

Procurement price from the point of view of farm producers

The importance of the procurement price (p_y) and its level for the farm producer results from the fact that it is primarily the variable determining revenue. At the same time, it is not about the revenue itself, but about the fact that it constitutes the basis for fulfilling the farm producer’s goal function. We mark revenue as: (R) – it is the product of the quantity of a product (y) and the analysed procurement price level (p_y). By analysing only the context of the procurement price, we can therefore express the amount of the revenue as (the time subscript is omitted here as well as in the further parts of the analysis):

$$R = y \cdot p_y$$

² We make this reservation in connection with comments of one of the reviewers.

Depending on the situation and the market structure for a given product, the price changes substitutively in relation to the production volume, which is known from the King and the price cobweb models. However, this is not the most important point here. What is important is whether the level of the price is acceptable or not, as a reference point for making a decision to sell something or not, where the amount of income is of fundamental importance. The amount of revenue (in a given production and procurement cycle) should cover the producer's costs of involving (services) factors of production $C(N)$ according to their actual remuneration³, which can be illustrated in the following way:⁴

$$y \cdot p_y = R \geq C(N) = K \cdot p_K + L \cdot p_L + Z \cdot p_Z \quad (2)$$

In this equation, $C(N) = K \cdot p_K + L \cdot p_L + Z \cdot p_Z$ are the costs of involvement of factors of production (production costs excluding non-input costs), and individual variables: K, L, Z are approximately the services of the production factors of capital, labour and land; variables. The following variables are important for this analysis: p_K, p_L, p_Z , which are, in a simplified manner, the remuneration of services of factors financed from the revenue. This is important as the remuneration of production factors in their basic dimension contributes to income, as the farm producer's goal function. With a given volume of production (and, as a result, sales), the importance of the procurement price in this context is obvious. Per unit of product, the price level should cover the average unit costs of services of production factors.⁵ Thus, the price level should be a source of financing of the farm producer's income. Using the above formula, we have:

$$p_y \geq \frac{K \cdot p_K + L \cdot p_L + Z \cdot p_Z}{y} \quad (3)$$

Thus, the farm producer perceives the procurement price as a variable whose level should cover the average unit production costs, but primarily in terms of income financing sources.⁶ For the producer, the price is a given and objective variable; as we

³ Kleinanss (2014) has a similar approach.

⁴ The producer's goal functions can be presented in various ways, in more or less outlandish forms, e.g. according to our markings (Gloy, LaDue 2003):

$$\max = \sum_i p_y \cdot y_i(X_i \alpha) - C_i(p_N \cdot y_i(X_i \alpha)) \quad \text{dla } y_i(x) \leq X_i$$

where the maximisation of the goal function as a profit is described by the difference in the essence of revenues as the product of prices (p_y) of the production vector (production function from given inputs $y_i(X_i \alpha)$) and the prices of inputs (factors) p_N , and the production function from inputs $y_i(X_i \alpha)$. It does not change the essence of our approach in any way. More advanced but synthetic views can be found in Woźny (2016).

⁵ Costs which are not inputs, e.g. taxes, premium for the Farmers' Social Security Fund (KRUS), the Social Insurance Institution (ZUS), etc., are not included in this article.

⁶ According to the comment of one of the reviewers, "conducting transactions by a farm producer may also take place as part of the strategy of minimising losses, hence the acceptability for a given procurement price level has a different dimension. Then the benefits may appear for the producer (improved liquidity, but under the conditions of realisation of losses)."

mentioned before, the farm producer is the price-taker.⁷ The producer refers to its level from the point of view of the incurred production costs. But these production costs, unlike the procurement price, are the outcome and subjective variable. This applies primarily to the structure and size (intensity) of inputs (services) of production factors, which is known as the production technique. This also applies to their remuneration, apart from some components (p_K) such as purchased material production means. We are not elaborating on this, as it is not the subject matter of our analysis. Only as a digression, we can note that it exemplifies a general problem of whether the product price adjusts to the producer's production costs or the opposite, i.e. the farm producer adjusts their own costs to the market-determined procurement price. Obviously, there is also the aspect of the economic short and long time. We are not elaborating on this. For the purpose of the analysis, it is only significant that the procurement price (i.e. its level) is given to the producer, the producer is the price-taker (conditions of competitive equilibrium) and the procurement price level is a variable shaping the producer's income, which is related to the production costs in the individual dimension. Thus, the basis for referring to the procurement price level for a farm producer as well as for any other producer is the average unit production costs.

If we assume that the farm producer makes rational choices and maximises own income function, for each of the production factors included and applied here, the conditions in which the procurement price level is of considerable importance should be met:

$$p_y \cdot \frac{\partial y}{\partial K} = p_K ; \quad p_y \cdot \frac{\partial y}{\partial L} = p_L ; \quad p_y \cdot \frac{\partial y}{\partial Z} = p_Z \quad (4)$$

Let us only take into account the condition related to the remuneration of the labour factor, because this is the main source of income for an average farm producer. From its conversion, in order to emphasise the importance of the procurement price level, the following equation can be derived:

$$p_y = p_L / \frac{\partial y}{\partial L} \quad (5)$$

Therefore, the expectations regarding the procurement price level depend on the relation between the remuneration of the labour factor (presumably from its expected level, e.g. parity level) and the actual level of the marginal productivity of this factor. The higher the productivity, the weaker the emphasis on the procurement price level with a given remuneration of the labour factor.⁸ These dependencies undoubtedly must have and have an impact on the relation of the farm

⁷ Obviously, a price risk and, as a result, income risk are associated with the volatility of the procurement price. The methods of price risk management used for limitation of this risk consist in "buying" the level of this price by a given farm producer individually (this is not a stabilisation of the price on a given market as a whole, as it is most often mistakenly stated).

⁸ Naturally, this means that the main source of income financing is labour productivity as well as the productivity of other factors. The relation between the remuneration of the labour factor and its productivity is referred to in the literature as the ULC or unit labour costs.

producer to the procurement price level. In particular, this must have an impact on determining the conditions of accepting a given procurement price level or not by the producer. Therefore, this is affected by two dependent conditions, i.e. the level of the achieved labour productivity and the accepted level of its remuneration as the basic component of the farm producer's income.

If the procurement price – let us define it here as the equilibrium price (p^*) – is given for the producer and constitutes the exogenous market benchmark for the transaction (which will be defined later), it determines the producer's average and marginal revenue from the production. With revenue: $R = y \cdot p_y^*$, the equation is as follows:

$$\frac{y \cdot p_y^*}{y} = \frac{p_y^* \cdot \Delta y}{\Delta y} = p_y^* \quad (6)$$

The average and marginal revenue (takings) should be equal to the procurement price in terms of levels; one can also assume the opposite. Naturally, it is an important but also a complementary point of reference for determining the benefits from a possible sale of the product at a given procurement price. Complementary to the cost point of reference and presented only from the level of the market, its equilibrium, which forms objective conditions for all its participants (here: farm producers). These conditions are most often favourable to some and not to others. Popularly speaking, this means that it pays off to produce and sell for some, and not to others, under the same market conditions.

The point of reference for the farm producer may be the relation of the procurement price level as the price received to the prices of inputs of production factors. In order to analyse this, we will use the approach to farm producer's revenue shaped by the difference between the procurement price level and the level of prices paid for inputs per production unit. Maintaining the convention of our approach, we will receive the following analytical record:⁹

$$d_{pr} = f(p_y - p_N)y \quad (7)$$

In simple terms, we assume that (d_{pr}) is the producer's revenue. As before, we assume that: $p_N \leftarrow (p_K, p_L, p_Z)$ the price of inputs (as some kind of abstraction) is determined by the mix of prices of these inputs (their level should be covered by remuneration from their services) for the producer in equilibrium. In the above formula, apart from the production volume, the key role is played by the difference in the levels of prices received and paid. We make a logarithmic differentiation in order to capture the changes. Total excess of revenue due to changes in these two variables, i.e. the difference in the levels of prices received to the prices paid and the increase in production, is:

⁹ In Beckman and Schimmelpennig (2015), we find a formulation per unit of the land factor area according to our markings:

$$d_{pr} = \sum_i (p_{y,i} - p_{Ni})y_i$$

and descriptively and problematically, $d_{pr} = p_y, p_N, TFP, r, p_L, GDP$ where revenue is related to prices received and paid, total productivity, interest rate, land factor price, and the level of GDP.

$$d(d_{pr}) = \left(\frac{\partial p_y}{p_y} \cdot \Delta p_y - \frac{\partial p_N}{p_N} \cdot \Delta p_N \right) + \frac{\partial y}{y} \cdot \Delta y \quad (8)$$

If we assume that there is no increase in revenue, the exact differential is equal to zero: $d(d_{pr}) = 0$, we have a substitution relation between these two sources of revenue (implicitly with given inputs of production factors), that is:

$$\left(\frac{\partial p_y}{p_y} \cdot \Delta p_y - \frac{\partial p_N}{p_N} \cdot \Delta p_N \right) = \frac{\partial y}{y} \cdot \Delta y \quad (9)$$

Farm producers usually expect a positive impact on their revenue on the left side of this equation, i.e. changes in the relation between the level of procurement prices and the prices of inputs which are favourable for them. It is important for our analysis that the procurement price level plays a significant role here and, from this point of view, the farm producer must refer to its level developed on the market independently of the producer, regardless of its will.

Procurement prices from the point of view of the processors

For the processor, the same procurement price and the same level of the price are of different significance than for the producer, which is obvious. The same procurement price level is a component of production costs for the processor. The amount of this price has an impact on the level of processing costs and, consequently, on the level of final prices of agri-food products. Usually, the processing costs are subject to minimisation, due to the conditions of competitive equilibrium currently dominating on the market of final agri-food products. Under these conditions, there are no easy and simple possibilities of transferring the cost effect of the increase in the procurement price level to the final buyer, i.e. the consumer. Formally speaking, in the processors' function, the procurement price is a component of the cost or budget constraint, the so-called isocosts. Isocosts are a line for two variables, i.e. purchased agricultural products (as raw materials): (y) and inputs related to processing them: (b). It can be expressed as follows:

$$C(p)_{min} = y \cdot p_y + b \cdot p_b \quad (10)$$

for a given processor's goal function:

$$\dot{z} = f(y, b) \quad (11)$$

In the minimised processing costs of the processor: $C(p)$, the second product on the right: ($b \cdot p_b$) is the processing costs as a product of the level of applied inputs related to processing and the price level of these inputs (non-agricultural). The first product: ($y \cdot p_y$) is the costs of purchasing a certain volume of agricultural products as raw materials for processing at a given procurement price level of our interest. As we assume, the procurement price level is naturally a market variable

for the processor, an exogenous one, which the processor does not influence as it is *de facto* a price-taker.¹⁰

For the entire processor function (i.e. the goal function and isocosts together as a conditional function), we assume the abovementioned demand constraint resulting from the competitive equilibrium on the market of final products (\dot{z}). Thus, as shown above, the maximisation of the processor's goal function can be achieved by minimising the costs (including inputs) to obtain a given volume of production of agri-food products, at given final prices of agri-food products (the prices obtained are omitted here as they are a constant). This takes place – especially in the short and medium term assumed here – with a given relation: $\frac{\dot{z}}{y,b}$ or, *de facto*, with a given productivity from these inputs.

Assuming the processor's equilibrium (max profit) in the competitive market conditions, i.e. when the price of its final agri-food product is equal to the average unit costs of processing, that is:

$$p_z = c(p) = \frac{c(p)}{\dot{z}} \quad (12)$$

The minimised function of the cost of processing can be expressed in unit terms (per unit of the final product) as:

$$p_z = c(p) = \frac{y}{\dot{z}} \cdot p_y + \frac{n}{\dot{z}} \cdot p_n \quad (13)$$

In this equation, the processor's input prices are highlighted, including the procurement price of products and the share or contribution of agricultural raw material and inputs related to its processing into the final agri-food product. This indicates two constraints for the procurement price. The first one regarding its level when we make the following manipulations:

$$\frac{y}{\dot{z}} \cdot p_y = p_z - \frac{n}{\dot{z}} \cdot p_n \quad (14)$$

and dividing it by the contribution of the agricultural product as a raw material to the final product, i.e. by $\frac{y}{\dot{z}}$, we are able to determine the boundary conditions of the procurement price level for the processor:¹¹

$$p_y = p_z - (1 - \rho)p_n \quad (15)$$

¹⁰ As we have already observed, this assumption may be a subject of a discussion in the agricultural market in regional and local systems. There may be conditions of a more or less monopolised buyer (processor), which may be the reason for the processor to have an influence on the procurement price, e.g. differentiate it. However, if we repeat this assumption, the essence of the reasoning regarding the development of acceptable inequalities will not change.

¹¹ $p_z \cdot \frac{\dot{z}}{y} - p_n \cdot \frac{n}{\dot{z}} \cdot \frac{\dot{z}}{y} = p_z \cdot \frac{\dot{z}}{y} - p_n \cdot \frac{n}{y} = p_z \cdot \left(1 - \frac{n}{y}\right) p_n = p_z - (1 - \rho)p_n$,
with $\frac{\dot{z}}{y} - \frac{n}{y} = \frac{y}{y} = 1$, $\rho = \frac{n}{y}$

It seems obvious that a constraint for the procurement price level is the relation between the price of the final product and non-agricultural inputs as well as the contribution of these inputs to the final product.

Similarly, one can refer to a possible change in the procurement price level from the processor's point of view. Considering the above constraint in the form of the average unit processing costs, equal to the price of the final product and differentiating them, it can be illustrated by the following equation:

$$\Delta p_z = \frac{y}{z} \cdot \Delta p_y + \frac{n}{z} \cdot \Delta p_n + \Delta \left(\frac{y}{z} \right) p_y + \Delta \left(\frac{n}{z} \right) p_n \quad (16)$$

For small changes in the prices of the processor inputs (both agricultural and non-agricultural) and for small changes in their unit consumption to produce the final product and assuming (knowing) that the last two expressions add up to zero, the above formula can be simplified to the following equation:

$$\Delta p_z = \frac{y}{z} \cdot \Delta p_y + \frac{n}{z} \cdot \Delta p_n \quad (17)$$

Similarly, we can devise a formula for acceptable changes in the procurement price level from the processor's point of view:

$$\Delta p_y = \Delta p_z - (1 - p) \Delta p_n \quad (18)$$

A possible change in the procurement price level is related to changes in the level of the price of the final product and the price of the non-agricultural inputs related to the processing of agricultural raw material. The relations are positive here, which is probably obvious. However, the relation to the proportion of other inputs and the agricultural product is negative: $p = \frac{n}{y}$.

The more inputs related to processing are used, i.e. the deeper the processing is, the higher the procurement price level accepted by the processor.¹² The reason for this is the substitution between the two inputs, which is included implicitly in the above formulas.

To confirm this reasoning and draw conclusions, we will deepen them. This is based on further transformation of the above penultimate formula by dividing it by sides. This allows for determining a possible change in the procurement price from the point of view of the processor. Thus:

$$\frac{\Delta p_z}{p_z} = \left(\frac{y}{z} \frac{p_y}{p_z} \right) \cdot \left(\frac{\Delta p_y}{p_y} \right) + \left(\frac{n}{z} \frac{p_n}{p_z} \right) \cdot \left(\frac{\Delta p_n}{p_n} \right) \quad (19)$$

A possible increase in the price of the final agri-food product is determined by the weighted increase in the prices of both inputs, i.e. the procurement price of

¹² Thus, common complaints about more and more processed food and the return to less processed food may have a negative impact on the procurement price level.

the agricultural product as a raw material and the price of inputs related to its processing. The weights are structural indicators showing the share of the input costs (raw materials and others) in the price of the final agri-food product, that is:

$$\left(\frac{y \cdot p_y}{p_z}\right) + \left(\frac{n \cdot p_n}{p_z}\right) = a + b = 1 \quad (20)$$

The logic of this is beyond dispute. It is, however, about the formal documentation of what is also intuitively perceived. The changes in the procurement price level from the processor's point of view fall within the share of the cost of this raw material in the price of the final product. Naturally, they may take place in relation to the levels of prices of the remaining inputs related to its processing. Hence, the changes in the procurement price from the processor's point of view, after simple transformations and simplifications, are as follows:

$$\frac{\Delta p_y}{p_y} = \frac{\Delta p_z}{p_z} - \left(\frac{n \cdot p_n}{y \cdot p_y}\right) \frac{\Delta p_n}{p_n} \quad (21)$$

Therefore, the processor sees the possibility of paying for the increase in the procurement price in the context of an increase in the final food product price. This also applies to the increase in other input prices and the structure of inputs to obtain the final agri-food product.

Expectations of producers and processors as to the procurement price level

Knowing the basis for reference of both the producer and the processor to the same procurement price level, we can address their expectations in this regard. It concerns the expectations regarding the same procurement price level determined exogenously on the market. These expectations result from the abovementioned grounds for referring to the procurement price level by both entities, which we adopted as a starting point. These expectations are of a fundamental importance for accepting a given procurement price level by the producer and the processor in their mutual market relation. As demonstrated above, the basis for it are their own maximised goal functions, i.e. revenue (farm producer) and profit (agri-food processor). We relate expectations to a given period, not to the future, hence we do not use the expected value in the formulas.

The farm producer will expect the procurement price level to cover the costs of services of production factors per production unit, with a given production volume. We showed this above. On the other hand, the processor will expect that the procurement price level on the market will allow for minimising the costs of processing agricultural products as a raw material per unit of the final agri-food product, for a given price level from a very competitive market of final food products.

Thus, in the formal record, we can assume that for the farm producer the procurement price level is a function of an average unit cost:

$$p_y^* = f(k_p) \quad (22)$$

The farm producer may adjust the costs to the procurement price level or expect that the procurement price will be adjusted to its average unit costs: (k_p). However, the mechanism of price formation on the market is quite clear. It is already known from Jovens that costs as a subjective and individual category should be adjusted to the price of the product as an objective – market – category, and not the other way around. Obviously, in the case of distortion of the competitive equilibrium, e.g. on a more or less monopolised market, this principle is no longer fully applicable. This principle may also be disturbed by a specific influence of the administrative and institutional factors on the agricultural market and procurement prices. Based on the theoretical premise, the reverse system of the procurement price formation, the so-called production and cost formula, functioned in the central state purchase as part of the centrally planned economy. The cost and production basis for the procurement price is also one of the premises of the so-called price intervention, that is maintaining their level in adjustment to production costs, calculated as average costs on the market scale. Costs in the accounts in the scale of the agricultural sector and its divisions are also calculated in the same way. This is a separate problem, in fact concerning the market and intervention as well as understanding production costs which, all in all, affects the mechanisms regulating the choices made by farm producers.

From the point of view of this analysis and the expectations of the farm producer regarding the procurement price level (for a given period but also for each other and subsequent period), it is mainly important for the price level to be higher than its average unit production costs of a given producer:

$$p_y^* \geq k_p \quad (23)$$

This expectation is the same regardless of whether the producer adjusts their own costs as an endogenous and subjective category to the price of the product being a “price-taker” or a “price-giver.” The latter situation can often occur when a price intervention adjusts the procurement price levels to the average unit cost of production for the entire market which, by the way, does not have to apply to every producer, and its individual relation should, but does not have to, be as in the formula (23).

An objective reference for the farm producer is the procurement price level determined by the market mechanism (but also determined at an administrative and institutional level). In fact, from the point of view of the farm producer, it does not matter. However, for a given product market it is significant; for a given demand, as well as for inventories, the procurement price level is a function of the supply of agricultural products in a given period. The producer participates in forming this supply on the basis of a previously made production decision, which is explained by the cobweb model and the King effect as well as by the herd behaviour, but not as an intentionally causative factor. In a given period, the farm producer accepts the procurement price level of the product as given (although it may withhold the supply, despite the fact that its action will not affect the state of the market). Thus, the procurement price level (of the product) is determined as follows:¹³

¹³ Cf. a more general approach as the basis for the one presented in the main text (Jakimowicz, 2010).

$$p_y^* = f\left(\frac{d_y}{y}\right) \quad \text{for } y > 0 \quad (24)$$

or more simply in analytical terms:

$$p_y^* \approx \frac{d_y}{y} \quad \text{for } y > 0 \quad (25)$$

It is obvious here that the larger the supply (y) with a given demand (d_y), the lower the procurement price (p_y^*), assumed to be the equilibrium price. This formula shows that all attempts to exert interventional impact on the procurement price concerned the reduction of supply (e.g. the system of warehouse receipts, state reserves) or increase in demand (e.g. export aids, subsidies for promotion, etc.).

The price level: (p_y^*) can also be determined on the basis of or rather result from the production costs of the least efficient farm producers with the highest production costs. Then, they do not produce the surplus in terms of producer surpluses. This surplus is produced by producers who would be willing to supply products to the market even at prices below this procurement price, i.e. for:

$$p_y^* > p_y \quad (26)$$

because their price, i.e.: (d_y), would be equal to the average unit costs of these more efficient producers:

$$p_y = k_p \quad (27)$$

Thus, all these producers, in an effort to produce such a surplus, will naturally reduce their production costs even below the level within the price: (p_y) by increasing production. This is an expression of market regulation in terms of efficiency. We return to this issue later in the paper.

Taking into account the demand of processors for agricultural products, the basis for the formation of the procurement price (p_y) may be the so-called inverse demand formula. Usually, demand forms relative to the price of the product, and here it is the opposite – the price of the product forms relative to the demand for it. This can be expressed as follows:

$$p_y^* = f(y^d, \dot{Z}) \quad (28)$$

The first variable: (y^d) is the demand for agricultural products as inputs or raw materials for production, demand from the processors. Variable: $\dot{Z} = \dot{z} \cdot p_z$ is the processor's revenue which is the product of the production volume and the resulting sales of final agri-food products: \dot{z} and their prices: p_z , which may be treated as a revenue constraint. Here, the procurement price level of an agricultural product is a function of demand for this product and a function of revenue obtained from the production and sale of final products by the processor. This is obvious in its essence and in that it is the starting point for the processor to refer to a given procurement price level of interest to it on the market.

For the processor, as shown above, the procurement price level is primarily a function of the level of a given price of the final food product:

$$p_y^* = f(p_z) \quad (29)$$

or in analytical terms, it is derived from this final price:

$$p_y^* \Leftarrow p_z \quad (30)$$

It takes place when the conditions of a competitive equilibrium on the market for final agri-food products are met. It can be assumed that this also applies to the purchase market of agricultural products.¹⁴ In the event of a shortage of agricultural products or administrative and institutional control of their supply or minimum prices and disturbance of the conditions of a competitive equilibrium on the market of final food products (for instance, supply shortage), the following formula can be derived:

$$p_y^* \Rightarrow p_z \quad (31)$$

This situation is often referred to while determining the sources of inflation which results from the transfer of the increase in the procurement price level to the agri-food retail prices. The only way to counteract this situation or to neutralise the effects of increased procurement prices is to improve the production efficiency of processors and reduce distributors' margins (wholesale, retail). Here, the reserves are usually larger than those at the level of farm producers.

Incidentally, the essence of the price spread: $a = \frac{p_z}{p_y}$ for $a > 1$ ¹⁵ lies in the potential neutralisation. Obviously, the larger the price spread, i.e. the higher the quotient, the greater the room for manoeuvre for the processor when it comes to accepting a given procurement price level. For our analysis, however, it is important whether the procurement price is lower than the price of the final (retail) agri-food product, which is obviously the result of processing a given agricultural product as a raw material, i.e. whether the following condition is met:

$$p_y^* < p_z \quad (32)$$

This condition seems obvious if both parties, i.e. farm producers and agri-food processors, fulfil their goal functions, one of the bases of which is the possibility of realising their benefits resulting from their expectations regarding the procurement price level. This requires further analysis.

Before we do that, we will look at it in terms of the willingness to pay.¹⁶ If the buying processor would be willing to pay the procurement price: (p_y) for the agricultural product (as input), and paid: (p_y^*), we have:

¹⁴ This assumption may be a bit exaggerated, as it can be applied with more certainty to the supply side, i.e. on the side of farm producers, and with less conviction to the demand side, i.e. the side represented by processors or purchasing companies as intermediaries.

¹⁵ The issue of the price spread is often raised in literature of agricultural economics, just as often as various approaches or measures of it are presented; we will not refer to it.

¹⁶ Concepts very popular in literature: *willing to pay* (WTP), and earlier in the text *willing to supply* (WTS).

$$p_y > p_y^* \quad (33)$$

The processor produced a surplus, an extra profit. In the production costs of the final product at the price: (p_z), the processor calculated the price level of the agricultural raw material (p_y) according to the above inequality higher than the market price level: (p_y^*). Therefore, the processor will increase the purchasing activity and the market procurement price level: (p_y^*) will increase to:

$$p_y^* \leq p_z \quad \text{and:} \quad p_z \geq k_{pz} = f(p_y, n) \quad (34)$$

where: k_{pz} – an average production costs at the processor; n – inputs related to the processing of the agricultural product and other costs of the processor.

The basis of the points shown here for the producer's and processor's references to a given procurement price level are in fact their individual production efficiencies (in the sense of TFP). With high production efficiency of the farm producer, the producer may accept a lower price, just as the processor may accept a higher procurement price level. This affects the amount of the accepted benefits of both parties at a given procurement price, which we analyse below.

Benefits for producers and processors at a given procurement price level

The above derivation and related comments lead to the main issue in the article, i.e. the possibility of developing the basis for the relationship between the expectations of the farm producer and the agri-food processor with regard to the procurement price level. In fact, it is about a balance as to the amount of benefits for both of these entities obtained at the same the procurement price level, the same for both parties. These benefits should be mutually accepted but not necessarily equal, although we make this assumption first. Naturally, these benefits are related to the performance of the goal function of both entities and their role, including the procurement price, as described above. The procurement price, which is the assumption made at the beginning, is for them, i.e. for both the farm producer and the processor – a common and exogenous variable. We assume here that both of these entities are price-takers because the conditions of a competitive equilibrium are met, which does not differ from reality.¹⁷

The above two inequalities (32) and (33) can be referred to as acceptable inequalities, alluding to the idea by Hurwicz to some extent. Therefore, we can assume that the condition of equilibrium or equality between the expectations regarding the amount of economic benefits for the producer and the processor is met if the following system exists:

$$p_y^* \geq k_p \quad \text{and} \quad p_y^* < p_z \quad (35)$$

¹⁷ This assumption in its basis or fundamentally forms the relationship between the agricultural sector and the processing sector, as well as the trade sectors in the agri-food economy as a whole. In practice, this assumption may be criticised because it is not always met locally.

to put it differently and more generally:

$$p_z > p_y^* \geq k_p \quad (36)$$

We believe, it constitutes the essence of market regulation. Popularly speaking, it is always about both parties being satisfied with the transaction. Here, in a formal sense, it is a balance between the expectations of the farm producer and the expectations of the agri-food processor with regard to the level of the procurement price. These expectations are conditioned by the individual production efficiency (as indicated, in the sense of TFP) of each of them. This individual production efficiency results in the possibility of accepting a given procurement price level for the fulfilment of own goal function. This explains the popular approach that at a given price it pays off for some entities and not for others, and that profitability is both a subjective and individual category, and not, for example, for the entire market or for everyone.

The expectations of both parties as to the level or amount of the procurement price must be mutually accepted. In other words, these expectations should be acceptable and compatible for the transaction to take place. Thus, it means that the procurement price level of the product should be, on the one hand (for the processor), lower than the price level of the final food product produced from it. On the other hand (for the producer) – for the price level to be higher than the subjective average costs of the product being purchased. Another issue is the amount of these benefits, this is related to the aforesaid individual production efficiency. The same applies to the symmetry of the amount of these benefits which are by definition relative. Both the producer and the processor must have an economic benefit from a possible purchase/sale transaction, i.e. the above acceptable conditions must be met. Such benefits (surpluses) they indeed have or obtain. The farm producer obtains a benefit, an additional source of income, because the procurement price level is higher than its average unit production costs. This allows the producer not only to re-establish production, but also to make possible extraordinary unit profits. Likewise, at the procurement price level, the processor obtains a certain price spread enabling it to re-establish production and to make a profit, i.e. to realise added value. This is based on the assumption that the final price of an agri-food product is given¹⁸ implicate fixed on a market with a competitive equilibrium and its level is *de facto* a constraint. If this assumption was not made, a kind of cost “pass it on” situation would be possible, i.e. transferring the effects of accepting a higher than the acceptable procurement price level to the final agri-food product, which can be simply illustrated as:

$$\uparrow p_z \leq \uparrow p_y^* \leftarrow k_p \uparrow \quad (37)$$

Naturally, this option is not beneficial for consumers and constitutes one of the sources of inflation for the entire economy. We provide it only to illustrate the significance and possible additional aspects of the discussed issue, i.e. the formation of the relation of accepting a given procurement price level by the producer and the processor.

¹⁸ In a more advanced approach, the logarithmic derivatives of these variables are equal to zero in this case.

Certainly, deviations from the assumption regarding the market development of the procurement price level are possible. The procurement price may be set administratively, e.g. as an intervention price or a minimum price. Then, however, the above acceptable inequality must be maintained also at the level of the producer and the processor in order to maintain the rationality of management. When the procurement price level is lower than the production costs of the product which the procurement price concerns: $p_y^* < k_p$ or – more often – when the procurement price level is higher than the price level of the final product: $p_z < p_y^*$, which is not a hypothetical situation as it has been happening now and then in economic practice (e.g. in a centrally planned economy or a large-scale income and price intervention), interventions and subsidies are usually necessary. They are necessary to restore the acceptable inequality, i.e.: $p_z > p_y^* \geq k_p$, at the level of producers and processors, with a reversed relationship on the market which then does not perform selective functions – it pays off for everyone, because it is ensured by transfers related to the intervention. This is a separate matter.

It can be assumed that this distribution of the amount of benefits in the form of, let us call it, acceptable inequalities is the result of certain iterative adjustments in both entities in response to market variables. This mechanism is similar as in the Walrasian approach where it is described using an auctioneer and the price as a *numeraire*. This largely reflects the actual situation on the agricultural market. In fact, the state of market equilibrium, more or less short- or medium-term (for a given purchasing campaign in one location or another and on the scale of the entire market), is determined by trial and error. As a result, after successive iterations, a state of market equilibrium is achieved in the sense of acceptable inequalities (purchase/sale transactions take place), defining the benefits of the parties, i.e. the producer and the processor, as:

$$p_z > p_y^* = p_y^* \geq k_p \quad (38)$$

and in more economic and empirically measurable terms as:

$$p_z - p_y^* = p_y^* - k_p \quad (39)$$

Naturally, when we have:

$$(p_z - p_y^*) > 0 \quad \text{and} \quad (p_y^* - k_p) > 0 \quad (40)$$

This expresses the sense of mutual benefits (or surpluses) for the farm producer and the processor. Of course, this is related to the procurement price, its acceptable level for both parties. In fact, this is relative in terms of the levels of benefits achieved, not their absolute amount. They are related to other bases, unit production costs and prices of final products.

Procurement price clearing the market for a given demand and supply

These acceptable inequalities and the development of an equilibrium between them may also be used to explain the formation of a given market procurement price level, mutually acceptable to the seller, i.e. the farm producer, and the buyer, i.e. the agri-food processor. This explains where this procurement price – as an equilibrium price in the sense of a level – comes from and how it develops. The explanation resulting from the above analysis goes beyond what results from a simple comparison of the demand and supply curves for an agricultural product. Moreover, the above reasoning explains why these curves intersect at this point and not at a different one. This intersection is largely the result of individual choices of producers and processors, next to the market forces related to the strength of the impact of the size (mass) of supply and demand on the basis of some mechanics and basic laws – related to the inverted functions of demand and supply, i.e. for the price (as dependent) in terms of the supply and demand (as independent variables). Thus, it is the basis for the formation of an equilibrium and the resulting equilibrium price level, in the sense of the intersection of the supply and demand curves in the agricultural market, which is expressed in the simplified form:

$$y_z = y_r \quad (41)$$

and taking into account the reduction due to the price spread resulting from processing:

$$y_z(1 - \mu) = y_r \quad (42)$$

where: $\mu = \frac{p_z}{p_r}$ – the relation between prices of an agri-food product and the procurement price reflecting the price spread illustrating the contribution of processing to the value of the final agri-food product (this issue will be described in greater detail in a further parts of the analysis).

If the above was presented in the convention of the consumer surplus, i.e. here in the convention of the seller's surplus and the buyer's surplus, we have, as in (Hudson, 2007):

$$R(+)=\frac{1}{2}(p_y^* - k_p)(y_r^* - 0) \quad (43)$$

and

$$\dot{Z}(+)=\frac{1}{2}(p_z - p_y^*)(y_D^* - 0) \quad (44)$$

where: y_r – is the supply of agricultural products for processors; y_D – is the demand for agricultural products and raw materials for balancing levels; other markings as explained earlier.

It is a division of the triangle in which the cathetus is the procurement price level, and the hypotenuses are sections of the product supply and demand for this product intersecting at the point which determines the equilibrium price as the point dividing the benefits into the surplus of the producer (seller) and the surplus of the consumer (buyer), accumulating in changes in revenue. On this basis, we can determine the conditions for the intersection of the line of the demand and supply of an agricultural product.

The demand of the processor(s) for the product, i.e.: y_z , can be expressed as:

$$y_z = a - b \cdot p_z \quad (45)$$

It can be observed that this demand is declining linearly, which is obvious, and it decreases with the increased procurement price level paid by the processor: p_z (a separate question is whether it decreases linearly or non-linearly). The supply of the agricultural product from the farm producer(s) is positive in relation to the procurement price: p_y (more precisely, it is the result of the production volume resulting from the price level of the previous period, taking into account the cobweb model and the King effect). Here we will confine ourselves to the statement that this supply is positive in relation to the level of this price, that is:

$$y_r = c + d \cdot p_y \quad (46)$$

According to the reasoning adopted in the article, the procurement price paid by the processor and the price obtained by the producer is obviously the same equilibrium price with regard to the level (we explain only to emphasise the essence of the reasoning):

$$p_z = p_y^* = p_y \quad (47)$$

Thus, we have equality of the demand from processors with the supply from farm producers of the same product:

$$a - b \cdot p_y^* = c + d \cdot p_y^* \quad (48)$$

Hence, we obtain the definition basis for the procurement price level: (p_y^*) as the equilibrium price, the category used in this text, therefore we have:

$$p_y^* = \frac{a-c}{b+d} \quad (49)$$

Thus, this is the point of intersection of the demand and supply lines defined as above. It is only the formal aspect (very useful for the estimated demand and supply functions). The mechanism of reaching this point, in fact, results from the formation of the amount of the benefits of both parties, as presented above. In principle, the procurement price level should clear the market, as demonstrated below.

Regarding the general state of equilibrium of the market for a given agricultural product, for a given equilibrium price level: (p_y^*) in a given procurement period (t), the market is cleared, because the demand for agricultural products from the processor: (y_z) is equal to its supply from the farm producer: (y_r), thus we have:

$$p_y^*(y_z - y_r) = 0 \quad (50)$$

This results from the fact that for a given agricultural product, the mechanism of changes in demand from the processor is as follows:

$$\frac{\partial y_z}{\partial p_y^*} < 0 \quad (51)$$

and for the farm producer, the mechanism of supply of this product for a given change in the procurement price is defined as:

$$\frac{\partial y_r}{\partial p_y^*} > 0 \quad (52)$$

These opposing processes naturally explain the development of the equilibrium state and the procurement price level acceptable by both sides, which is the subject of our attention. Here, similarly to the approach introduced above, the process is of an iterative nature in the Walrasian sense. However, what is not explained is why both parties agree to a certain the procurement price level. In our approach, we explain this matter. This approach, as well as the previous one can be extended to different approaches to time, here we take given time: (t) , and not the future: $(t+1)$ or the past: $(t-1)$.

Procurement price as an effect of agricultural policy

The procurement price (its level) may be a transmission channel of income support, which is – as we have previously mentioned – the farm producer's goal function instead of or beside direct payments. Remaining in the convention of the above analysis and assuming that regardless of the method of support transmission (t_r), through prices or direct payments, the farm producer's revenue (R) always increases. We can put it as follows (for a given period t):

$$R' = y \cdot (p_y + tr) \quad \text{oraz} \quad R' = R + tr = (y \cdot p_y) + tr \quad (53)$$

$$y \cdot (p_y + tr) = (y \cdot p_y) + tr \quad (54)$$

Thus, the revenue effect is the same which is documented by the identity (54). This is also true even when we take into consideration: (y_i) , that is individual products. Through the procurement price, transfers will affect the structure of revenues without significant changes in their amount. However, this is a separate and more specific problem.

Usually, agricultural policy deals with maintaining the procurement price level above the one resulting only from the market regulation,¹⁹ although in the event of the centrally planned economy it was the other way round. There are usually many

¹⁹ Consumer sensitivity to this matter is usually greater in moderately wealthy countries than in the wealthy ones. This is due to the share of agri-food products in consumer spending which is an indicator according to which countries can be roughly divided into wealthy, moderately wealthy, etc. In poorer countries this share is higher, usually above 25%, in wealthier countries it is below this level. Therefore, political importance of procurement prices and the resulting temptation to influence the procurement price through agricultural policy instruments is different.

arguments to support this temptation, that is, the intention or real action. Leaving aside the discussion in this regard, we will only refer to possible political and sometimes economic benefits and the costs of maintaining procurement prices above the level which would result only from the market regulation. These benefits and costs can be applied to farm producers and consumers who conduct a non-agricultural activity, the final purchasers of these products after they have been processed into final agri-food products, as shown above. As we have just shown, producers obtain benefit in the form of increased revenues. Consumers incur costs in the form of increased expenditures on agri-food products (same applies to producers, but they usually do not relate their benefits to these costs) and higher taxes. This seems to be of a substitutive rather than complementary nature. This is, naturally, an open issue, however, we make this assumption.²⁰

This issue can be analysed in the trend of the abovementioned approach in the marginal calculus, taking the following simplified function of the policy objective:²¹

$$a_1(p_y^x) \geq d_{pr} \quad (55)$$

where: d_{pr} – the farm producer’s revenue; b – the budget expenditure as support costs, including maintaining the procurement price under limiting conditions:

$$a_1(p_y^x) \geq d_{pr} \quad (56)$$

$$a_2(p_y^x) \geq b \quad (57)$$

where: p_y^x – the “supported” the procurement price level (a concept similar to the minimum price, though not a legal act but the result of an intervention).

In the first equation (56), producer’s revenue: d_{pr} can be interpreted as a variable representing possible political benefits (of a government) of farm producers and their families. The second variable (b) represents the costs of these benefits and the loss of support of the rest of society, i.e. consumers burdened with the costs of

²⁰ It can be assumed that in a wealthier country, the costs of possible maintenance of purchase prices are relatively low in relation to the political, and sometimes economic, benefits. Usually, the share of agri-food products in consumer spending is small. Hence, the possible maintenance of the purchase price is of little importance for relatively wealthy consumers. The same applies to their tax burden to finance the maintenance of procurement prices. The proportions between those employed in agriculture and in sectors other than agriculture are of great importance. The benefits of support are enjoyed by a small population in terms of amount and share in the total, and the burden is distributed among its dominant part. In short, it is a slightly higher expenditure on food with a small share in total expenditure and slightly higher taxes in the already relatively high ones. The situation is reverse in poorer countries. Maintaining purchase prices as a component of the prices of final food products is no longer so immaterial. The share of food expenditure is higher and the tax base as a source of financing this support is lower. This implies higher costs, not only economic but also political ones. There are somewhat opposite proportions between the beneficiaries and the burdened ones. These contradictions in moderately wealthy countries, such as Poland, have been largely resolved under the CAP.

²¹ The borrowed idea was (Von Witzke and Hausner, 1991) with own development, of course, like any model approach, it is a kind of simplification of reality in order to extract the essence of the analysed issue.

this support for the procurement price (57). The two constraints are linear. Both are a function of the procurement price level resulting from this support under the agricultural policy. Here, the supported procurement price level is crucial to maximise political benefits. The optimal condition for the maximisation of this benefit function, for exact differential and logarithmic derivatives, is as follows:

$$\frac{\partial u}{\partial d_{pr}} \cdot \frac{\partial a_1}{\partial p_y^x} + \frac{\partial u}{\partial b} \cdot \frac{\partial a_2}{\partial p_y^x} = 0 \quad (58)$$

and:

$$\frac{\partial u}{\partial d_{pr}} \cdot \frac{\partial a_1}{\partial p_y^x} = - \frac{\partial u}{\partial b} \cdot \frac{\partial a_2}{\partial p_y^x} \quad (59)$$

This can be found in the solution of the Lagrange function. For the initial utility function with two constraints, it is as follows:

$$L(d_{pr}, b, \lambda) = u(d_{pr}, b) - \lambda(a_1(p_y^x) - d_{pr}) - \lambda(a_2(p_y^x) - b) \quad (60)$$

The meaning of these equations is quite obvious. Both administrative and institutional maintenance of the procurement price at a given level should be associated with a balance of two variables. Firstly, there is support from the government (political benefit) from farm producers as beneficiaries who obtain income benefits from the procurement price level (58) on the one hand. Secondly, on the other hand, there is a loss of support from consumers (part of the society) who bear the burden of maintaining the procurement price (taxes, higher spending on food consumption), as shown by (59). Naturally, this is a hypothetical assumption and, in a way, stylised to show the essence of this issue. Presently, this support is provided outside the procurement price through direct payments, as shown in the first formula in this part of the analysis. However, the essence of the political support mechanism is the same.

Summary

On the basis of the logical and formal analysis, we have demonstrated that there are certain acceptable inequalities which condition the conclusion of a transaction between the producer and the processor on the basis of a given procurement price level. Both entities refer to a given procurement price level from the point of view of its role in their goal functions. For the farm producer, the procurement price is a component of revenue and its level shapes the amount of revenue which is related to production costs in exercising the goal function. For the agri-food processor, the procurement price level has an impact on the production costs of obtaining a given volume of the final production. The processing costs are subject to minimisation. The producer wants the procurement price level to be as high as possible, while the processor wants it as low as possible. Basically, it determines their expectations in relation to the procurement price level shaped on the market. We assumed that the agricultural market is in competitive equilibrium and hence both en-

tities are price-takers. If the conditions in the acceptable inequalities are met, both parties gain certain mutual benefits based on their expectations, and the transaction takes place without a loss to either of the parties. The amount of these benefits, in a relative sense, is in fact determined by the market and individual production efficiencies of both entities. These individual production efficiencies are crucial. Hence, *inter alia*, the explanation as to why under given market conditions it is profitable for some and not for others. This article conveys a theoretical and cognitive message. It fills in the cognitive gap in this regard. The empirical verification of the derived formulas is not easy, but it can be the subject of a separate analysis.

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DOPUSZCZALNY POZIOM CENY SKUPU DLA PRODUCENTA I PRZETWÓRCY ROLNO-ŻYWNOŚCIOWEGO

Abstrakt

Celem analizy w artykule jest wykazanie, iż dla danej ceny skupu istnieje pewna równość dopuszczająca wzajemne korzyści producenta rolnego i przetwórcy rolno-żywnościowego. To pozwala zawierać transakcje przy tym poziomie ceny skupu, który jest dopuszczalny i obustronnie akceptowalny ze względu na te korzyści. Korzyści nie muszą być równe, stąd pojęcie: nierówności dopuszczające. Pokazane są podstawy do oczekiwania poziomu ceny skupu, a zatem i korzyści z perspektywy producenta i przetwórcy. Wynikają one z ich maksymalizowanych funkcji celu. Obie strony są cenobiorcami dla ceny skupu ustalonej na rynku skupu, z pewnym odniesieniem do jej administracyjnego ustalenia. Hipoteza o nierówności dopuszczającej udowodnienia jest w analizie logiczno-formalnej z wykorzystaniem zapisów i reguł algebry. Problem ten w literaturze w zasadzie nie był podejmowany.

Słowa kluczowe: dopuszczalny poziom ceny skupu, nierówności dopuszczające, funkcja celu producenta rolnego, funkcja celu przetwórcy.

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