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## Qualitative growth of social welfare for heterogeneous markets

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### Abstract

In this work we study the influence of the quality of products in the consumer surplus. The mathematical models describing the change in consumer surplus by increasing the level of quality of consumed products are produced. Presents a graphical representation and reasoning transformations occurring in the economy. The theory of high-quality consumer surplus is developed.

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**Key words:** quality, demand, consumer surplus, high-quality consumer surplus, welfare, the surface of demand, the multiplicative effect

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### 1. Introduction

On the basis of revealing of interconnection between theories of welfare and markets of imperfect competition, by quality non-homogeneity of goods and services, consumers and producers there determines the influence of public welfare on mechanisms of imperfect competition market and their adverse effect on public welfare which includes stimulation of demand and growth of welfare on the basis of rising level of quality of produced and consumed goods and services. Thus it broadens the sphere of research of welfare

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theory on the basis of «defrosting» and activating of the most important welfare factor - quality, which is captured by Marshall's theory in sphere of assumption - «other things being equal».

On the basis of author's classification of goods on the grounds of changeability of quantity and quality, preferability and information awareness, introduction and widening of terminology of different types of goods, including free goods of limited quality, goods of changeable quality and quantity, goods, which quality can be checked before consumption, goods, which quality can be checked during the process of consumption and others, in the work there substantiated and systemized the reasons of forming of quality non homogeneity of objects and subjects of management, consisting in their layering by consumption and producing of different quality level, time and geographical area of their production and selling. Thus there reveals the condition of rise of quality goods and services on market, which comes down to excess of rise speed of quality producer's surplus over rise of speed of expenses, connected with providing the given quality level.

All this allowed introducing a hypothesis about existence of the fourth theorem of welfare, the essence of which includes in that the rise of quality level of produced and consumed goods in economic system leads to multiplicative rise of individual and public welfare by stimulation of supply and demand. Thus unlike the well-known fundamental theorems of welfare, solving the problem of optimal distribution or redistribution of already existing wealth, the fourth theorem is connected with solving of public welfare rise as a result of rise of quality consumer and producer excesses provided by the rise of goods quality.

It is known that with the violation even of one conditions of perfect competition the market there appears imperfect competition when producers-sellers are inclined to present, with the help of packing and external design their homogeneous goods like heterogeneous, broaden the sphere of preference, using favorable geographical position, temporal situation, etc. Inequality is also created by advertisement.

All this at our point of view stipulates non homogeneity of goods and services. In turn non homogeneity of producers-sellers connected with quality difference of technologies, labor-power, and other factors of production. Non homogeneity of consumers is determined by social-economic levels, including difference in income, taste, preferences, gender characteristics, etc.

On non-homogeneous markets there appear monopolistic and oligopolistic competition, both between sellers and buyers. The given thesis in work can be substantiated as follows. In condition of perfect competition goods on market is homogeneous, and in conditions of monopoly goods don't have substitutes, which also provides their homogeneity. As a result of this consumers, regardless of their preferences and income become homogeneous in consumption of homogeneous goods.

The theory of non-homogeneity in our understanding is the basis of the theory of information asymmetry. As it is known asymmetrical information is provided by the absence of information of subjects of management that come into relations. This situation appears on market as a result of non-homogeneity of subjects, namely their tastes, preferences, actions etc.

As a result of studying of conditions of transition to social-oriented economy and different forms of non-homogeneity we made a conclusion of impossibility of development of public welfare theory in the framework of classical and neoclassical theories of markets.

## 2. Method

In the framework of the research made in this work, consumer surplus, taking into account the most important factor - the quality of goods, leads to the necessity of studying of demand and qualitative consumer surplus in three-dimensional space of factors price-volume- quality. Thus studying of these important categories is carried out in space i.e. they are out of two-dimensional subspace limits.

Let's take single product for which manufacturer chooses two real numbers: price  $p$  and quality  $g$ . Let  $p = P(Q, g)$  - inverse function of demand, i.e. the price which creates demand for  $Q$  product units with the quality level  $g$ . It is desirable to provide quality inasmuch as price -  $P$  is growing by  $g$ . Let  $C(Q, g)$  - costs

overall for production of Q product units with quality level g. It is natural to suppose that costs overall C will grow by quality g.

The choice of the quality level by competing firm is made to maximize the difference between overall consumer surplus and production costs. Taking quantity and quality as variables, competing firm maximizes public welfare:

$$W(Q, g) = \int_0^g \int_0^Q P(x, y) dx dy - C(Q, g) \quad (1)$$

Where the expression of integral - is overall consumer surplus, described by demand curve with changing quality level 0 to g and changing volume 0 to Q.

Qualitative consumer surplus - is money indicator of consumer's income, obtained as a result of purchase of product unit with changeable quality level which includes amount of price surplus. Thus price surplus can be considered with changing volume. As it seen qualitative surplus depends on volume and quality.

Qualitative consumer surplus is a volume under the surface of three-dimensional function of demand lying between two plains, determined by two price levels, parallel to plain of axis of volume and quality on graph of three-dimensional function of demand.

Each level of these two prices is corresponded by surface of parallel plain of axes of volume and quality, limited by the line of intersection of these plains with inverse function of demand.

It's notable that other types of consumer surplus can be introduced analogously for example, from factor of consumer's income, preferences etc. The offered methodology allows introducing consumer surplus for the space of factors, more than three.

Therefore in work, consumer surplus of A Marshall in plain price-volume is called consumer surplus of the first order, and consumer surplus in three-dimensional space of factors price-volume-quality - consumer surplus of the second order or qualitative consumer surplus.

Analogous research in work is made concerning qualitative producer surplus which appears as a result of increment of A. Marshall's producer surplus with increment of goods quality level.

In the well-known literature sources there closely considered only dependence of supply volume on one factor only - on price, in presupposition about constancy of all other factors. However such factor as quality, in modern period of development of science and technologies appeared to be very mobile.

In space and time, location of producers on market, offering their goods of the certain quality level is not equal. For example some of them produced many goods of low quality, the others - less goods of high quality. Then expenses of producers on product unit of appropriate quality are not equal. Expenses rise with the rise of product quality level

In work there was obtained the following dependence: producers-sellers increase volume of supply of goods with the rise of price, lowering of quality and competition, which connected with decrease of expenses for providing the given low quality level and competitiveness of goods. The largest volume of supply is reached with maximal price minimal possible quality level and competitiveness requests of goods. And vice versa the least volume of supply is reached with minimal price and high quality of goods and competitiveness requests. At the same time the volume of supply increases with the growth of demand level on high-quality goods.

### 3. Consumer benefit

Studies of price in consumer surplus (consumers surplus) paid considerable attention. A. Marshall analyzed the extent to which «the price actually paid for the item, reflecting benefits arising from the possession of it. Price paid by individual for any item, can never exceed, and seldom reaches the level at which the customer better pays for it than to be without it, as a result the satisfaction derived from the

purchase of the thing, is usually higher than that from which he refuses, paying its price, and so he gets surplus satisfaction from buying process. The difference between the price that a buyer would pay, just not to get along without this item, and the price that he pays for it in fact, represents a measure of its economic extension of satisfaction. You can call it a consumer surplus.

Ludwig von Mises: The difference between the price one must pay for the goods and the maximum amount that he is ready to pay is called the consumer's surplus. You can call it a consumer surplus. In economic theory, there even was a case where many economists were against that very concept of consumer surplus. For example, Professor Nicholson made objecting to the concept of «consumer surplus» and prof. Edgeworth responded to them in the same journal. Prof. Nicholson writes: «What is the point to say that the utility of income (say) £ 100 a year worth (say) £ 1,000 a year? «There is no sense in such statement».

In future, the term «consumer surplus» in economic theory was replaced by A. Marshall to the new term - «economic surplus» (also known as total welfare or Marshallian surplus after Alfred Marshall), which implies an additional satisfaction or utility derived by consumers due to the fact that the actual price they pay for the goods below the price they would be willing to pay.

In modern economic literature, the term benefit of consumers is used represented by the difference between the maximum amount of money that consumers are willing to pay for a given quantity of the goods and their actual costs, based on current market prices for these goods. For consumers in total - it is the area between the demand curve and the line of market price (Fig. 1).

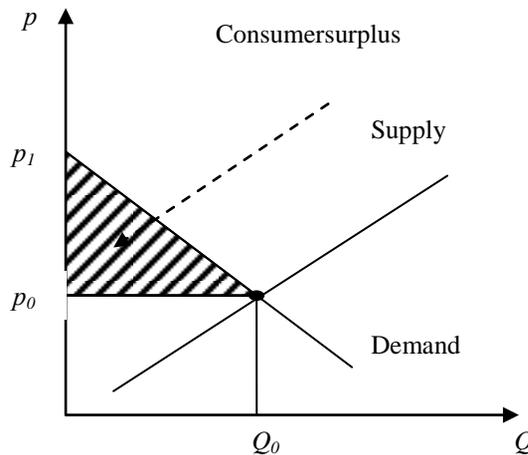


Fig. 1. Consumer surplus

If discriminating monopolist could assign to each item a separate price that reflects the maximum amount the consumer is willing to pay for it, he could assign the entire consumer surplus in the form of sales proceeds. [8] Research of the market demand in this part were started by A. Marshall in graphic way. He derived demand curve for any major market. The graph represents the quality. Some time later, the economics in this area had gained extensive material and Marshall result was subjected to critical analysis of JR Hicks. «In my last article I have come to some very simple and attractive conclusions about the relationship between the adjusted measures of» consumer's surplus «and its Marshall measure in cases where we can not neglect the effects of income, but the evidence given us, though, was very broad, it was terrible, complex and algebraic».

Here, without a detailed analysis of its consumer surplus, we note an important point for our further research. The most important result of his research is that Marshall's consumer surplus is regarded as an

absolute value. Hick's concept is that the consumer surplus is relative, not absolute. Hicks emphasizes this by comparing the surplus with the movement: «We always look at the movement from one specific situation to another, we ask what increase (or decrease) of cash income, which could measure the improvement (or deterioration) of the economic income which is the result of this movement. Itself is an increase or decrease in income must be one of two things, otherwise it is meaningless ... the consumers' surplus is a convenient tool for the analysis - as comfortable as it always was, and now we have to learn to use it with more confidence and trust».

Both A. Marshall and JR Hicks consider the consumer surplus relatively to the prices variation. For example, in the case of the tax, it is necessary to consider the variation of the price, in the case of rationing consumer - the variation of quantity.

As in mentioned works, as in other studies, which we have analyzed above are going to analyze in future, the effect of variations in the change of quality level of consumer surplus has not been investigated and relating to heterogeneous markets is not a formal challenge.

In order to develop the theory of heterogeneous consumer surplus in the market of heterogeneous goods, first one should enter a condition of purchase of goods on the preferences of each customer group, which is a parameter of consumer taste  $\theta_n$  consuming  $Q_n$  or 0 items, which is characterized by the quality index of  $g_n$ .

In these circumstances, consumers have the following preferences.

$$U = \sum_{n=1}^N \alpha_n U_n, \quad (2)$$

where  $\alpha_n$  - the percentage of n group consumers.

$U$  Should be viewed as a surplus derived from the consumption of goods quality index  $g_n$ . Usefulness is separable in price and quality. All consumers want high quality at a given price. However, consumers with high  $\theta_n > \theta_{n-1}$  have a greater willingness to pay  $p_n > p_{n-1}$  for the high quality  $g_n > g_{n-1}$ .

In future, the surplus for each group will consider separately and therefore when considering the indexes of the variables will be omitted.

Modeling of the tastes distribution within each group is thinking that tastes  $\theta$  are distributed in the economy with some density  $\omega$  with integral distribution function  $F_n(\theta)$  on  $[0, +\infty]$ , where  $F_n(0) = 0$  and  $F_n(+\infty) = 1$ . Thus, the percentage of consumers that  $F_n(\theta)$  with a taste parameter less than  $\theta$ .

Therefore the density function of N consumer groups tastes is described by a mixture distribution

$$\omega(\theta) = \sum_{n=1}^N \alpha_n \omega_n(\theta), \quad (3)$$

where  $\alpha_n$  - the probability of n- component of the density function.  $\omega_n(\theta)$

Each customer consumes 1 or 0 items. This product is characterized by a quality indicator  $g$  (we use  $g$  to denote the quality of the goods or services are not to be confused with the number of quality, denoted by  $Q$ ). At the moment let's consider a single-monopoly which produces the goods of the same quality. The consumer has the following preferences:

$$U = \theta g - p \begin{cases} > 0, \\ \leq 0, \end{cases} \quad (4)$$

when  $> 0$  the consumer buys the product,  $\leq 0$  does not buy the item.

$U$  should be viewed as a surplus derived from the consumption of goods,  $g$  - a positive real number that describes the quality of the product. Modeling the distribution of tastes is the assumption that the tastes  $(\theta)$  are distributed in the economy according to some density  $\omega$  with integral distribution function  $F(\theta)$  on  $[0, +\infty]$ , where  $F(0) = 0$  and  $F(+\infty) = 1$ . Thus,  $F(\theta)$  - the percentage of consumers with less taste parameter  $\theta$ .

Another interpretation of these preferences  $\theta$  is regarded as the reciprocal of the marginal rate of substitution between income and quality, and not as a parameter of taste. As for the choice to make a purchase or not, the preferences of each customer group can be represented as follows:

$$U = g - \left(\frac{1}{\theta}\right)p \begin{cases} > 0, \\ \leq 0, \end{cases} \quad (5)$$

In this interpretation, all consumers receive the same surplus of goods, but they have different levels of income, and therefore different marginal rates of substitution between income and quality ( $1 / \theta$ ). More affluent consumers have a lower «marginal utility of income» or, equivalently, a higher  $\theta$ . It is assumed that consumers have the same preference order and differ only in terms of income. Consider the following expression separable consumer utility function:  $U = u(I - p) + g$ , where  $I$  - income consumers. (Nothing will change if you take a few more general function  $U = u(I - p) + F(g)$ , where  $F(g)$  - increasing the quality of the utility function, and this will only lead to a redefinition of the concept of «quality».) Let  $p$  much smaller than  $I$ , i.e. value of the cost of production of a particular product is low compared to income.

We derive the function of the demand for this utility function. If the price  $p$  can get the goods of only one level of quality  $g$ , then the demand is equal to the number of consumers with taste parameter  $\theta$ , that  $\theta g > p$ . In other words, the demand for a product is expressed by

$$Q(p) = Nn(1 - F(p/g)), \quad (6)$$

where  $Nn$  - the total number of consumers in the  $n$ - group.

If the market offers several products that differ in terms of quality, consumers along with a selection of quality products also decide whether to buy a product at all (assuming that they have a single demand, i.e. consume no more than one unit of product, regardless of quality). For example, assume that the two levels of quality goods  $g_1 < g_2$  sold at  $p_1 < p_2$ . (The inequality in prices causes a trivial task, because the goods of poor quality, which is more expensive product quality, will never be bought.) Let us state the assumption that the «quality per ruble» above for a product with quality level  $g_2$ , i.e. the following inequality:  $g_2/p_2 \geq g_1/p_1$ . In that case, if consumers and make a purchase, one always prefer the quality level of quality  $g_2$  and  $g_1$ :

$$(\theta g_2 - p_2) - (\theta g_1 - p_1) = p_2 \left(\frac{\theta g_2}{p_2} - 1\right) - p_1 \left(\frac{\theta g_1}{p_1} - 1\right) \geq (p_2 - p_1) p_1 \left(\frac{\theta g_1}{p_1} - 1\right) \geq 0, \quad (7)$$

if  $\theta g_1 \geq p_1$

The demand for high quality goods is then:

$$Q(p_1, p_2) = N \left( 1 - F\left(\frac{p_2}{g_2}\right) \right) \quad (8)$$

and the demand of low-quality goods will be zero. More interesting is the case when the goods are of poor quality is not «dominated». Then the consumer with taste parameter greater than  $(p_2 - p_1) / (g_2 - g_1)$ , buy high quality goods because  $\theta g_2 - p_2 \geq \theta g_1 - p_1$  we find that  $\theta \geq \bar{\theta}$ , and consumers with taste parameter below  $\bar{\theta}$ , but above  $p_1 / g_1$ , buy the goods of poor quality, and the others are not buying it. Thus, the demand functions are as follows:

$$Q_2(p_1, p_2) = N \left( 1 - F\left(\frac{p_2 - p_1}{g_2 - g_1}\right) \right) \quad (9)$$

and

$$Q_1(p_1, p_2) = N \left( F\left(\frac{p_2 - p_1}{g_2 - g_1}\right) - F\left(\frac{p_1}{g_1}\right) \right). \quad (10)$$

In some characteristics the best choice (at equal prices) depends on the definite consumer. Consumer

tastes are different, for example, the design and shape of the goods are a good example. Another example is the location. For example, consumers of real estate or of any other commodity will choose a convenient area or nearby shop or supermarket. In the case of such «horizontal» or «space» there is no differentiation of the «good» or «bad» products.

Products with quality conditions  $g_0$  and  $g_1$  can be considered as two goods. First, let's consider the market goods with quality level  $g_0$ . In this case, the demand for this product is reduced by raising its prices and does not depend on the prices of other goods and the income of the consumer. Without loss of generality, we can consider the case of a quasi-linear utility functions.

$$U(Q_0, Q_1, Q_2, \dots, Q_m) = Q_0 + \sum_{i=1}^m V_i(Q_i) \tag{11}$$

where  $V_i$  - increasing and concave functions. Utility maximization is carried out in case of the budget constraint

$$Q_0 + \sum_{i=1}^m V_i(Q_i) \leq I \tag{12}$$

where  $I$  - consumer income which gives  $\frac{d_i V_i(Q_i)}{dQ_i} = P_i$  for all  $i$ .

Then the function of each consumer goods demand and, consequently, the demand function of all consumers, satisfies all the conditions of the demand function. In this case, the consumer surplus is defined by triangle area -  $A_0r_0S_0$  (see Fig. 2) located between the demand curve and the horizontal line of the equilibrium price  $p_0$ . The proof of this provision can be found, for example, in the work of Marshall and J. Hicks.

This area is a measure of the amount that consumers are willing to pay above the already consumed  $(P_0, Q_0)$  for the right to use  $Q_1$  commodity units. This is explained on the basis of the demand curve  $D_1$ , consisting of a large number of single (individual) demand (Fig. 2).

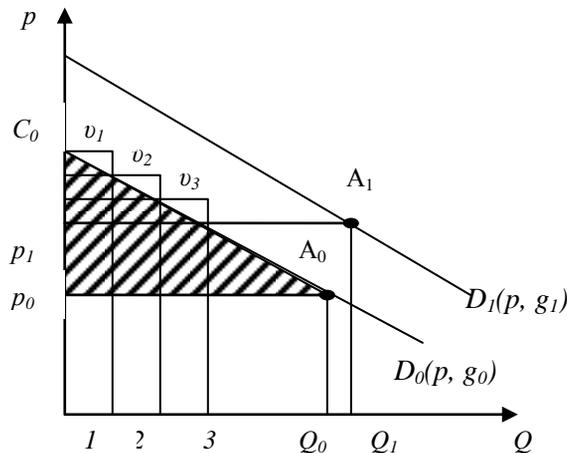


Fig. 2. Consumer surplus with the price  $p_0$  and the quality level  $g_0$

In other words, in the case of great number of consumers who buy either zero or a unit of a good. Consumers are heterogeneous in the sense of monetary terms, their value judgments or the degree of willingness to pay  $V_i$  for quality goods  $g_0$  are different (i.e., in the case described above, the quasi-linear

utility function  $V_i$  is a step function for each consumer, equal to zero when consumption of goods is less than one, and equal to one consumer willingness to pay for the product  $i$ , where consumption is equal to or greater than one. Fig. 3 users are in descending order of estimates  $V_1 \geq V_2 \geq V_3 \geq V_1 \dots$  User rating  $V_i$  buys when  $V_1 \geq p_0$ . Each  $i$ - consumer sells surplus  $V_i - p_0$ , including the last  $n$ - customer, the implementation of the surplus which is virtually absent. In this case, the total consumer surplus equals

$$S_{nom}(g_0) = \sum_{i=1}^{n-1} (V_i - p_0) \tag{13}$$

If  $n$  is large, the demand function can be represented by a continuous demand function  $D(p, g)$ . Then the net consumer surplus in  $g_0$  equal to the integral

$$S_{net}(g_0) = \int_{p_0}^{\bar{p}} D(p, g_0) dp \tag{14}$$

where  $\bar{p}$  means the price of failure (choke - off price) - the lowest price at which there is no demand. [9] In the discrete case it is equal to  $V_1$ , but can be assumed to be infinite in saving the formula.

Next, in order to summarize the results of well-known works, let's consider an increment of quality goods from  $g_0$  to  $g_1$ , i.e. the case  $g_1 = g_0 + \Delta g$ . Thus the price  $p_1$  creates demand  $Q_1$  of items with quality level  $g_1$ . It is desirable to improve the quality of the measure to which the inverse demand function  $p(Q, g)$  increases with  $g$ . At a total cost of  $C(Q, g)$   $Q$  for the production of items with quality level as  $g$  increases. Obviously, the choice of the number and quality of goods is carried out by the manufacturer so as to maximize the difference between the gross consumer surplus and production costs. (Eg, a monopolist), increasing the level of quality on  $\Delta g$  may increase the price from  $p_0$  to  $p_1$ , while maintaining or improving the previous level of utility.

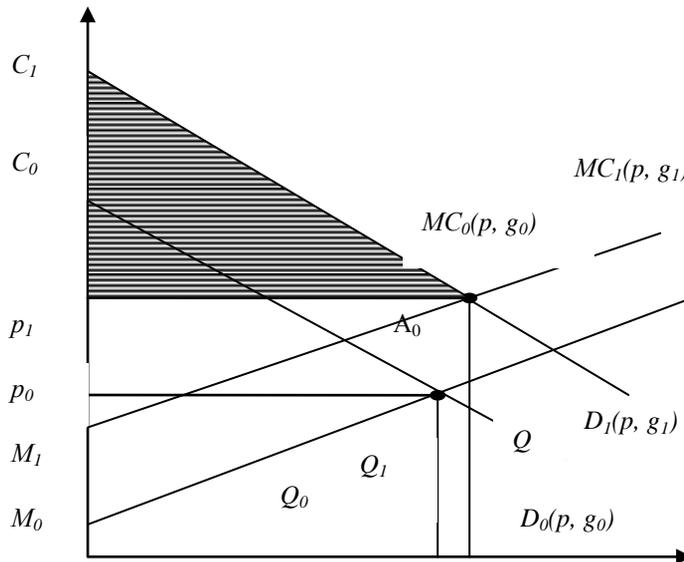


Fig. 3. The change in consumer surplus for the increment quality  $g_1 = g_0 + \Delta g$

In addition, the stimulus quality of the monopolistic producer is connected with the marginal

willingness to pay for the quality ultimate consumer, because the consumer will increase the income which is equal to  $Q_1 p_1 (Q, g_1) \Delta g$ , which means a shift of the demand curve  $D_0 = D(p, g_0)$  to  $D_1 = D(p, g_1)$ .

As a result of the demand curve shift, there occurs a new area equal to the area of a triangle  $A_1 p_1 C_1$  that characterizes the consumer surplus. In addition, as indicated by Fig. 4, the increase in quality is a price increase on the value of  $\Delta p = p_1 - p_0$  and the increase in consumption  $\Delta Q = Q_1 - Q_0$

A gross consumer surplus  $S_{gross}(g_0)$  is equal to the sum of net consumer surplus and cost  $S_{gross}(g_0) = p_0 D(p_0, g_0)$  and  $S_{gross}(g_1) = p_1 D(p_1, g_1)$ ,

The increment of quality shifts the demand curve to the right up, which is accompanied with a simultaneous increase in the maximum possible price and equilibrium price and the equilibrium quantity demanded of goods, i.e. multiplicative effect change in consumers' surplus and, therefore, the multiplicative effect of a change in consumer welfare, equal to the difference of areas of triangles  $S(A_1 p_1 C_1)$  и  $S(A_0 p_0 C_0)$ . As a result, the surplus (or profit) of consumers increases. This makes it possible to determine the welfare gains as a result of the quality from low to high levels.

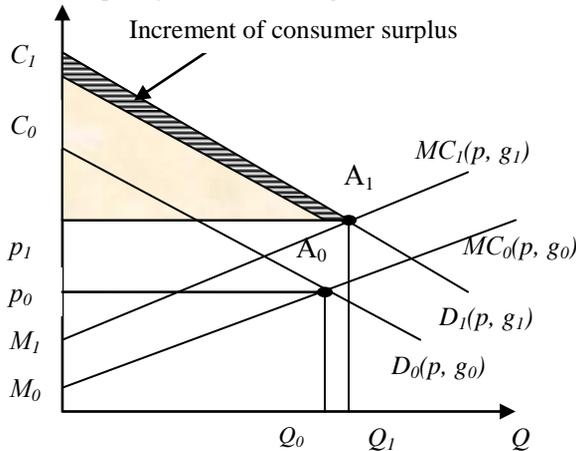


Fig. 4. Increment of consumer surplus increment of quality

For example, the absolute increase in consumer welfare characterizes the size of its increase for a certain period of growth quality. It is equal to the difference of two compared consumer surplus and expresses the absolute growth rate of the growth of the welfare level of quality. Compare levels of consumer surplus  $S_i = S(p_i, g_i)$  are determined by the area under the demand curve  $D_i = D(p_i, g_i)$  which are bounded below by the equilibrium price  $p_i$ , where the index values  $i = 0, 1$ . For the case of linear demand  $S_i = 1/2 (C_i - p_i) Q_i$ , where  $C_i$  - the maximum possible price,  $p_i$  - the equilibrium price at a level of quality  $g_i$ ,  $i = 1, 2$ , the product  $C_i Q_i = \Pi_{max i}$  and  $p_i Q_i = \Pi_{eq i}$ , represent a net consumer surplus and the cost of the purchase of a good quality  $g_i$ .  $1/2$  factor also has economic sense, as it describes only part of the consideration of the welfare of the population, i.e. consumers.

Net consumer surplus is the difference between the gross surplus of consumers and the costs for a given level of quality.

Gross surplus of consumers is the maximum possible value of consumers' surplus. It is equal to the product of the highest possible price and the equilibrium consumption of the product quality.

Expenditure is equal to the product of the equilibrium price and the equilibrium consumption of the product quality. After the introduction of these new concepts for the case of linear demand, we can also determine the welfare gains associated with the increase in the level of quality of the goods consumed.

Welfare gain of the linear increase in the quality of demand consumption goods is determined as the difference between growth in gross surplus and the cost increases when the equilibrium price and volume with the change (increase) the quality from low to higher levels. It should be noted that the gross surplus is not less than the cost of consumption, because otherwise there is no use for customers to buy a quality product.

AJ Dupuis, being a precursor of marginalism, developed the theory of «excess price.» In his article, «The Measurement of useful public work» excess price he described as money meter of maximum income arising from the ability of consumers to buy each item for the same price. In contrast to Dupuis and Marshall, who considered the price surplus under the principle of «all things being equal», we propose to extend the theory of consumer surplus to the conditions of change and the impact of product quality on consumer surplus.

#### 4. Conclusions

The study showed that the term «consumer surplus» was used to refer to the area under the Marshallian demand curve between the two price levels. This monetary measure of consumer benefit or in other words it is a net loss, he would bore if purchased goods at the price, which he was ready to pay, in other things being equal. At the same time the consumer surplus is an approximate exponential of welfare changes.

This definition seems to be limited, because it does not account changes in the quality level of commodity, which is its main characteristic.

The level of quality is variable quantity. Therefore, the study of consumer surplus can not consider the quality of the goods in the form of a constant, as in the works of neo-classical economists. The quality factor is not subject to the principle «ceteris paribus» - other things being equal (conditions).

In the most general case, the consumer surplus is equal to the value of that is between the two planes formed by the two levels of prices and axes parallel to the plane of volume and quality. As a rule, the lower plane is the equilibrium price and the upper plane - the maximum price.

The maximum value of the consumer surplus is equal to the volume under the surface of demand, bounded below with the plane defined by the equilibrium price.

Thus, consideration of the consumer surplus in a new methodological approach, namely with regard to the most important factor - the quality of the product makes it necessary to study the supply and qualitative consumer surplus in the space of price-quantity- quality factors. The study of these major categories are in space, i.e. are outside the plane.

In our view, a qualitative consumer surplus is equal to the volume under the surface of three-dimensional function of demand and placed between the two planes defined by the two levels of prices, parallel to the plane of the axes of the volume and quality.

Each level of the prices of the two surfaces parallel to the plane of the axes of the volume and quality, limited line of intersection of these planes with the price demand function.

It should be noted that in the same way can be introduced other types of consumer surplus, for example, the factor of consumer income, preferences, etc., and you can also enter the consumer surplus for the space of factors more than three.

Thus, the consumer surplus in the price and volume space may be called consumer surplus of the first order, and the consumer surplus in the space of price-quantity-quality factors is the consumer surplus of second order or qualitative consumer surplus.

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