Emerging Markets Queries in Finance and Business

Qualitative selection and differentiation of the benefits

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Abstract

In work are investigated questions of interrelation of quality and demand and are considered concepts, which limiting utility, quality and demand. This task is connected with economic alternatives which arise in any economic decision making process, in particular, because of the need of increase of return from scale for producers or increase of total utility for consumers – for growth of public welfare.

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1. Introduction

One of the fundamental problems of any economic system is distribution and selection of produced and sold goods. This task is connected with economic alternatives which arise in any economic decision making process, in particular, because of the need of increase of return from scale for producers or increase of total utility for consumers – for growth of public welfare.

In article, it is considered how the producer of goods of various qualities carries out the choice; also questions of interdependence from possibility of their realization and price behavior are investigated. In this paragraph will consider how the producer makes choice of goods on the assumption that characteristics of goods are known to consumers before its purchase, i.e. information about the quality of the goods is known before its purchase. Therefore the producer can offer too high or too low quality and more or less variety of goods to public needs. Thus the producer has no reason to choose the best goods because it is difficult and
sometimes impossible to determine the price behavior of consumers and, therefore, it is impossible to allocate deviations from an optimum without the analysis of preferences of consumers and the production technology.

In addition, we will consider the goods characteristics of that consumer know only after their acquisition ("experience goods"). The main questions connected with such goods, are the following: are there incentives for producers to ensure the quality and such variables, as the price and the advertising pass any (indirect) information on it? The main incentive for quality assurance is possibility of repetitive consumer purchases which induces firms to maintain a level of quality in order to avoid damage to their reputation and to lose possibility of sales in future.

2. Method

As is known, it is difficult to find satisfactory definition of the concept of an industry or market. On the one hand, the two goods are almost never perfect substitutes (in the sense that it is indifferent to all consumers which of goods to buy if they have the same price). Goods usually differ in some characteristics. On the other hand, the group of goods in economy ("branch") is always in interaction for some extent with other goods; pricing on the goods which aren't included to this branch, influences on demand for goods in this branch not only through income effects, but also through substitution effects. The concept of branch is an idealization or a marginal case.

There is a question how to describe the differences between goods of one branch. This question, in particular, was under consideration of Hotelling, Chamberlin, Lancaster. As shown in J.Tirole's work the goods can be described as a set of characteristics: quality, location, time, availability, existence of information by consumers on existence of goods and its quality, etc. Each consumer classifies goods by a set of variables.

Having all potential characteristics of the goods, it is possible to get its complete description. As in empirical, and theoretical work researchers are focusing on a small subset of characteristics and on special (and if it is possible, reasonable) description of preferences. There are three types of the commonly used situations.

In vertically differentiated space of goods all consumers agree on the most preferable set of characteristics, and generally and the ordering of preferences. Quality – a typical example to that. Most agree that the higher quality is more preferable; for example, "Volvo" car is more preferable than "Hyundai". Nevertheless, the most part of consumers can continue to buy the last. The income of consumers, cars prices and their service define a final choice of consumers. In the same way smaller and more powerful computer is more preferable than bigger and less powerful. At the equal prices natural grading characteristics on space is important.

Goods defined by characteristics, which consumers prefer. Preferences of consumers can be non-uniform in relation to characteristics. When considering horizontal and vertical differentiation’s models it supposed that consumers buy only one product, in other words, they do not get extra utility from consumption of various goods. On the contrary, it can be assumed that consumers can consume more goods; moreover, the only thing that all of them are interested in goods is its characteristics. For example, assume that the consumer is interested in protein and vitamins load in foodstuff. If unit of foodstuff 1 contains two units of a protein and one unit of vitamins, unit of foodstuff 2 – one unit of a protein and two units of vitamins and unit of foodstuff 3 –one unit of each, the consumer is indifferent in a choice between one unit of foodstuff 1 and 2 and three units of foodstuff 3. In other words, the consumer, finally, are only interested in characteristics of set of goods, i.e. only in the sum of characteristics of set of goods. For the first time this approach was used by Lancaster.

The approach "goods – characteristics" makes sense in some cases. For example, buying electro bulbs consumers primarily interested in the total number of hours during which bulbs will work. Ability to summarize characteristics is the key to this approach. In some situations this approach is less useful, particularly in the indivisibility of consumption, as in the cases of vertical and horizontal differentiation considered above. Then the model of Lancaster has to be corrected.

As Rosen notes, "two cars six foots long each aren't equivalent to one car of twelve foots in length as they
cannot be managed at the same time" (or "because that violins two, they don't become a Stradivarius violin"). Rosen departs from the concept of Lancaster, assuming divisibility exist. Consequently, "the hedonic prices", making a total cost of a set of characteristics, cannot be linear on quantitative values of characteristics even in the conditions of the perfect competition. Thus, it is impossible to calculate the goods price, by summarizing quantitative values of characteristics weighed at the prices. Individual quantitative values of these characteristics have influence on prices.

In our opinion, this last case means that volumes of supply and demand cannot be considered only depending on the price. The variety of characteristics of the goods demands consideration of the specified categories of the market in the space of all their characteristics, including, at the same time price and quality.

As noted above, approach in terms of goods, instead of characteristics is very common (for example, the main form of Lancaster’s approach assumes linear functional forms). However for annexes to the theory of the organization of the industry it can have some disadvantages. Absence of the characteristics description according that firms compete, sometimes gives a limited intuitive view about truth of preferences. As well as in case with utility function, approach can be very specific. The last considers all differentiated goods symmetrically. When the firm introduces a new product, it doesn't choose level of its differentiation to other products.

It differs from approaches of horizontal and vertical differentiation, and also from approach "goods – characteristics" that there is no concept of "remoteness", or "vicinity" in relation to other goods. In particular, this approach is not so suitable for the description of limited space. Generally, the economists who are engaged in the theory of industrial organization consider that the new product doesn't compete so closely with all and each product.

3. Result

Let's consider various ways selection of goods. Begin with selecting the quality level (vertical characteristics) of the producer. Then, consider the closely related question of whether the producer realizes too much or few products (from the public point of view).

Assume that the single product is produced and the producer chooses for it two material numbers: price \( p \) and quality \( g \). Let \( p = P(Q, g) \) – inverse function of demand, i.e. price that creates demand on \( Q \) commodity units with \( g \) level of quality. Quality is desirable in that measure in what \( P \) increases on \( g \). Let's \( C(Q, g) \) – the general costs of production of \( Q \) commodity units with \( g \) level of quality. It is natural to assume that the general expenses \( C \) will increase on quality \( g \).

Competitive firm choose the quality level to maximize a difference between gross consumer surplus and production expenses. Considering quantity and quality as the variables, the competitive firm maximizes public welfare.

\[
W(Q, g) = \int_0^g P(x, g)dx - C(Q, g)
\]  

(1)

where integrand expression \( P(x, g) \) – is the gross consumer surplus, described by a demand curve with this level of quality \( g \).

The first order conditions, i.e. equality to the zero of first derivatives at the price and quality are following:

\[
P(Q, g) = C_q(Q, g)
\]  

(2)

and
\[ \int_0^Q P_g(x, g)dx = C_g(Q, g), \]  

where interlinear indexes denote private derivatives on volume \( Q \) and quality \( g \). Equation (2) is a well-known equality between price and marginal costs. Equation (3) follows from the choice of the level of quality. It shows that the partial derivative of gross surplus on quality is equal to the marginal costs of good production with this level of quality. To understand the economic meaning of this equation, suppose that the demand function based on a large number of consumers with unit demand, and range them in the order of decreasing willingness to pay. Then \( P(x, g) \) – is the price at which to the consumer \( x \) is indifferent to buy or do not buy one commodity unit with a level of quality \( g \).

Thus, price \( P_g(x, g) \) is equal to willingness of the consumer \( x \) to pay (in monetary terms) for one additional unit of quality. On the other hand, price \( P_g(x, g) \) – is a marginal valuation of quality of the marginal user at price \( P_g(x, g) \). It follows thence limit gross surplus is equal to a goods release \( Q \) and an average marginal valuation of quality for all market:

\[ \left( \int_0^Q P_g(x, g)dx \right) / Q. \]

These results will be used further to determine the growth of public welfare from improvement of level of goods quality. The reasons of growth of goods quality are various. In particular, this may be the capital accumulation, successful application of scientific and technical progress results, development of new perspective technologies, using of more qualitative resources, etc.

Let’s allow \( g_2 = g_1 + \Delta g \) – a new level of quality, \( \Delta g > 0 \) – a positive increment of a quality level.

However the increment of a quality level leads to the goods price increase, corresponding to a quality increment. As for quantity demanded, it can increase, remain invariable or decrease depending on type of goods.

Therefore on the basis of equation (1) we can get results of an increment of public welfare on increase of goods quality level and quantity of output in the following form:

\[ dW(Q, g) = W_g(Q, g) dg \text{ or } \Delta W(Q, g) = W_g(Q, g) \Delta g, \]

where \( W_g(Q, g) \) – limit public welfare for one additional unit of quality level at a constant or variable quantity of output.

\[ dW(Q, g) = \left[ \int_0^Q P_g(x, g)dx - C_g(Q, g) \right] dg, \]

where \( P_g(x, g) \) – marginal valuation of quality and the marginal costs of providing an additional unit of quality level.

\( P_g(x, g) \) – is the price equal to willingness of consumer \( x \) to pay (in monetary terms) for one additional unit of quality, on the other hand the price \( P_g(x, g) \) – is a marginal valuation of quality of marginal user at the price \( P_g(x, g) \). It follows that a welfare gain on quality is equal to goods of quality \( dg \) increment on a difference between an average marginal quality evaluation and marginal cost of goods production of this quality level.

To determine the maximum welfare on output quantity and quality will consider a condition of the second order. Value of welfare function \( W(Q, g) \) in a point \( M(Q_0, g_0) \) is called as a maximum if it is the greatest in comparison with its value in all rather close values of point \( M_0 \). The welfare function depends from two variables–production volume and goods quality and can have a maximum only in the points lying in function area of welfare. There all its partial derivatives of the first order are equal to zero of the second order condition.
too.

The second order condition is determined as:

\[
\Delta = \begin{vmatrix} A & B \\ B & C \end{vmatrix} = AC - B^2 > 0 \text{, when } A<0 \text{ and } C<0
\]

(5)

where \( A=W_{QQ}(Q_0, g_0), \ C=W_{gg}(Q_0, g_0), \ B=W_{Qg}(Q_0, g_0) \), respectively the second derivatives on the volume and quality and joint derivatives on the volume and quality.

\( A=W_{QQ}(Q_0, g_0) = P_g(Q, g) - C_{Qg}(Q, g) < 0 \)

\( C=W_{gg}(Q_0, g_0) = \int_0^Q P_{gg}(Q, g)dx - C_{gg}(Q, g) < 0 \)

\( B=W_{Qg}(Q_0, g_0) = P_g(x, g) - C_{Qg}(Q, g) \)

Similarly we can consider growth of social welfare on condition of change of production volume:

\[
dW(Q, g) = W_q(Q, g) \frac{dQ}{Q} = (P(Q, g) - C_q(Q, g))dQ
\]

where \( W_q(Q, g) \) – social marginal welfare for one additional unit of quantity at an initial or invariable level of goods quality.

\( P_g(x, g) \) is positive as the partial derivative of increasing function of the price from quality.

Improving of the quality level on additional unit is stimulated by consumer demand for quality goods. In addition, the goods price on quality grows quicker, than the cost of expenses for one additional unit of quality. It is a condition of a quality level increase. Otherwise increase of a quality goods level is senseless.

At the same time positive marginal quality assessment shows the direction of social welfare growth, i.e. we find positive link between growth of goods quality and as result social welfare growth.

Thus, we obtain the new function of social welfare that establishes direct link between social welfare and a level of quality weal. It represents the sum of benefits (surplus) of consumers and producers of this quality weal in the market.

The producer is interested in the profit, not in the social surplus. Thus, he/she maximizes profit

\[
P^\prime(Q, g) = Q \cdot P(Q, g) - C(Q, g).
\]

It leads to conditions of the first order

\[
P(Q, g) + QP_g(Q, g) = C_g(Q, g)
\]

(6)

and

\[
QP_g(Q, g) = C_g(Q, g).
\]

(7)

The equation (4) is known to us as equality between marginal revenue and marginal cost that represents optimal pricing of the producer. The equation (5) determines the optimal level of quality for this output \( Q \). It claims that marginal revenue linked with increase of a quality level on unit, is equal to the marginal cost of goods production of this quality level.

The difference between the equations (2) and (4) is known; the producer is interested in influence of production volume on the price while competitive firms are not interested. It is more interesting to compare the equations (3) and (5) in this case. Interest of the producer in an average marginal quality evaluation is replaced with his interest in "marginal" evaluation to \( P_g(Q, g) \), where the first word " marginal" belongs to the consumer, and the second–to a level of quality, i.e. the marginal consumer to a marginal level of quality. It is easy to understand, as the producer considers influence of quality improvement on all consumers; the monopolist
considers influence of quality improvement on the marginal consumer. If monopolist raises the level of quality on $\Delta g$, he raises the price of $P_g(Q, g) \Delta g$, and thus keep the demand on the same level (i.e., keep the same level of marginal consumer utility). However such prices rising can extend on all premarginal consumers that generates the additional income $Q \cdot P_g(Q, g) \Delta g$.

As a result: a incentive for quality assurance is related to the marginal willingness of marginal consumer to pay for quality in a case with the producer.

The quality of some goods (for example, clothes) the consumer can check even before their purchasing. In other cases, quality can be known when the goods are bought, for example, taste of canned food or quality of food in a restaurant. There are also goods qualitative aspects of that (such as the fluoride content in toothpaste, timeliness of medical intervention) can be checked rarely, even after their consumption. These three types of goods can be called as search goods, experience goods and credence goods. Certainly, most of the goods cannot be divided on such a simple classification because they have features that are checked before their purchasing, after it or never checked.

The main question for search goods is selection of goods (their quality, variety). For experience goods the main question consists in information. How consumers learn about goods quality? What incentives forcing firms to provide quality? We will see that repeated purchases allow the consumer to exercise some goods quality control. For credence goods the information is more current question. For the obvious reasons government intervention here is often necessary.

In a broad sense search goods include "goods on a guarantee". There are no needs always check quality before purchasing. If the producer guarantees to the consumer full compensation in case of discrepancy of quality to the declared characteristics of goods, it ceases being a problem; the customer doesn't care if goods quality corresponds to the declared by the producer. It is necessary to be convinced, has the producer an incentive to give a full guarantee. It can be shown that in the continued possibilities to estimate quality (characteristics) of goods and if deviations in characteristics can be attributed to the producer completely, the last actually has a desire to give a full guarantee. At intuitive level it is supposed that in case of a partial guarantee of the producer consumers would have a suspicion and they would draw the right conclusion: the producer is afraid to give a full guarantee for the reason that his goods is defective. Therefore, the consumer would have to pay compensation. Thus, the partial guarantee is a signal of low quality. On the other hand, the system of a full guarantee induces the producer to internalize any wrong perceptions by consumers and eliminates information problems. Thus, information problem about quality can be eliminated by improved system of guarantees.

Nevertheless, in many interesting real situations the system of guarantees is missing or incomplete. If quality means durability, the goods need to be consumed so that the consumer will learn his real quality; if as usual it happens, the last characteristic of goods depends on a way of consumption and original quality of such goods, the consumer will have a problem of moral hazard: the consumer has no incentive to care of goods in the presence of a guarantee of full compensation in case of its failure (i.e. the failing of goods doesn't demand expenses from the consumer). The evident way in this case would make a consumer internalize some of the expenses linked with his behavior, and provide him a partial guarantee. As motive of partial guarantees providing can be reasons of adverse selection. For the obvious reasons goods with full guarantee involve irresponsible users or consumers with "high level of risk" whereas the goods with a partial guarantee (cheaper), are bought by consumers for whom probability to get benefit from a guarantee less.

The moral hazard and adverse selection, certainly, explain many limitations of the guarantee system. For example, it is unlikely that the producer would provide a guarantee on those parts of car that depend of the driving habits of the owner or his behavior during maintenance (for example, tires). But there are also other reasons when experience goods have the partial guarantee. Definition of a quality level can be impossible or too expensive for judicial authorities whereas the consumer still observing it. On the one hand, the perception of quality can be subjective (do colors on TV screen “meet expectations” of consumer after a year of its
working?). On the other hand, the unintended expenses can be incommensurable to a problem (the consumer doesn't make a claim to the producer at breakage of a low-priced goods). When the quality description, offered by the producer, includes many properties and/or considerable uncertainty of last characteristics of a sample of made goods, the guarantee can demand the high unintended expenses and it complicates consumer evaluation.

The producer who sells experience goods to one-time buyers and cannot provide any guarantee, nor prosecuted for defective goods, has intensive stimulus to decrease quality (if quality is linked with heavy expenses) to the lowest level as market price cannot react to unobservable quality. The minimum level of quality can be legalized by standard or by level when consumers can present convincing evidence of insufficient quality assurance. Thus, there is a "moral hazard" from the producer.

The problem of moral hazard explains, for example, why food at restaurants in some establishments is not what might be: the short duration of consumption in these places doesn't allow reputation to be important. Generally a level of goods quality that the producer chose or goods that bought once mostly will be low.

Let's consider the next simple model. All consumers are identical. They have preferences $U = \theta g - p$, if they buy a goods of the producer at the price $p$, with level of quality $g$, otherwise $U = 0$. The producer chooses the price $p$ and level of quality $g$. Specific costs of production make $Cg$ for level of quality $g$. The profit of the producer is $I - Cg$ if he sells goods with level of quality $g$ at the price $p$ and it is equal to zero if he doesn't sell goods. Assume that consumers don't get information about quality before purchase. Obviously, there cannot be a balance when the monopolist sells goods and provides its high quality. The monopolist would save $Cp - I$, by reducing quality that wouldn't reduce demand. If $c_p = 0$, balance in this model is reached at $g = 0$, and consequently, $p = 0$. If $c_p > 0$, the market disappears as consumers aren't ready to pay for goods with a level of quality zero and therefore the producer cannot cover the own expenses.

In this simple example we assumed that consumers cannot learn quality of goods before its purchase. However in certain interesting cases some consumers get information about quality of goods before purchasing. For example, the consumers carry out technical tests or develop the skills that help them to estimate quality by quick look at goods. The consumers watch television programs about qualitative and operational features of goods or read specialized publications. Other opportunity is that consumers come to the market consistently therefore at a given time some of them have information about the level of quality, and others - no.

4. Conclusions

The informed consumers have a positive impact on uninformed consumers. Being more exacting, they raise the level of quality of a producer goods. Therefore, firstly, the producer will provide high quality only at sufficiently high price. If the price is high, the producer is afraid to lose a high margin of profit on the informed consumers so low quality is less attractive. In this sense, high prices can be a signal of high quality goods for the uninformed consumers if there are also informed consumers (and producers can’t offer various quality levels to consumers of different groups).

Secondly, the more informed consumers, the higher probability that our condition will be executed. It is natural, because informed consumers don't allow the monopolist to reduce a level of quality. Thus, we conclude that increasing of the informed consumers promotes efficiency increase.

The last conclusion is offered as an argument for government intervention. Awareness of consumers depends on their relative expenses of information obtaining. Making a decision about information obtaining necessity, the consumer considers only own private expenses and benefits. The consumer doesn't take into account fact that, being more informed, he makes the producer (or allows him) to provide high quality. Thus, it
is necessary to stimulate increase of awareness of consumers more than their optimal level.

One of such incentives could be subsidizing of a specialized television programs and magazines issue.

Imperfect information is the basis of the quality problem. At the single relations the informed consumers have a positive external impact on the uninformed consumers. The government in this case can improve welfare, by subsidizing information obtaining.

References


