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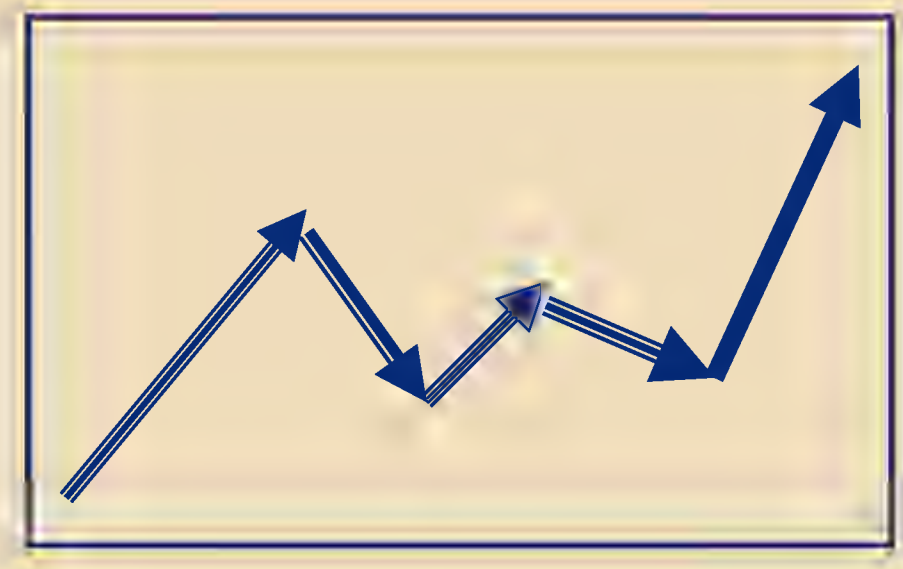
AN INTRODUCTION TO A THEORY OF MARKET COMPETITION

Volume I



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S. PIASECKI, J.W. OWSIŃSKI, AN INTRODUCTION TO A THEORY OF MARKET COMPETITION

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AN INTRODUCTION TO A THEORY OF MARKET COMPETITION

Volume I

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Chapter V

The possibilities of defending a market share

1. The strategies of defence of the share owned

The present volume I of the theory of market competition concerns the issues of defence of the previously "owned" share in a given sales market (called shortly "passive competition"). This defence consists in the continuous optimisation of the price-and-production policy of the company, aimed at achievement of the best (better than the competitors) financial effect on a given market, under the changing general economic conditions. Then, in the case of an offensive of the competitors, the defence consists in application of an appropriate sales price policy.

The analysis of the process of competition between the companies shall be limited to consideration of the price competition on the market for two competitive products, produced by two competing companies.

The first phase of passive competition – optimisation of activity, allows for transition to the second phase – the policy of price lowering, whose application is conditioned by the sufficiently ample financial reserves, their accumulation being facilitated by the optimisation. We have described the first phase in detail in the four preceding chapters.

The second phase starts, when:

- there exists a "resident" Company A, disposing of a significant share on the sales market of a product considered (say, "a"), satisfying a definite need of customers;
- a newcomer Company B enters the market, selling a cheaper, competitive product (say, "b"), which satisfies the same kind of need of the customers, Company B aiming at pushing Company A away from the market.

What should – or rather: must – in such a situation do Company A, attacked on its grounds by the competitive company B? What kind of defensive strategy ought to be applied under these circumstances?

If we assume that Company A is not able of starting at once production of a better and not more expensive product than that offered by the competitor, then the sole feasible response to the attack remains to lower the price of the product sold to date, below the price quoted by the competitor.

Let us note that the notion of "price lowering" ought to be understood in a possibly broad sense, encompassing not just a decrease of the sales price (whether retail or wholesale), but also adding of various bonuses and privileges to the product sold (like participation in lotteries with valuable prizes, entitlement to cost-free servicing, cost-free insurance, special conditions for crediting of purchase, etc.). All these instruments have the same ultimate effect, namely the total revenue from sales decreases just like in the case of a corresponding decrease of sales price.

In what follows, the notion of the price decrease shall, therefore, be taken as denoting the entire set of undertakings, entailing lower sales revenue.

In the situation, when the sale of product is threatened by the appearance of a cheaper competitive product on the market, reaction of the company, subject to such threat, must be sufficiently swift, in order to prevent the drop of sales (or to regain the market share) with possibly smallest losses of profit.

Naturally, the value, by which the price of the product is lowered, must be chosen so as to achieve the desired effect, under minimum losses. The choice of this value can be facilitated by the use of the nominal charts of the relations:

- demand-price: $\Lambda = \Lambda(C)$, and
- cost-production: $\kappa = \kappa(\mu)$.

These relations were charted for their following forms:

$$\Lambda = \lambda_{\mathrm{mx}}\left(1-\frac{C}{C_{mx}}\right) \text{ and } \kappa = \frac{Q}{\mu}+b \text{, see Fig. 5.1.}$$

In the use of the charted relations, as described in greater detail below, we must remember of the market clearing assumption, i.e. $\mu = \Lambda$.

We shall start by considering the situation of the Company A, selling its product on the given market for a long time. This market is represented by the above relation, $\Lambda(C)$, in which the values λ_{mx} and C_{mx} are known parameters, characterising the market, explained at length in Chapter I.

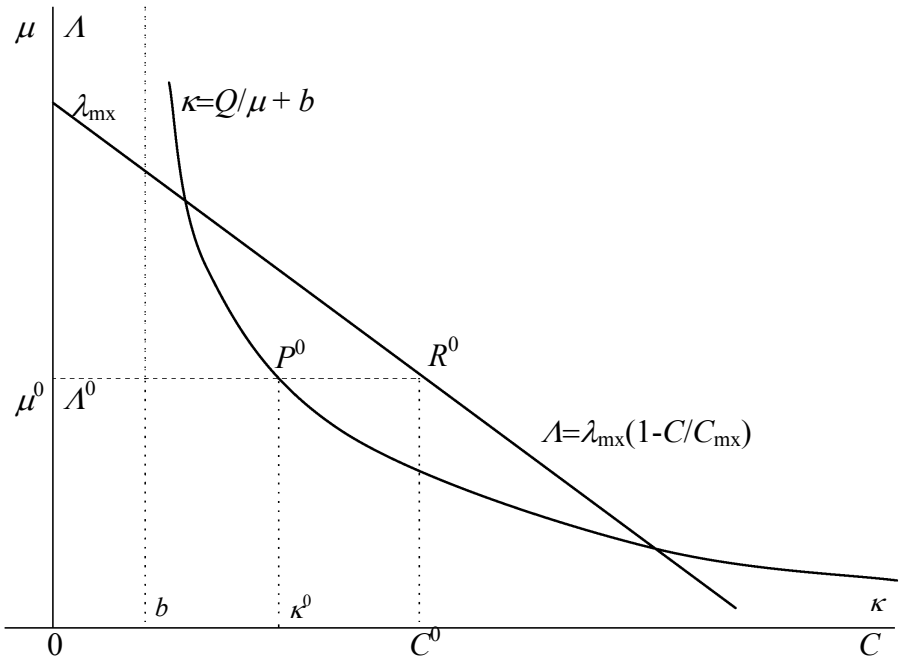

Figure 5.1. Characteristics of the market considered

Fig. 5.1 depicts the initial situation, when Company A sells its product for the price C^0, indicated on the horizontal axis, C. This

leads to the sales volume Λ^0, represented by the height of point R^0, situated on the straight line of $\Lambda(C)$.

For the production volume $\mu^0 = \Lambda^0$, the cost of manufacturing the product, κ^0, is represented in the figure by the projection of point P^0, situated on the curve $\kappa(\mu)$, on the horizontal axis.

Consequently, the area of the rectangle (0, Λ^0, R^0, C^0) represents the value of revenue, gained by Company A from the sale of its product, before the competitive product appears on the market. Analogously, the area of the rectangle (0, μ^0, P^0, κ^0) represents the cost borne in production, while the area of the rectangle (κ^0, P^0, R^0, C^0) corresponds to profit accruing from the product sale. The ratio of the areas of the two latter rectangles defines the value of the return coefficient, ε.

Assume, next, that at a certain time instant a competitive product appears on the market, sold for a significantly lower price, $C^1 < C^0$. It can be easily guessed that an increasing (actually: from zero) number of customers shall start purchasing this competitive product, while the sale of product "a" shall decrease. Assume now that after some time the sale shall drop to the half of the initial value. Such a situation is illustrated in Fig. 5.2.

In this new situation, profit of Company A is significantly lower, as represented by the area of the rectangle (κ^1, P^1, R^1, C^0).

If Company A does not react to this new situation, then, after some time, the sale of its product shall entirely disappear, as pushed away from the market by the competitor.

Assume, though, that Company A, trying to defend its position on the market, decided to lower the price of its product down to $C^1 < C^0$. Starting with this time instant the sales of the product of Company A begin to increase, up to (in the limit, i.e. in time-wise infinity) the sales value from before the competitor's entry, and even higher (namely $\Lambda(C^1)$).

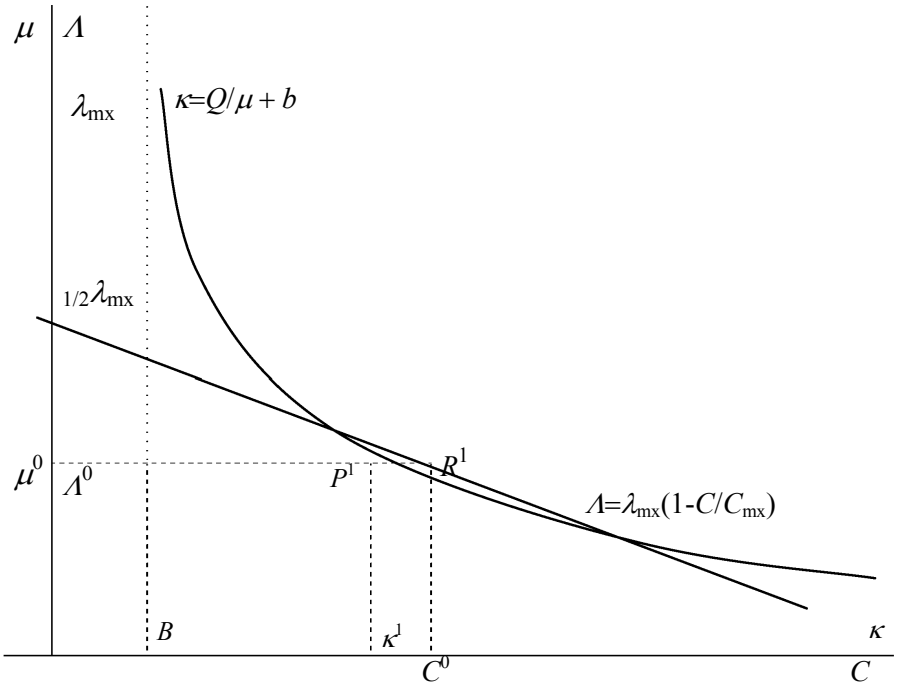

Figure 5.2. The chart for the halved sales of Company A

The situation that would arise after a not too long time, following such a counterattack of Company A, is shown in Fig. 5.3. Profit of Company A, though, would now be definitely lower than at the beginning of the "game". It would be represented by the rectangle (κ^2, P^2, R^2, C^1). Note, in addition, that if we assumed the sales price equal κ, profit would be equal zero.

In taking decisions, concerning the level of price of product, sold by Company A, all calculations, dealing with costs, profits, sales value, etc., can be performed using the chart, analogous to the one, shown in the figures here, corresponding to relation "price (cost) – (demand) production". A more general view of the chart, valid for the linear dependence of demand upon price, drawn for different values of λ_{mx} and different b, is shown in Fig. 5.4.

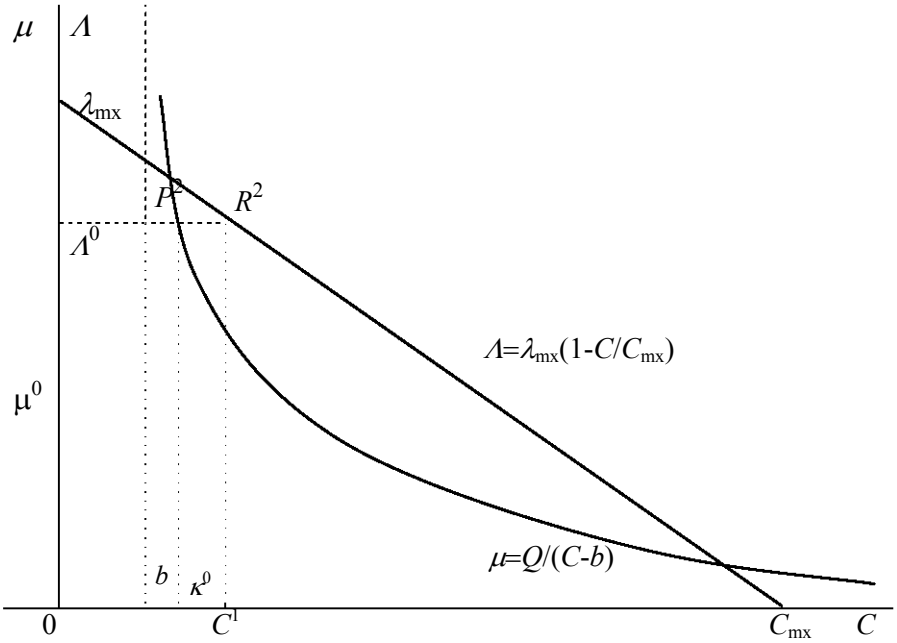

Figure 5.3. Situation after the counterattack of Company A

In any case, only an appropriate, swift reaction, here in the form of price decrease, may allow for the maintenance of the market position of Company A, but even this without absolute certainty. It might also happen that the countermove of the competitor consists in further lowering of the price, leading to a "price war".

It can be easily noticed that is Company A had been initially selling its product for the optimum price, corresponding to maximum of profit, then Company B has to bear significant losses, when selling its product for a lower price, and this for two reasons:

- it gains lower profit, by selling for a lower price (recall that we assume for both companies the same production technology and the same production costs);
- it sells product for non-optimum price, while the optimum price ensures the maximum of profit.

Company A shall, likewise, bear definite losses, due to smaller volume of sales in physical terms.

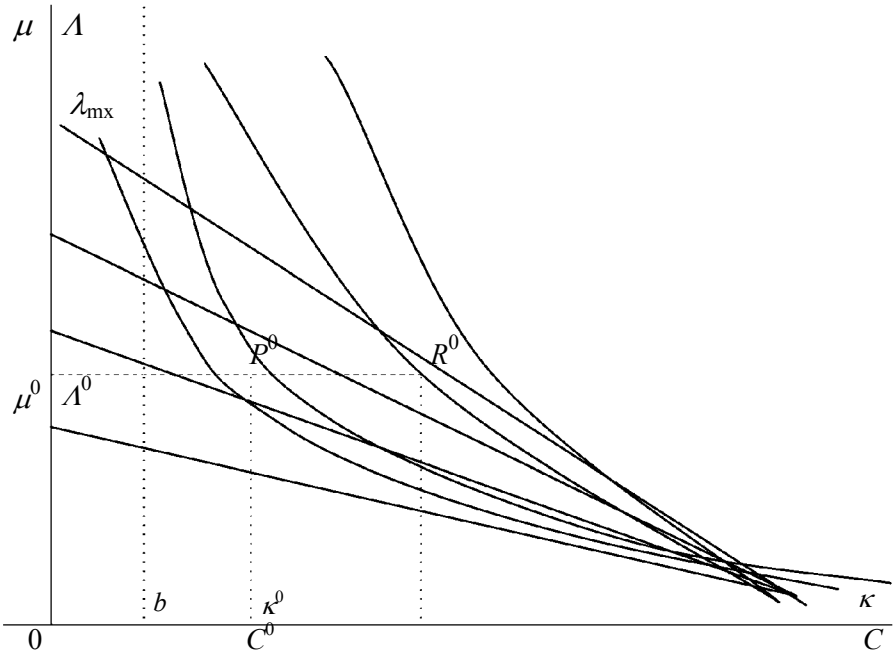

Figure 5.4. A family of price-demand charts for different values of parameters λ_{mx} and b

The situation, when Company A sells its product for optimum price, may discourage Company B from entering the market. If, however, Company A sells its products for a price higher than the optimum one, then it will bear relatively higher losses than Company B, having entered the market with the optimum price, lower than the one quoted by Company A. This situation, in turn, shall constitute an encouragement for Company B to enter the market with its product.

On the other hand, if Company A makes a preventive move before the competitor enters the market and lowers the price of its product, then, in order to still be able to effectively enter the mar-

ket, Company B has to push down the price even harder, which will definitely be a strong argument against attempting the entry.

One should not expect, though, that such price games are being always played before wide public. Most often, if possible, the game concerns the wholesale prices, while the retail prices may remain unchanged. Company A lowers the wholesale price and makes it possible for the wholesale operators to achieve higher profits, so that these operators would be motivated to promote the sales of the products, on which higher profits are gained. The effects of such manipulations can be observed daily on the shelves of the big boxes, and also small shops. This applies, first of all, to daily products sold in large quantities, like food and hygienic articles. In many cases, a simple observation of the dynamics of presence of various products from the same narrow domain (e.g. hard chocolate tablets) may already be highly telling. As a consequence, some of the competitive products tend to disappear from the market.

As noted several times before, if a company plans to get engaged in a price war like described here, it must dispose of adequate financial reserves for covering the potential losses, incurred by the consecutive price decreases. Lack of such adequate reserves puts the company at the risk of being eliminated from the market, quite often due to an inimical takeover. The magnitude of these reserves has the decisive significance for the sides of the game in answering the question: "who will win?"

The reserves considered encompass not only those in the form of cash, deposits and guaranteed credit capabilities with the banks, but also definite internal reserves, inherent to a given company itself. Let us explain this in greater detail.

It is common that companies produce various different products. In our previous considerations we assumed that competition concerns just one product (perhaps a bundle of products, treated as one), which is manufactured by some resident firm. A competitor enters the market with an equivalent product, sold for a lower price.

This brings about a definite decrease of sales of the product, turned out by the resident company.

Hence, in order to maintain manufacturing and sales of the product subject to competitive entry, it may become necessary to use the financial reserves, accumulated previously in the bank (e.g. in the form of a special fund) for covering potential losses, caused by the lowering of price of own products, provoked by the move of the competitor(s).

A different policy can, though, be applied, as well, under the condition that the company considered produces also other goods, which have not been subject to a competitive attack, or whose sale maintenance is not as important for the company.

For illustration, assume that the resident Company A produces goods I and II. Simultaneously, Company B, entering the market, started selling its product, equivalent to II (say, II'), for a lower price. This brought about the drop of sales of product II.

In response, the resident company also has to decrease the sales price of product II, if it does not wish the competitor to effectively enter the market. We will assume, though, that the resident company does not dispose of financial reserves in the form of means in the bank for covering the potential losses, caused by lowering of price.

Assume, further, that the constant cost of maintaining the technology necessary for manufacturing both products equals Q per time unit. If there are no bookkeeping regulations, determining uniquely how to split Q into parts corresponding to particular products, i.e. Q_I and Q_{II}, then we can assume, for instance, the following, quite artificial, splitting rule: Q_I=Q and Q_{II}=0. Then, the calculated costs of manufacturing these products would be, respectively:

$$\kappa_{\mathrm{I}} = \frac{Q}{\mu_{\mathrm{I}}} + b_I \qquad\qquad \kappa_{\mathrm{II}} = b_{II}$$

this leading to the possibility of maximum lowering of the sales price of product II, down to the level of $C_{II} = b_{II}$, with, however, simultaneous sharp increase of the sales price of product I, i.e. C_I

(that is, if we still wish to cover the production cost with our prices). The latter fact causes a drop in the sales of product I.

Consequently, as we try to save the sales of product II, we do this at the expense of a decrease in the sales of product I. In case the resident Company A produces a wide range of goods, the possibility of manipulating with the split of the constant cost may compensate for the lack of reserve of financial means in a bank. In such an artificial manner we can cover losses, arising from the sale of product II for the price below the "actual" production costs ("*actual*" rather than *actual*, since we may not be capable of calculating them in a justified manner anyway).

We shall treat these two mechanisms of maintaining the sale of product II, i.e. by giving up sales (and production) of (some) other product(s) or by using up the reserve of financial means, accumulated in the bank, as equivalent, namely – as the use of financial reserves of the enterprise. This is also an additional assumption, which facilitates consideration of the competition as the game, concerning two competing products, even though the phenomenon may take place for companies producing many kinds of goods.

In exactly the same manner we can treat the reserves, resulting from the activity of the global company on numerous local markets, and functioning through many local branches. By giving up sales of other products on some markets we can preserve our market share with respect to the fundamental product and the essential markets.

A broader treatment of the strategy of defence of the market share possessed shall be presented in Volume II of this exposition, when dealing with active strategies of expanding the market share possessed.

2. A summary of the book

After these preliminary considerations, concerning the market share defence strategies, let us pass over to the analysis of the meaning of other conclusions, resulting from the present Volume I.

In Chapter I we considered various kinds of dependence of demand upon price, paying attention to the possibly precise determination of the potential customers and the quantitative volume of the market. It is shown how the income characteristics of the potential customers influence the shape of dependence of demand upon product price. This shape is, ultimately, decisive for the price and production policy of the company.

We have put together here the diagrams of profit functions for five selected kinds of dependence of demand upon product price (Figs. 5.5 through 5.9). The numbering of models corresponds to that from Chapter I. On diagrams the location of the optimum price is marked, guaranteeing maximum profit for the company.

Knowledge of the optimum price C^*, for which products ought to be sold, allows for direct determination of the expected sales, Λ^*, and the corresponding production intensity, $\mu = \Lambda^*$, as well as the expected (maximum) profit, Z^*.

Model I

$$F=Z+Q$$

$$\Lambda = a \cdot (C_{mx} - C)$$

$$\kappa = b + \frac{Q}{\mu}$$

$$C^* = \frac{C_{mx} + b}{2}$$

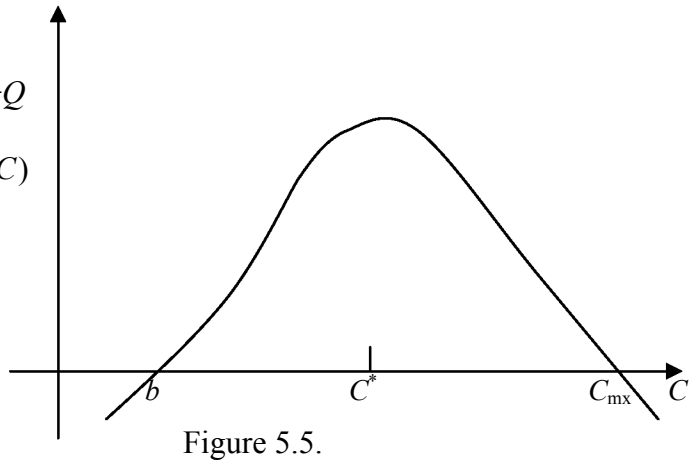

Figure 5.5.

Model II

$$\Lambda = \lambda_{mx} \cdot (1 - \frac{C}{C_{mx}})^2$$

$$\kappa = b + \frac{Q}{\mu}$$

$$C^* = \frac{C_{mx} + 2b}{3}$$

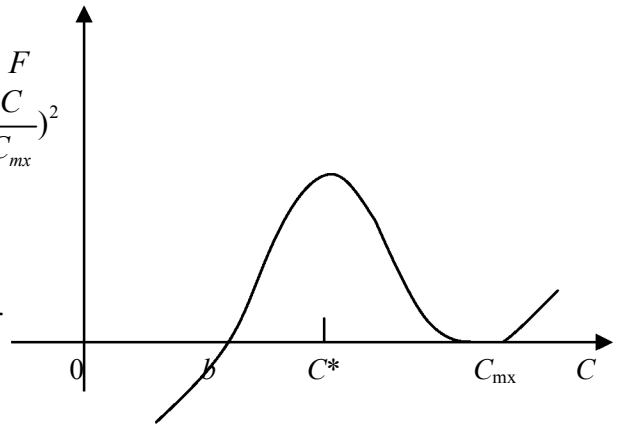

Figure 5.6.

Model III

$\Lambda = \lambda_{mx} C_0/(C_0+C)$

$\kappa = b + Q/\mu$

C^* unlimited

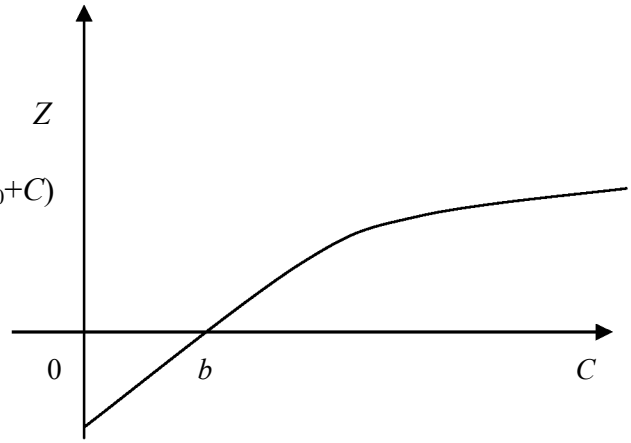

Figure 5.7.

Model V

$$\Lambda = \lambda_{mx} \frac{1-\left(\frac{C}{C_{mx}}\right)^2}{1+\left(\frac{C}{C_{mx}}\right)^2}$$

$$\kappa = b + \frac{Q}{\mu}$$

$$C^* = \frac{1}{4} C_{mx}$$

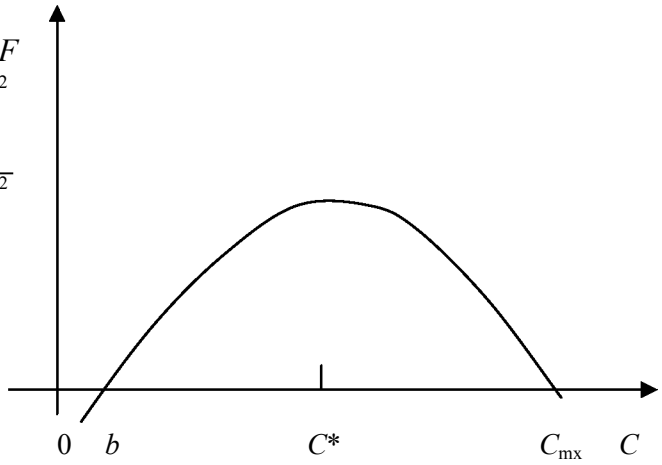

Figure 5.8.

Model VI

$$\Lambda = \lambda_{mx} \cdot \left\{1-\left[3-2\cdot\left(\frac{C}{C_{mx}}\right)\right]\cdot\left(\frac{C}{C_{mx}}\right)^2\right\}$$

$$\kappa = b + \frac{Q}{\mu}$$

$$b < C^* < C_{mx}$$

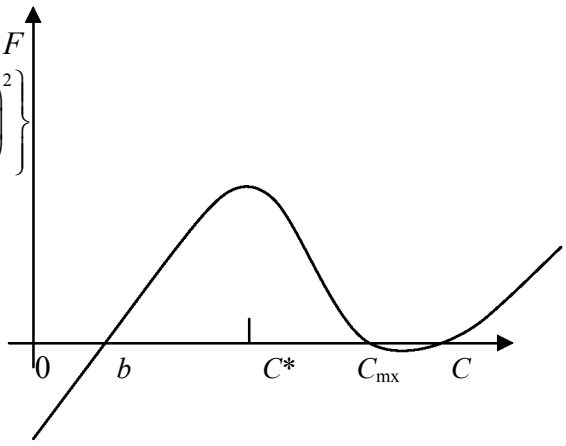

Figure 5.9.

Among the here illustrated kinds of dependence of demand upon price the third one (Fig. 5.7) is of special interest. In conditions of this model one should raise the prices without limit, manufacturing increasingly costly products and, at the same time, agree-

ing to declining demand, sales (in physical terms) and production. This, naturally, is a theoretical construct, associated with the assumption of the unlimited incomes of potential customers (no C_{mx}).

Let us note that in the cases of other kinds of relations $\Lambda(C)$, where assumption was introduced of existence of incomes being limited from above by the number d_{mx}, the optimum price is also limited and lower than C_{mx}.

In the subsequent part of this book, in Chapter III, information is provided for the companies that have to (or wish to) bear additional costs of delivering the product sold to the place indicated by the final purchaser.

In this case the respective policy of the company has to deal, as well, with the magnitude of the area, over which the company secures free-of-charge delivery of products. Hence, the problem arises of determining the price of product in such a way as to account for the transport cost and still ensure achievement of maximum profit.

This concerns, in a particular manner, the global companies, which dispose of numerous local branches, scattered around the globe, servicing altogether very extensive geographical territories, and often also ensuring delivery. For these companies, market strategy encompasses also the problem of optimisation of the spatial structure of the company, along with the price & production policy. Thus, in Chapter IV of the book a method of optimising the spatial structures of global corporations (including sales networks) was outlined, without a detailed description, which goes beyond the framework of the very theory of competition.

3. The future of world economy

The implication of the considerations here presented is, evidently, that the enterprises, disposing of ampler reserves and economically stronger, have better chances of winning in the competitive struggle. This is true, however, under very strong conditions, namely that (1) the macroeconomic environment of the competing companies is the same, (2) the management of these companies uses the same ("equivalently clever") way of constructing strategies and policies; (3) the products sold are actually equivalent (as to functionality and quality, first of all); (4) the broadly conceived production technologies used are also equivalent – in terms of costs incurred. Although these assumptions are very stringent, indeed, the implication mentioned holds also when they are satisfied with a certain margin of approximation (not "the same" but merely "similar").

This implication is, of course, not astonishing at all. Actually, it is commonly known, and – in particular – to persons dealing with game theory. Possibly the simplest example, illustrating the correctness of the implied proposition, is the one derived from the game of coin flipping ("heads or tails"). In this game, when we try to guess the side of the coin facing upwards, our chances of guessing (and hence of "winning") are ½, provided the game is fair (i.e. the coin thin and symmetric, the side facing upward shown to the players).

If we make out of this simple game a "war of attrition" then, of course, winning depends entirely upon the money the players dispose of at the very start. This is true even if the indication of the winner has to account for the involved probabilities.

Thus, we show below a table, in which probabilities of winning are defined for the "wealthier" player, given various initial amounts of money and the stake equal one currency unit.

Initial cash of players in currency units: I	II	Probability that player I wins	Expected time of the game (numbers of coin flips)
9	1	0.9	9
90	10	0.9	900

This table shows very clearly how strongly the outcome depends upon the financial reserves of the two players at the instant the game begins and the expected duration of the game (here expressed in the number of times the coin is flipped) until one of the players gets rid of all belongings.

The fact of domination of the stronger and the wealthier has been always known to the societies on the basis of common experience. This is confirmed by the well known proverbs and colloquial expressions, present in all languages and cultures.

Yet, there is, of course, a probability that the financially weaker player wins, just like the main prize in a lottery can go to (almost) anybody (provided the participation fee is paid and the lottery is fair).

* * *

Yet, the conclusions that can be drawn from the mathematical relations, formulated in this book, concern much broader issues.

If companies, competing on an open market in production and sale of the same (or very similar)product, under identical costs of production and transport, feature the structure of unit costs of production of the form

$$\kappa(\mu)=\frac{Q}{\mu}+b$$

and demand decreases with the increase of product price,

then, even though there exists a theoretical possibility of coexistence on the market – in the state of unstable equilibrium – of a number of producers with the same sales volumes, the ultimate

outcome from the thus modelled competition is subordination of an open market to one producer-monopolist (on a definite territory, whose area is inversely proportional to unit costs of production and transport).

At the same time, as noted several times before, it is very difficult to push away from the market a resident company that functions optimally, when the technologies used are the same, since this requires abrupt market entry with high production and price that is lower than the optimum one. This results in the profits of the competitor that are much lower than those of the resident company, and the necessity of bearing costs of the attempt of pushing the resident company away. Thus, market entry may be very costly, or even outright impossible, especially if we mean resident global corporations.

In terms of models analysed here it is only in the case, when unit cost of production increases in production volume (intensity), i.e. when there is no positive "scale effect", but to the contrary, that competition leads to maximum satisfaction of demand, under minimum prices, or appearance of market division, with corresponding diversity of products, satisfying the same kind of need.

There exists also quite a theoretical model, (I.1), such that the market competition process leads to maximum satisfaction of customers' demand under the lowest prices and the maximum feasible number of enterprises of minimum feasible magnitude. Such a model might be realistic only in conditions of pure handicraft. This model corresponds, therefore, to the way of thinking that led to the slogans like "small is beautiful", and the preference for small scale businesses.

Yet, the real world is completely different, because the entire development of production technologies to date indicates the necessity of increasingly costly investing into increasingly complex production apparatuses, saving human labour and minimising direct production costs. Due to this, the "scale effect" has been increasingly strongly influencing the processes of integration and elimination of enterprises.

This kind of situation leads unavoidably to increasing monopolisation of the markets. And the observed effect has given rise to various national anti-monopoly laws and agencies, whose objective is to defend the customers from the monopolistic pricing practices of the monopolies emerging on the national markets.

Hence, within the sphere of functioning of the model with positive scale effects, the complete "economic freedom", coupled with "cutthroat competition" of the multinational corporations, not limited by any national or international laws, may lead to an unwanted course of global economic development processes. In view of the risks, associated with monopolisation, but also losses, borne in the monopolisation process by some of the national companies, attempts are undertaken of limiting the scope and the depth of this process (e.g. European Union against Microsoft).

If, however, in many domains a clear scale effect is present, then, as long as there is no monopoly, prices may go down with the scale of competitors, and imposing the limits on the process can stop price decreases (thus often narrowing down the group of customers, who can afford a given product or service), or even cause them to raise, and this on both national and international scale. It has, therefore, become quite customary on many markets to nurture the ideology of "civilised oligopoly" (few companies on the same market), with mechanisms for ensuring that competition still persists.

Individual countries and groups of countries, as well as international bodies try to control (if not necessarily curb) the process of global monopolisation in various ways, within their respective scopes of competence. The controls applied, though, are not just aimed at the global monopolisation process – there are more objectives to national and regional policies (employment, innovation, etc.). There are still many types of controls at disposal: anti-dumping customs and quota, quality and health standards, business licensing and employment regulations, and so on. These controls, applied by different countries, regions and international bodies

(like WTO) in a variety of manners, are often (sometimes intentionally) inconsistent.

Although no emergent global order is in view that would safeguard from the negative consequences of the global monopolisation processes, some rudimentary principles seem to gain acceptance or at least are not treated as outward threat or rejection of cooperation. These include limited protection of vulnerable internal markets, employment (labour force movement), as well as the anti-dumping mechanisms, and it is hoped that thereby some sort of equilibrated growth path can be realised. At the same time, all participants are aware of the fact that such combined and multiparty policies are highly vulnerable to one-sided actions and more general shocks, like financial and economic crises.

Another cause of the fact that no explicit "optimum global economic policy" has been devised nor implemented, resides simply in the lack of well-proven, effective theories and models that would encompass the actual complexity of the real-world economy. We have repeated several times in this book that the models and analyses presented are obvious simplifications of the real situations, even if, under definite conditions, they ought to be considered true.

Yet, the consciousness that definite forces of economic nature are at work, and that their functioning does not necessarily bring (only) positive effects, must be present, when concrete policies are devised and laws are enacted.

This book presents a complete exposition of a coherent and far-reaching theory of market competition. It is based on simple precepts, does not require deep knowledge of either economics or mathematics, and is therefore aimed primarily at undergraduate students and all those trying to put in order their vision of how the essential market mechanisms might work. Volume II, now in preparation, shall bring the theory to further problems and results.

The logic of the presentation is straightforward; it associates the microeconomic elements to arrive at both more general conclusions and at concrete formulae defining the way the market mechanisms work under definite assumed conditions.

Some may consider this exposition too simplistic. In fact, it is deliberately kept very simple, for heuristic purposes, as well as in order to make the conclusions more clear. Adding a lot of details that make theory more realistic – these details, indeed, changing from country to country, and from sector to sector – is mainly left to the Reader, who is supposed to be able to design the more accurate image on the basis of the foundations, provided in the book.

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