PRODUCTION MANAGEMENT AND MARKET CONSTRAINTS

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Abstract

The present paper deals with optimization of production depending on input resources under market constraints. Production efficiency refers to increasing the output with a minimum input. The objectives of management are: reducing costs of outputs simultaneously with reducing prices of market goods. This is a big challenge for each firm, in order to ensure quality with reducing costs per unit when the market "imposes" the price. Reducing the cost per unit depends on the optimal combination of resources: labour and capital. The paper presents a relation between market price evolution as a constraint and mixing of resources as a management priority.

Keywords: production, management, efficiency, variable inputs, costs, outputs, market price, optimal combination, resources.

JEL Classification: M_{11}, G_{14}.

1. Introduction

Production is the most important component of the economic activity; its main aim is to combine resources in order to provide high-quality and cost-effective products, goods or services.

The challenges of the 21st-century production are diverse, and not easy to anticipate; those involved directly or indirectly in production are forced to develop techniques and analysis methods which enable them to minimize negative effects. Management is an important tool for achieving these goals in production activity.

Producers are constantly engaged in developing high-quality and cost-effective products. Modern technologies supported by the technical and technological advance of the last four decades help manufacturers develop complex products, with a minimum loss of resources – materials, raw materials and energy. The rate of present-day production seemed unimaginable years ago. Productivity has increased, production costs per unit being significantly lower than delivery prices.

Competition, the motor for progress, brings huge befits to consumers, enabling them to find high-quality products and purchase them for reasonable prices. On the other hand, competition is a permanent threat to companies, because of the emergence of less expensive products or substitution products on the market.

Any manufacturing company might find itself trapped between two markets: the resources market and end-products, as shown in fig. 1.

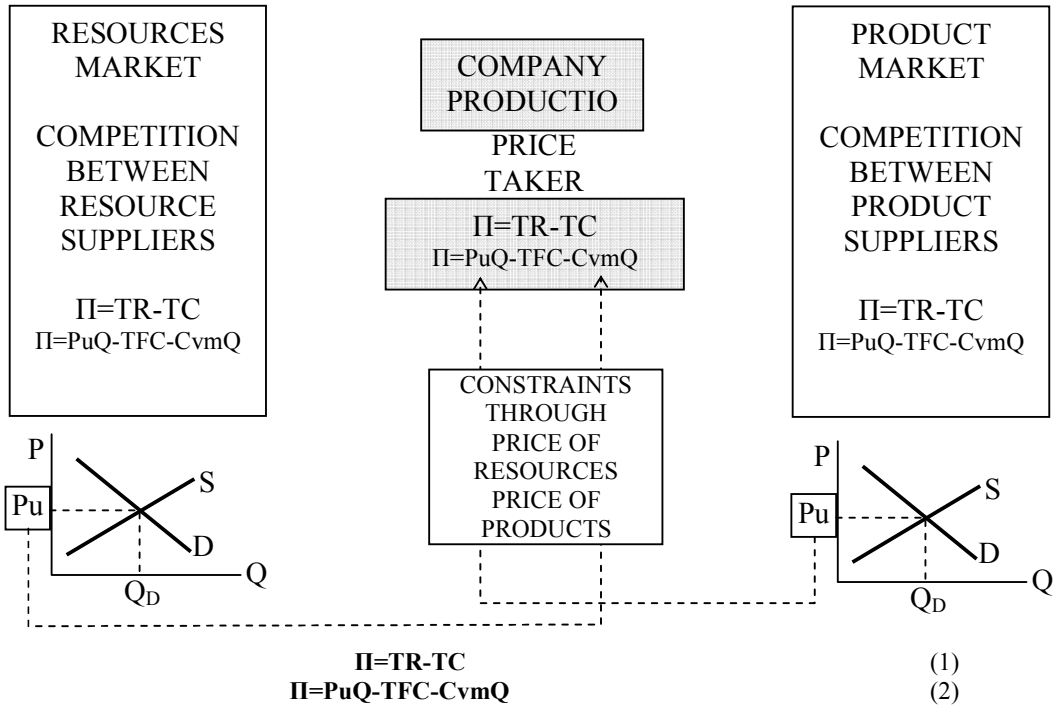

Fig. 1. The market constraints

The market is a sum of constraints and threats to any manufacturing company participating in the products and services competition. As shown in figure 1, there is strong competition on the resource market; resource suppliers always target the higher price possible while buyers seek to purchase goods and services for the lowest price available. The competitors' behavior on the end-products market is basically similar: manufacturing companies target the highest price possible for their products, and buyers are constantly engaged in the search for the lowest price available.

The main objective of all players on the market is to obtain profit (Π). In all cases, the higher the difference between price (Pum) and average variable costs (Cvm), the higher the profit.

The profit, calculated as the difference between total revenue (TR) and total cost (TC),

expression 1, is strictly dependent on TR and TC. Starting from expression 1 and developing costs according to the two categories, we obtain expression 2. Total fixed costs (TFC) confirm the production capacity of the company and its facilities. Costs per unit depend on the manufacturing technology employed, on the innovation level. The quantity of products manufactured depends on the technological level of machine tools and production system and on the management.

Production, being a consumer of material, energy, human, information resources, has become increasingly dependent on the market. The resource market – where companies buy what is needed for the production process, for market prices set independently by those in charge with production management – is dynamic, permanently changing, expanding or contracting.

Producers require and expect suppliers to deliver the required quantity of resources and meet deadlines.

The limited character of resources, in our opinion, refers to the lack of the needed quantity of resources in the right place and the right time, and not to the resource depletion, such as for example the exhaustion of material resources.

The issue of using resources effectively is one of the points of interest for companies; it is known that, in the long run, profitability without efficiency may have negative effects on sustainability of the business. Efficiency refers to consuming the smallest amount of resources to produce the highest number of products.

2. Case study and modeling

As a competitor on the market, the company is a "PRICE TAKER"**,** who has to accept the price (Pu) set through competition. The price of resources is used for the calculation of consumptions per product unit, which determines the average variable expenditures (Cvm), figure 1, and thus resources price is one of the constraints imposed by the market.

On the product market, providing that competition is present, the price (Pu) is formed as a result of the meeting between demand D and supply S. The turnover and the profit of the company are dependent on the price level Pu and quantity Q; this is the second market constraint.

As there is competition on the market of end-products, the price is set through the meeting of demand and supply; this price is valid for a well-determined period of time. The market also provides the quantity that is to be bought during the period when the balance E1…E5 is present. For the balance E5 (Pu=9) the quantity required by the market is Q5. Each firm's target is to have more and more market quota so it can sell quantity close to its

production capacity. Management of firm will decide quantity of resources and production management to get maximum value for turnover.

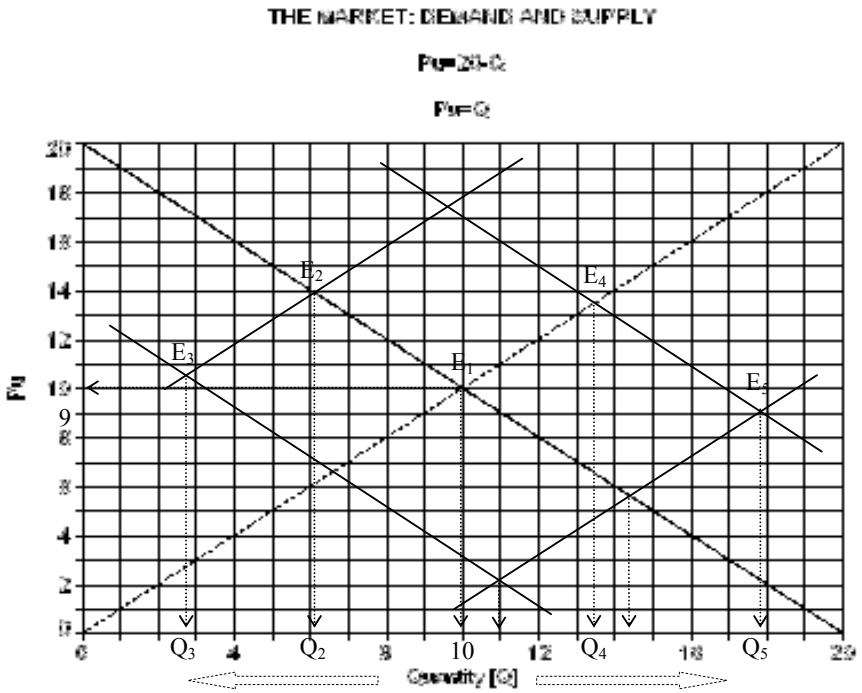

Fig. 2. The market game-Demand and supply

The rate of turnover for one of the companies competing on the market will be a fraction of the $PumQ_D$, as shown in fig. 3.

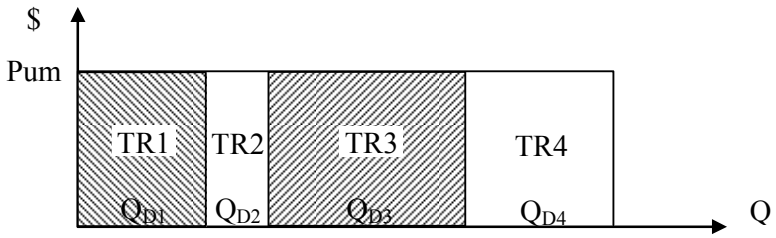

Fig. 3. Turnover for each firm

The total quantity of the market will be:

$Q_D=Q_{D1}+ Q_{D2}+ Q_{D3}+ Q_{D4}$,

expressing the sum of quantities provided by each company. The quantity provided by each company depends on own production capacity.

Returning to expression 2,

Π=PuQ-TFC-CvmQ,

For one of the companies, under "price taker" conditions the turnover rate (TR) will depend on the production capacity. Company 1 will record a turnover rate PuQ_{D1}, company 2 PuQ_{D2}, company 3 PuQ_{D3} and company 4 PuQ_{D4}. Production management will decide the value for total quantity (Q_T) and in correspondence we have value for variable inputs (VI), Table1.

Total production function will be presented in correspondence with data from table 1.

Table1.

Total production function data

VI	Q_T
1	29
2	70
3	117
4	164
5	205
6	234
7	245
8	232
9	189

The maxim production function value will be for 7 value of variable input, fig. 4. The production function is given by polynomial multiple regressions using "Table curve editor" or other similar software. Based on data from table 1 production function will be:

$Q=21X+9X^2-X^3$, figure 4

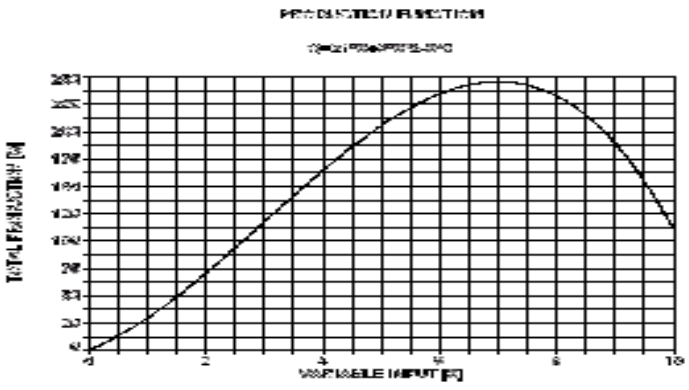

Fig. 4. The model of production function

Production efficiency will subsequently refer to reducing average unit costs (Cvm). As shown before, variable unit costs may be reduced through the implementation of new

technologies and better management.

Starting from software modeled production based on discrete data according to the table below where VI is the input variable (labor), Q_T total production, MP marginal production and APvi average production for the input variable, we obtain the graph in fig. 4.

When each input variable unit has the same value Px accomplishing graphical correspondence, we obtain the evolution curve of variable costs.

There is a leveling tendency of variable costs, up to a value of total production due to the fast increase of production for the same input variable.

Modeling average and marginal product using data from table 2 will get production function and variable costs, fig. 5.

Table 2. Total marginal function data

MP	AP_{VI}
36	29
45	35
48	39
45	41
36	41
21	39
0	35
-27	29
-60	21

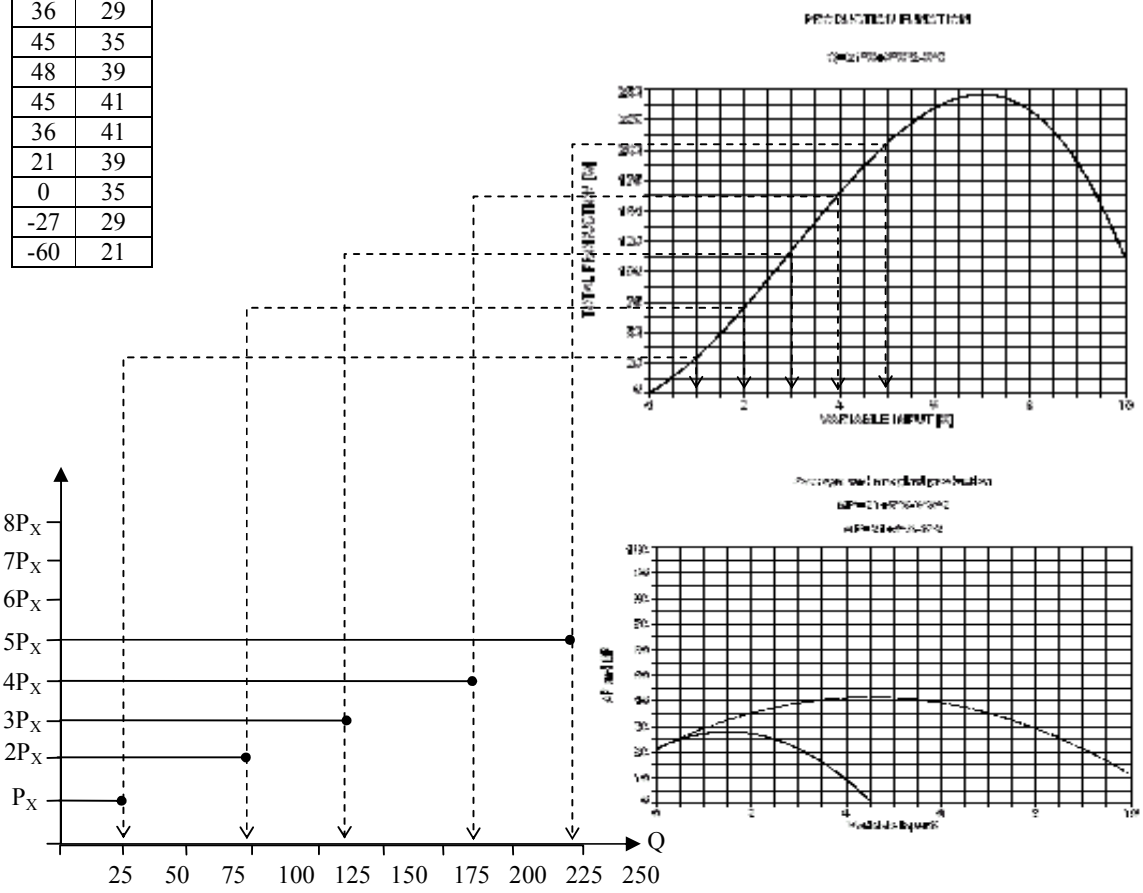

Fig.5. Total average and marginal product

3. Conclusion

The firm management aiming at maxim profit will have to consider carefully and continuously the consumption of resources and the total variable cost.

Proper management of resources will involve a reduction of variable costs, too.

By establishing a connection between the total production and the variable costs, the management can determine the value of the total production and implicitly the minimum costs for a certain number of input variables.

The efficient use of 90 of the market development, by analyzing the prices it imposes, as well as combining resources in order to reduce production costs.

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