

Space Model in monopolistic competition – analysis of international trade

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Abstract: The article is interested in firm behaviour in the conditions of monopolistic competition and it shows the possibilities of the analysis of the firm behaviour in profit maximizing using the space model created by the contemporary microeconomic theory. This form of imperfect competition is often prevailing in the real environment.

Key words: monopolistic competition, firm, price, equilibrium, space differences

Competitiveness of the firm is closely connected to the accomplishment of equilibrium, thus maximizing profit under the condition of certain type of competition. For this research, we use some instruments of the present microeconomic theory, the Space Model of the firm in the monopolistic competition, which will be used under the conditions of increasing returns to scale.

The topic of competitiveness has its own microeconomic and macroeconomic dimension; its definition is a complicated, hitherto still not finished, task of the economic science. The contribution deals with the ability to compete under the conditions of imperfect (monopolistic) competition, thus it deals with the microeconomic dimension of competitiveness.

World economy undergoes a permanent development, connected during the last decades with a deep structural transformation issuing from the deepening specialisation which influences in a considerable way the economy and consequently also the social sphere of the whole society (Jeníček 2007).

The monopolistic competition includes some of the features of perfect competition and monopoly. Often there are many firms in the market, for which the entrance to (and the exit from) the sector is free, if they can compete by the deepened differentiation of their product or services. The determining conditions of their existence are the different consumer preferences towards the products or services of a single firm. These goods (services) can be reciprocally substituted, but not completely. They differ by several features, which are attractive for certain groups of consumers. The basic source of the imperfection of this kind is

the heterogeneity of the offered goods (services), which appears in the consequence of the differentiated consumer preferences. These preferences can result from the objective differences among products of the firms or from subjective evaluations from the side of different groups of buyers. The firms cannot affect the total market supply in any way because of its heterogeneity and the size of the firms. However, they must consider the existence of competitors, but still, their market prices and quantities are non-controllable constants. The number of firms can be even lower, but there are no interactions generated as it is in the case of oligopoly (Varian 1993).

There are different models of monopolistic competition used. One of them is the so-called Space Model. The Space Model defines the price bounds, in which the price can be set higher than average costs. If the price crosses the upper bound it causes the efflux of buyers, if it crosses the lower bound the quantity of buyers increases, because there are new buyers coming (Woll 1990).

MATERIAL AND METHODS

The goal of the contribution is to analyze the behaviour of the firm under the condition of monopolistic competition, to observe the setting of its equilibrium quantity of production and its equilibrium price. This is happening under the conditions of the increasing returns to scale, which are the cause of the increasing scale of production, while the average costs decline,

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together with the specialization on production of a lower variety of goods.

The monopolistic competition is, besides the oligopoly, a common situation in which the firms can be found at present. The conditions of perfect competition are too ideal for this situation to appear very often and the monopolies are rare. The analysis of the firm's behaviour under such conditions is the important tool for knowing the possibilities of competitiveness at the microeconomic level.

We will assume that there are two firms in the market, which are, however, too distant from each other to react to each other (for example through the changes of the price levels or supplied quantities). Next, we will assume that the goods sellers offer their products to people, who live within a certain distance from them and therefore they have to take into account the transportation costs besides the market price of the good. The buyers live in between these two firms and they are relatively equally distributed. We do not count with any other differences of the products of both firms. We consider the increasing returns to scale, which can be best visible during the international exchange. Both firms can be placed in different countries having common borders. Both firms also try to maximize their net yields (profits), as the consumers try to get the maximal difference between their utility and the incurred expenses in the form of market price. The subjects of the market (firms and consumers) thus reach, from their point of views, the optimal state.

RESULTS AND DISCUSSION

For increasing the returns to scale of production, we will use the term economies of scale. The economies of scale appear, if the growth of the production of the firm or sector leads to a slower pace of the total costs growth. The result of the asymmetric growth of production and the total costs is the decrease of the average costs in the long run.

Internal economies of scale

The internal economies of scale occur as a result of the increasing individual firm's production, which is not dependent on any changes of the other firm's sizes within the sector. The most remarkable sources of this type of the economies of scale are:

- (a) the indivisibility
 - of the technically-technological units, which causes that a certain type of equipment cannot

- of the production processes, certain production processes require certain scale of production
- (b) the enlargement of the diversity of activities allows the specialization and division of labour. Every worker has a certain capacity of the job performance and he/she has, at the same time, some specific talents, which can be used for specialization
- (c) there are many labour or production operations, which must be done no matter what is the issuing production, e.g. typesetting of newspapers does not depend on the number of copies, as a design of a product. With the increase of the products produced, the average cost for such procedure declines,
- (d) the relation of the volume and space is the next source of the economies of scale. If we need to increase the capacity x of a container to x_2 , then the space in the container y increases only to y_2 . The relation between the production capacity and costs is the same as the one of volume and space. This fact leads to a production of tankers, huge trucks or planes etc.
- (e) if, for the production of certain good, there is a need of several connected production processes and each of them has different optimal range of operation, then the total optimum is given by the lowest common multiple of the individual optima,
- (f) if the production process needs to hold reserves dependent on the volume of the final production, then the total reserve will show lower fluctuations than the fluctuations of the production.

If we use the traditional terms of the firm theory, we can say that the effect of internal economies of scale is induced by the decrease of cost in the long run. If such savings exist for very large volumes of production, it is natural, that the firms will be large and there will be a tendency to the appearance of the imperfect competition in the sector; that is the tendency of the creation of monopoly or oligopoly. The role of information is the key role.

Getting the approach to information in a proper context is a necessary, however not sufficient, condition of the really active acting. Managers must be capable to enter into the interactions with the information system, to ask new questions and to formulate new hypotheses. It requires creating of such an information strategy, which enables to establish contacts with

other managers, to use other specialist knowledge and to cooperate with them on the conclusions formulation (Šilerová and Kučírková 2008).

External economies of scale

The external economies of scale appear, if there is a growth of the whole sector or of a group of firms, for which the costs of every single firm decline. The external economies are generally classified as:

- (a) Money economies or the economies in money expenditures with unchanged technologies. The example can be the significant growth of demand after the production of a sector or after certain product and a decrease of a product's price, as a cause of external economies of scale.
- (b) Technological economies, which are the result of technologic efficiency, increased quality of production factors etc.

To show the influence of the internal and external economies of scale, we can use Figure 1.

Part of the Figure 1a shows the average cost curve of the given firm in the long run. With the growth of the quantity of production Q , the average costs decline. The firm needs, to produce at minimal average cost LAC , to adjust its capacity from Q to Q_m , which requires enough time – the long run. In the long run, the firm is focused; it pursues the goal of the minimal average costs in the long run, which allows it to realize the internal increased returns to scale. The change of the capacity of the firm is, in the graph, expressed as a move to the right, from the position A to the position B .

Part of the Figure 1b introduces the effect of the external economies of scale. In the standard theory of firm, this effect can be described as a drop of the long term average costs curve, in our graph, from LAC_1 to LAC_2 .

The difference between the internal and external economies of scale can be also shown thanks to a simple example, where we assume the existence of 10 firms in a sector. Each of them produces 100 units, thus together they produce 1000 units. Now, let the demand be double and the number of firms will double too. Each of the firms, again, produces 100 pieces. If there were savings created in every firm, we will talk about the external economies of scale and each of the firms in the long run moves from LAC_1 to LAC_2 , while keeping the production Q constant.

Reversely, if the number of the firms drops to just a half, even with the former market demand, each firm will double its production and in the long run it will adjust the capacity to this new production and it moves from the position A to the position B and it will realize the internal economies of scale.

The internal and external economies of scale have different causes for forming of the sectors' structure. In sectors, where the returns to scale are determined just by the external factors, many relatively small firms will exist and the market structure will be a perfect or monopolistic competition. The predominance of the factors leading to the creation of the internal economies of scale will lead to the forming of large firms within the sector and therefore, to some of the type of imperfect competition, probably oligopoly, but in both cases, the monopolistic competition can emerge.

Application of the presented model on the agriculture sector conditions

An example of the arisen **external economies of scale** in the agricultural sector can be the new milk processing technology PURE-LAC, the goal of which is to introduce fresh market milk with the extended expiration date into our food market. The classic pasteurized market milk often succumbs to

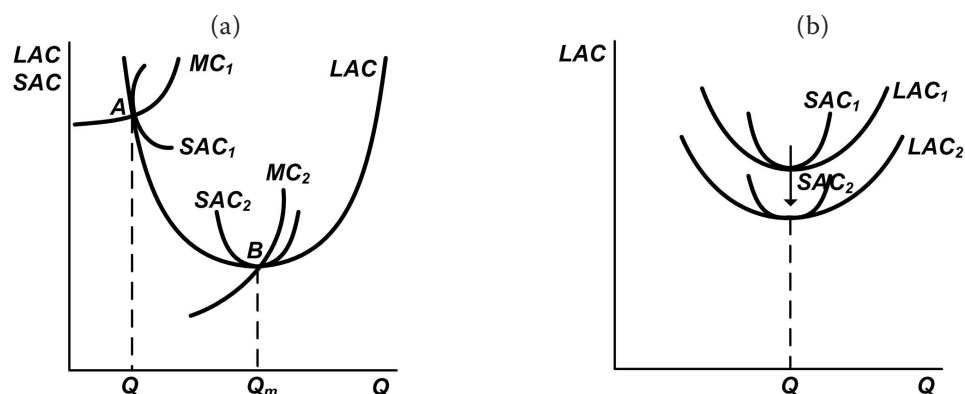


Figure 1. Economies of scale (increasing returns to scale): (a) internal, (b) external

the micro-biotic deterioration, especially under the conditions of the well-known temperature variability in cooling of the distribution chain. It occurs in many regions during the manipulation with a sensitive product while being transported or sold, as well as during the food and drink preparation in the gastronomic production units or households. This Danish-Norwegian technology concept PURE-LAC is based on a specially developed infusion chamber for raw milk processing, out of which there comes the market milk or cream. The main advantage of this technology is the elimination of the microbiological contamination by using the process of the liquidation of the hygienically, healthily and technologically unwelcome spores.

An implementation of new technologies and the following safety improvement of the food chain and the consumer's health, the fulfilment of the market demands, food quality support as well as the possibility to decrease the production costs in the production process compared to the comparable assortment, are the ways leading to the support of competitiveness. An offer of a brand new quality could lead to a commercial success and is probably the only way of remaining the position at the market. It could also lead to further desired growth of the domestic and foreign milk consumption (Agroweb 2002).

On the contrary, the example of the rise of the **internal economies of scale** in the presented sector could be the allowed acquisition of the J & T investment group in the meat products market. This group, based on the Antimonopoly Bureau (ÚOHS) decision, got the possession (thanks to Českomoravský uzenářský podnik) of two more firms, the KMOTR-Masna Kroměříž a.s. and the Vysočina, a.s., which operate in the sector of meat production, likewise the MASOZÁVOD Krahulčí, which is owned by this

group as well. The production program of the mentioned firms forms a complex assortment of meat products like different kinds of sausages, salami, hams or smoked meat.

Even after the fusion is over, the newly established subject does not possess a significant market share and, on the contrary, it faces the existence of competitors, as are the Kostecké uzeniny and the Maso Planá, which are the members of the AGROFERT group. A considerable influence on this market situation has also the presence of the chain stores, which operate not only in the role of purchasers with a substantial market power, but in some cases also as producers (e.g. the Globus) (ÚOHS 2006).

Space Model of monopolistic competition

We consider two firms with differentiated product, when both firms take the price of the competitor as a given constant.

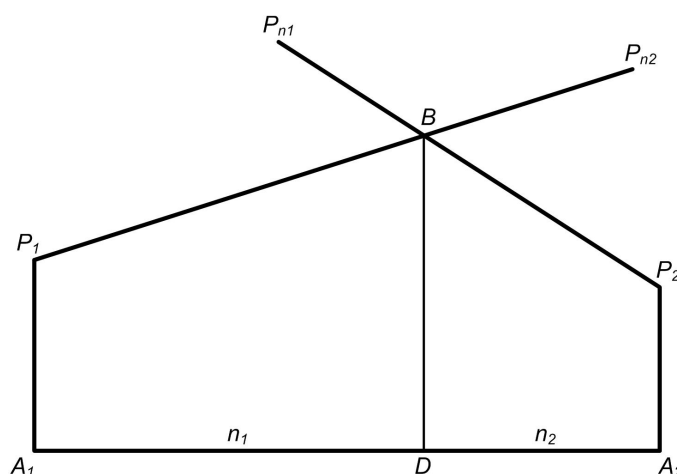
The prices of goods (services), which the two firms offer in the sector we sign as P_1 and P_2 , the distance from a buyer to the place of purchase is then n_1 and n_2 . The transportation tariff for a unit of good per one kilometre we mark as t_1 and t_2 (Figure 2).

This way, the border between our two sellers will be determined and it will define the area, in which it is beneficial for the buyer to prefer the purchase of the given good (service) of the respective firm. At this border, the total costs of the buyer are equal for the purchase in any of the two firms. Thus:

$$P_1 + t_1 \times n_1 = P_2 + t_2 \times n_2 \quad (1)$$

If the distance of the buyer from the first firm is n_1 and from the second firm n_2 , the distance between both firms must be:

$$n_1 + n_2 = n \quad (2)$$



- A_1 = sales centre of first firm
- A_2 = sales centre of second firm
- Abscissa A_1A_2 = distance between sales centres n
- $n_1 = A_1D, P_{n1} = P_{n2}$
- $n_2 = A_2D, P_{n2} = P_{n1}$
- n_1 = measured from A_1
- n_2 = measured from A_2

Figure 2. Space Model of monopolistic competition

Therefore, both distances can be, using the previous relation, expressed as:

$$n_1 = \frac{P_2 - P_1 + t_2 \times n}{t_1 + t_2} \quad (3)$$

$$n_1 = \frac{P_2 - P_1 + t_1 \times n}{t_1 + t_2} \quad (4)$$

According to the fact, that we assume an equal distribution of buyers in the given area, we can consider the demanded quantity as a direct proportion to the distance n_1 (n_2). For each kilometre, there is q^* of the demanded units of the good.

$$q_1 = n_1 \times q^* \quad (5)$$

$$q_2 = n_2 \times q^* \quad (6)$$

Now we will only concentrate on the first buyer. The demanded quantity will be:

$$q_1 = \frac{P_2 - P_1 + t_2 \times n}{t_1 + t_2} \times q^* \quad (7)$$

The quantities on the right hand side in the equation (7) are given constants, except P_1 ; thereby this is a demand function after good q_1 . In addition, we assume that the costs function of the first firm is the following:

$$TC_1 = \alpha + \beta \times q_1 \quad (8)$$

For q_1 , it is needed to substitute from the equation (8)

Marginal costs of the first firm will be (in relation to P_1):

$$MC_1 = \frac{-\beta \times q^*}{t_1 + t_2} \quad (9)$$

From the demand function (7), we derive, using the same procedure, the function of the total and marginal revenues.

$$TR_1 = q_1 \times P_1 \quad (10)$$

MR_1 has to be derived from P_1

$$MR_1 = \frac{P_2 + t_2 \times n}{t_1 + t_2} \times q^* - \frac{2P_1}{t_1 + t_2} \times q^* \quad (11)$$

Marginal revenues, in the equilibrium point, are equal to marginal costs. Therefore, the optimal quantity of the good q_1 will be the following:

$$q_1 = \frac{P_2 + t_2 \times n - \beta}{2(t_1 + t_2)} \times q^* \quad (12)$$

The equilibrium price of the first firm's good P_1 is then:

$$P_1 = \frac{P_2 + t_2 \times n + \beta}{2} \quad (13)$$

The equilibrium price and the quantity are explicitly given by the presented constant quantities. The price P_1 will be higher than the price derived from marginal costs b in case, that the firm's profit is larger than zero, thus the following relation applies:

$$\pi_1 = \frac{(P_2 + t_2 \times n - \beta)^2}{4(t_1 + t_2)} \times q^* - \alpha \geq 0 \quad (14)$$

If the price P_2 of the good offered by the second firm does not fit in the relation (14), it means, that it is not worth for the first firm to offer in the sector, because it would not reach a positive economic profit. This second price cannot be influenced by the first firm in any way; it is a given constant for it.

Except P_2 , the equilibrium price P_1 depends proportionally on the transportation tariff t_2 , on the distance between both sellers n and on the height of the marginal costs b . The entrance of the new firms would come out as a "shortening" of the distance n and it would also lead to the decrease of the equilibrium price P_1 , the equilibrium quantity q_1 and economic profit. In the long run, the competitor's price P_2 declines and the firm lowers the price of its product P_1 too.

It would stay in the sector, if it realized at least the normal profit, the point of long-term equilibrium corresponds with the situation, when the economic profit is, according to (14), equal to zero.

$$P_1 = 2 \sqrt{\frac{\alpha}{q^*} \times (t_1 + t_2)} + \beta - t_2 n \quad (15)$$

From which the outcome for the price and quantity of the first firm is

$$P_1 = \beta \sqrt{\frac{\alpha}{q^*} \times (t_1 + t_2)} \quad (16)$$

$$q_1 = \sqrt{\frac{\alpha q^*}{t_1 + t_2}} \quad (17)$$

Consequently, in the long run it does not immediately rest with the distance n . What stands out more is the function of costs and the demand formulized by the quantity q^* .

CONCLUSION

The Space Model clearly shows the common feature of the monopolistic competition. For each firm, there is a price zone with the maximal and minimal market price. Exceeding the upper market price limit causes a reflux of the buyers towards competitors; its lowering under the low price limit decreases the firms' profit down to zero. In between them, there is

a space, in which the firm is, in fact, in the position of monopoly. The price of the competitor is given. The entrance of the new firms into the sector would mean a drop down of the low price limit. This applies in the short run. In the long run, the economic profit of the firm would be equal to zero, the price of the competitor declines and the firm stays in the sector only if it is able to realize at least a normal profit. In the long run, it does not rest with the distance n , the costs and the demand expressed by the quantity q^* stand out more distinctively. In the international exchange, the economies of scale are more visible, the costs decrease and the demand increase (Frank 1995).

The firm's behaviour in the monopolistic competition can be very different and it cannot be described by using just one model. Here, there were demonstrated the possibilities of the Space Model. The differentiation of the goods or services can be connected to the differentiation of distances, which is not the assumption of presented model. It is also possible, that the firm tries to increase the range of goods differentiation to create a higher grade of market power or, reversely, to decrease it to have a good, which is more similar to other firms' goods to be able to attract their customers. Firms can also offer more composite goods (boutiques etc.). Monopolistic competition expresses itself especially in the sale of consumption goods, services etc.

In the agriculture sector production, the Space Model can be applied e.g. in the case of the pizza

delivery services into broadly deployed consumption spaces. In this case, the significant factor is the distance and the rate for delivery.

Thereby, it is important to be concerned with this type of firms.

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