SIMULATION OF THE PERFECT COMPETITION AND MONOPOLY MARKET STRUCTURE IN THE COMPANY THEORY

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ABSTRACT

The present paper has as target to create a programme in the Matlab area, in order to solve, didactically but not only, have problems concerning company theory – extreme cases– perfected competition and monopoly market structure.

This programme is capable, for a known function of total costs of $CTS = a_0 + a_1Q - a_2Q^2 + a_3Q^3$, *to give data regarding: level of balance production, total costs, to be made wholly and on the limit, on the level of balance production.*

KEY WORDS:
programme, matlab area, competition, monopoly market, costs, didactically material, simulation

1. GENERAL OUTLOOK

The behavior of a company with respect to their main decisions can only be understood within the framework of the market structure which it carries out its activity in. Any company has to face the issue of making two basic decisions: *how much to produce and what price to sell their products at?*

Market structure defines the level of competition for a certain product offered by the company. The market consists in all the companies and individuals that are willing, available and capable of buying or selling a certain product. The most important characteristics of the markets are the number and size of sellers and buyers, as well as the extent of product differentiation.

Traditionally, four market structures are mentioned with respect to these characteristics:
- perfect competition market;
- monopoly;
- monopolistic competition;
- oligopoly.

2. PERFECT COMPETITION

In a perfect competition market structure the company will decide only upon the quantity to be produced and offered on the market, but not upon the price or product diversification (implicitly upon the advertising) as they would infringe the hypotheses of the perfect competition model.

The graph of the short term overall income in a perfect competition a straight line that crosses the origin having as a slope the market balance price.

$$VTS = p_e Q \tag{1}$$

The short term marginal income has the form:

$$VMS = p_e \tag{2}$$

The curve of short term overall costs has the form:

$$CTS = a_0 + a_1 Q - a_2 Q^2 + a_3 Q^3 \tag{3}$$

Depending on the position of the short term overall cost curve CTS with respect to the line of overall incomes VTS, we can distinguish four situations, namely:

a) the company that makes over profit;
b) the company that makes normal profit;
c) the company that does not make the entire normal profit;
d) the company that has actual losses.

a) The company makes over profit

In this case the difference between the overall incomes and the overall costs is maximal for balance output Q_e.

Mathematically:

$$\Pi TS = VTS - CTS \tag{4}$$

The marginalistic principle of profit maximization implies equality between the marginal cost and the marginal income:

$$CMS = VMS = pQ \tag{5}$$

The hatched area in figure 1 represents an over profit that is equal to the product between Q_e and the difference between p_e and *CUTS* at the level of output Q_e namely:

$$[\text{over profit}] = Q_e \big[p_e - CUTS(Q_e) \big] \tag{6}$$

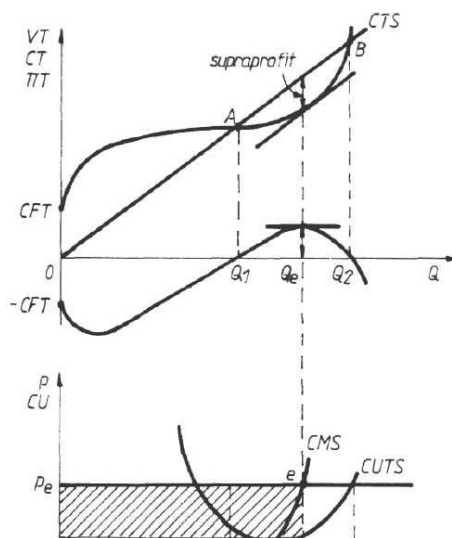*b) The company makes a normal profit*

$$CMS = VMS = p_e \tag{7}$$

The company will make a normal profit by functioning at minimal point *Q* of curve *CUTS* (see figure 2), as:

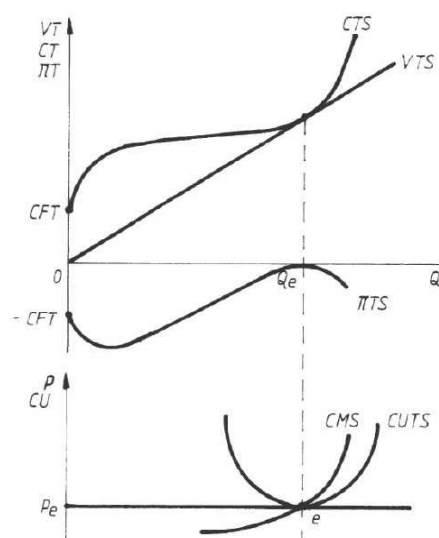$$CUTS = CMS = VMS = p_e \tag{8}$$

c) *The company does no make the entire normal profit*

For certain output levels, the company is able to cover at least the total variable costs and partially the total fixed costs, so that the profit exists, but it is inferior to the normal one (see figure 3).
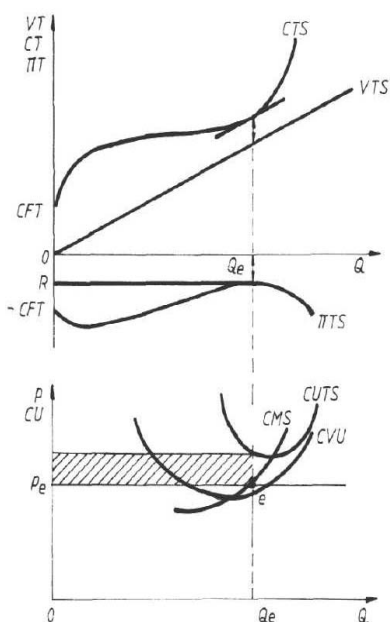
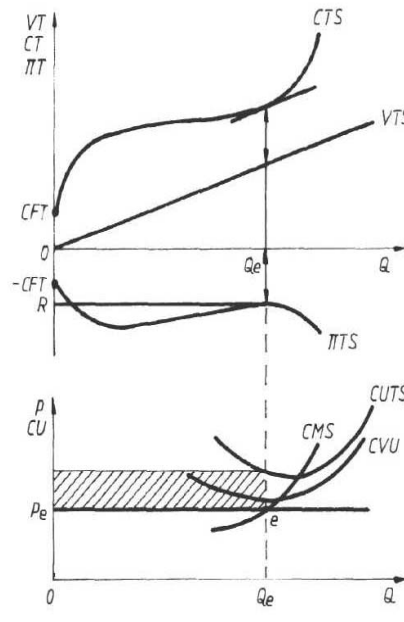$$[\text{exploitation loss}] = Q_e \big[CUTS(Q_e) - p_e \big] \tag{9}$$

Fig.1. Perfect competition
the company makes over profit

Fig. 2. Perfect competition
the company makes a normal profit

Fig. 3. Perfect competition
the company does no make the
entire normal profit

Fig. 4. Perfect competition
the company has actual losses

d) The company has actual losses

At the level of balance output Q_e, the overall incomes cannot cover even the overall variable costs, the total loss being *OR*, more than the loss that would be registered at level *0* of output, equal to the amount of overall fixed costs (see figure 4).

3. THE MONOPOLISTIC TYPE OF MARKET

Monopoly is the name given to the extreme case of market in which there is just one seller of a product.

The monopolistic structure involves mainly the existence of just one seller for a certain product, so it cannot enter competition with any other companies, which leads to two results:

➢ the market demand curve is in the same time the demand curve for that very product;

➢ other companies are denied the entrance on the market;

A monopolistic company will behave on the market by taking correlated decisions upon 2 parameters:

➢ the quantity offered on the market;

➢ the price at which this quantity is being offered.

On short term, it does not imply the knowledge of the demand curve for a product offered by the monopolistic company, as expressed by the relation:

$$Q = b_0 - b_1 p \tag{10}$$

or,
$$p = a_4 - a_5 Q \tag{11}$$

The company aiming at maximizing the profit will have to decide upon the volume of output for which the maximal profit condition is met, namely:

$$VMS = CMS \tag{12}$$

From costs theory we know that for a linear demand curve, the curve of marginal income VMS, crosses the area perpendicular to the price axis at its median point, starting from the same point as the demand curve.

Thus, the overall income on short term in a monopolistic-type competition has the form:

$$VTS = p \cdot Q = a_4 Q - a_5 Q^2 \tag{13}$$

which represents a parable admitting an apex.

According to the position of the overall cost curve on short term, *CTS* with respect to the parable of the overall incomes on short term, *VTS* four different situations can be distinguished, namely:

a) the monopolistic company makes over profit;

b) the monopolistic company makes normal profit;

c) the monopolistic company has losses in exploitation;

d) the monopolistic company has to temporarily close down ;

a) The monopolistic company makes over profit

The over profit will be maximal at the level of balance output Q_e when the vertical distance between curve *VTS* and curve *CTS* is maximal (the tangents to the two curves become parallel).

The over profit is the case given in the figure (see figure 5) as a hatched area, its analytical expression being:

$$[\text{over profit}] = Q_e \left[p_e - \frac{CUTS}{Q_e} \right] \tag{14}$$

One can notice that the balance level of output Q_e, is inferior to output level Q_m for which *CUTS* is minimal.
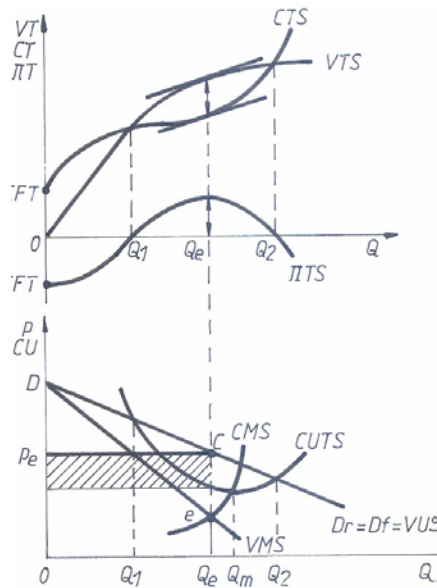

Fig.5. The monopolistic company
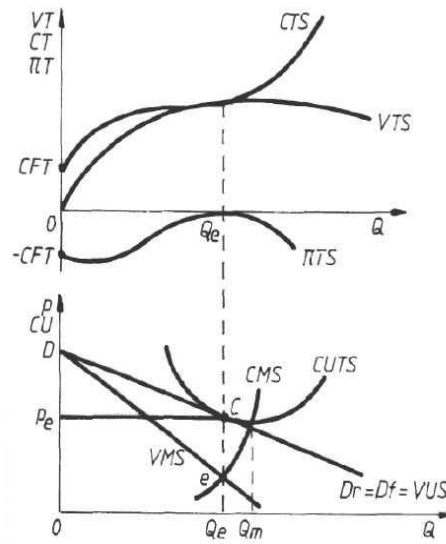makes over profit

Fig.6. The monopolistic company
makes normal profit

b) The monopolistic company makes a normal profit
The monopolistic company makes only a normal profit when it offers on the market the quantity of products Q_e, as at this level, curve *VTS* becomes tangent to *CTS* (see figure 6), the over profit being null as *ПTS* is tangent to the horizontal axis at the level of output Q_e.

At point C curve *CUTS* is tangent to line *VUS*, determining the level of balance price p_e.

c) The monopolistic company has exploitation losses
In this case, there are levels of output for which the company manages to cover the total fixed costs and partially the total variable costs, but it does not even make a normal profit (see figure 7). The monopolistic company will tend to obtain the balance output Q_e, for which curve *VTS* approaches most *CTS*, the loss being minor.

The loss is represented graphically by segment *OR* and the hatched area, analytically:

$$[\text{exploitation loss}] = Q_e[\text{CUTS}(Q_e) - p_e] \qquad (15)$$

d) The monopolistic company has to temporarily close down
For any output level, the company cannot cover even the fixed costs (see figure 8). The total loss is larger than the loss that would come from output level 0, i.e. equal to the total amount to fixed costs.
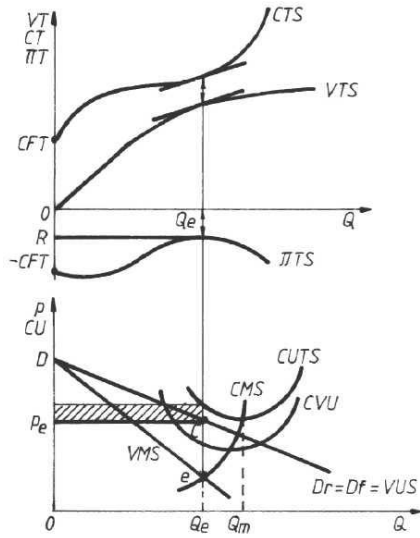
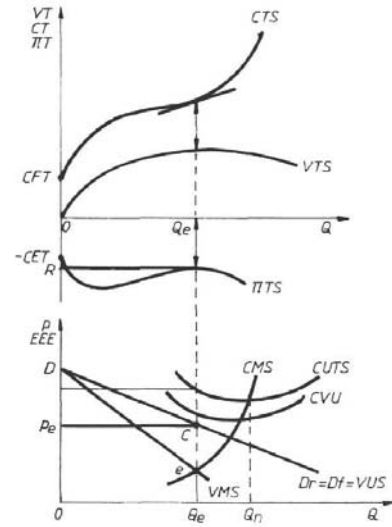**Fig.7.** The monopolistic company has losses in exploitation

Fig.8. The monopolistic company has to temporarily close down

3. MATLAB WORK SOFTWARE

The package of programs MATLAB (MATrix LABoratory) offers advanced software aiming at simplifying the means of numerical processing of data. Matlab allows the user to express the solutions of scientific applications in a simple language, close to the analytical (mathematical) expression of the problem under consideration. In this way, the user can focus mainly on the solving method, without having to face major difficulties in translating the solution into the MATLAB language.

MATLAB kernel includes a large number of pre-definite functions meant for all purpose mathematical operations (arithmetic in floating point, polynomial calculations, trigonometric, exponential, logarithmic, special functions, etc.), table and matrix handling, solving numeric analysis problems, 2D and 3D graphic representations, developing programs in MATLAB language and their interfacing with the host operation system. To the pre-defined functions available in the basic kernel we can add a series of toolboxes covering specific fields (signal processing, the theory of control, statistics, neural networks, symbolic calculations, image processing, optimizing, etc.). These toolboxes, as well as the user programs are source files written in a simple programming language, characteristic to MATLAB.

MATLAB kernel can operate both as command line, the command given by the user being executed immediately, and also as interpreter, executing a program existing as source file. This characteristic enhanced the extensive character of the language, allowing the users to add their own functions to the already existent set (predefined or in the firmware toolboxes).

The flexibility of the language is also advantaged by the existence of one type of basic data, the matrix one, having as elements real or

imaginary values. Unlike in other languages, the variabled do not have to be declared or dimensioned.

The actual version of MATLAB kernel is entirely written in C and can run on several computing systems (IBM- PC, VAX, SUN, Macintosh). It offers the facilities of a completely integrated system, based on its own language and on an efficient interpreter. This allows the expression of a relatively intricate algorithm in a compact form, executed in an acceptable time span, in a highly accurate way, the solution being displayed in a convenient form, alphanumerically, eventually accompanied by a graph.

The Matlab programme for perfect competition market it is presented down, for numerical exemple: $CTS = 1000 + 80Q - 6Q^2 + 0,2Q^3$ and the pice $p_e = 260$

Runing the programme we obtained the next windows:

Fig.9. The Matlab programme for numerical exemple:
$CTS = 1000 + 80Q - 6Q^2 + 0,2Q^3$, $p_e = 260$

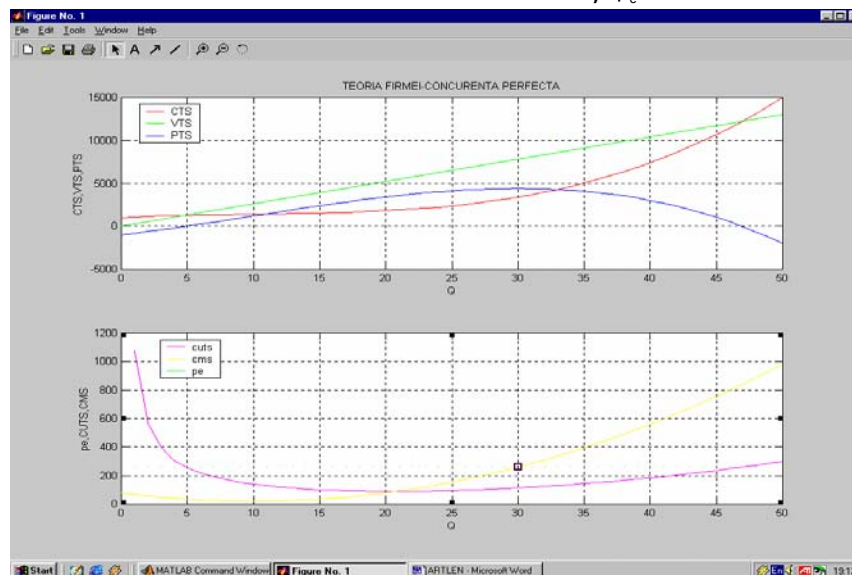**Fig.10.** The graphical expression of cost, income, profit, marginal costs,marginal incomes and the price

4. CONCLUSIONS

The paper introduces a program capable to solve all the problems related to the theory of the company – the extreme cases (the perfect competition market and the monopolistic one) determining the balance output, the maximal income, the maximal costs and maximal profit, as well as the graphical expression of costs, incomes, income and profit, with respect to the output.

BIBLIOGRAFIE

[1.]   Smarandache Ion Enea, ş.a., Microeconomie, Editura Universitaria Craiova, 1999;
[2.]   Gogoneaţă C-tin, ş.a., Microeconomie, vol. I, Editura Economică Bucureşti, 1999;
[3.]   Fireţeanu Virgiliu, ş.a., Matlab - calcul numeric, grafică, aplicaţii, Editura Teora, 1999;
[4.]   Băbăiţă Ilie, Microeconomie- aplicaţii, Editura Mirton Timişoara 2000;
[5.]   Şarpe Daniela Ancuţa, ş.a., Microeconomie- Teorie şi aplicaţii, Editura Economică Bucureşti, 2002.