ISSN 1075-7007, Studies on Russian Economic Development, 2013, Vol. 24, No. 3, pp. 208–219. © Pleiades Publishing, Ltd., 2013.
Original Russian Text © A.D. Nekipelov, 2013.

MACROECONOMIC PROBLEMS

Behavior of a Firm Which Maximizes the Rate of Profit: Specific Features[1]

A.D. Nekipelov
Presidium of the Russian Academy of Sciences
Received December 18, 2012

Abstract—The author challenges the well-known assumption of the modern microeconomic theory, stating that the maximization of economic profit is a natural aim of a firm. The article asserts that the behavior of a firm controlled by private owners of capital should be linked to the firm's desire to maximize the rate of profit. The return to the interpretation of a capitalist firm's motivation, which is characteristic of the period of the classical political economy, makes it necessary to reconsider some established views, namely, the demand for physical capital by a firm; the optimal combination of production factors used; the scale of output, which maximizes the firm's objective function; and the character of the firm's cost functions (both economic and accounting).
The conclusions drawn by the author also have some practical significance. A deep understanding of the genuine economic aims and motives, which determine the behavior of different types of firms, is especially important for a government searching for the optimal use of its assets.

DOI: 10.1134/S1075700713030088

Profit rate as a natural objective for a capitalist firm. Maximization of economic profits is a driving motive of a firm's activity according to the neoclassical theory. It would not be true to say that this assertion is generally accepted: numerous alternative positions aimed to explain a firm's behavior can be found in economic literature[2]. Some of them try to explain a firm's motivation on the basis of a direct examination of its behavior in the "real economy." In this respect, R. Nelson's and S. Winter's approach, according to which a firm is rather a "behavioral" than a "maximizing" entity, should be mentioned first.

The proposal to treat a firm as an entity, which organizes its behavior according to some experience-based "routines," can barely be accepted[3] from the point of view of "pure economic theory."[4] In fact, it is difficult to put it in harmony with the ideology itself of such a theory. The latter, taking as an initial point some postulates, is to be built with the help of deduction. During this process, the model of the economy under consideration becomes more and more complex, which makes, at least ideally, the distance between "real facts" and theoretic propositions smaller and smaller as an investigator approaches the "surface" of economic life. It is supposed that the application of such a methodology assists a researcher in making a transition from a simple fixation of some phenomena and an establishment of the functional relationships between them to the understanding of their inner interrelationships and subordination within the economic system.

Attempts to explain a firm's behavior by the interests of its managers cannot be accepted from the "pure theoretical" perspective either. This is because the task of the general economic theory is rather to explain than simply to note managers' abilities to influence the way a firm functions.

However, the problem of discovering the roots of a capitalist firm's motivation may not be considered closed. The neoclassical treatment of economic profit as a firm's objective was not always dominant. It substituted for the conviction of classical economists that a firm's natural aim consisted in the maximization of the yield of the invested capital (that is, in the maximization of the rate of profit) [5].

The change of the attitude towards the notion of gross profit lies at the foundation of the new paradigm.

[1] The article was translated by the author.

[2] Surveys of the existing positions on this issue can be found, in particular, in (Kreps, pp. 724–739) and (Mesnard, pp. 1–3)

[3] This assertion is not equal to saying that a concrete economic analysis of a firm's behavior is not needed at all. It is however important not to forget that discovering this or that economic process or phenomenon is not the same thing as their understanding and explanation.

[4] B. Russell drew a distinction between "pure" and "realistic" sciences. In the first group, he included formal logic and mathematics "... whose function it is (in the words of A. Pigou) to discover implications." The second group includes sciences, such as "physics, chemistry, and biology, which are concerned, once more using A.Pigou's expression, with actualities" (Pigou, pp. 5, 6). In this context, the general economic theory should be classified as a "pure science."

[5] Today very few scholars support this position. I know of only two of them—French economist L. de Mesnard and American economist D. W. Katzner. I am grateful to Prof. V. Polterovich (Russia) who attracted my attention to a working paper by Mesnard published on his Website and which I quote here.

Representatives of the classical school regarded it as a homogenous substance, qualitatively equal to the excess of total money income over total current money expenditures. Neoclassical economists came to the conclusion that gross profit did not constitute a uniform object. One of its parts is represented by the normal yield on capital, whereas the other part is a conglomerate of heterogeneous elements. They include the following: entrepreneurial income, related to the execution of the management function (including the function of taking risks, which cannot be covered by insurance), as well as the incomes resulting from temporary or constant exclusive advantages of a firm vis-à-vis its competitors. The conclusion was made that the comparison of such a heterogeneous category as gross profit with the amount of advanced capital did not make much economic sense and that, therefore, the task of profit rate maximization could not be regarded as a firm's objective[6].

However, one should not take these considerations as certain. The thing is that managerial activity includes two qualitatively different elements. The first one has to do with the necessity of carrying out the routine process of management, which presupposes, along with the organization of productive and marketing activity, the assessment of the state and perspectives for the development of markets, which are relevant for the firm in question. It is important that these perspectives be assessed with due attention to their probabilistic character. The decision-making process, based on both these estimates and an entrepreneur's attitude towards risk-taking, his views on the comparative value of the present and future advantages and losses, constitutes the second element. This element is rather linked to his system of preferences than to his professional managerial qualities.

It seems that this specific feature of managerial activity was not adequately treated by the authors of the neoclassical theory of the firm. Instead of separating the two above-mentioned elements, they completely divorced managerial activity from other types of human activity. According to them, it is rather managerial services as a whole than their routine part that should be remunerated. Moreover, this remuneration has to be done in an indirect form of special income—economic profit—which has a residual character, rather than in the form of a labor wage based on direct market assessment.

Meanwhile, in real life, routine managerial services are subject to market transactions and the respective economic agents—managers—receive their income in the form of labor wages (salaries). As far as the decision-making process, based on an entrepreneur's system of preferences, is concerned, it does not (and cannot) generate any additional risk-adjusted permanent income. Firms receive economic profits as a result of either a competitive advantage based on high-quality management (first element) or of this or that twist in the market environment.

That is why there is every reason to believe that an entrepreneurial capitalist will judge his efforts (time expenditure) associated with managing his firm on the basis of the best alternative labor income he can earn. The respective amount should in this case be included in the firm's economic costs. The additional rental income received by the firm from different temporary or permanent advantages also makes part of the opportunity costs and therefore has no impact on the firm's risk-adjusted gross profit.

However, if neither the results of entrepreneurial activity associated with the determination of an admissible degree of risk-taking nor the rental incomes generated by some chunky market advantage do not influence the risk-adjusted amount of gross profit, then there are no grounds to characterize this latter notion as heterogeneous.

Sometimes, the following reasoning is used to justify the neoclassical approach to a firm's motivation problem. As an autonomous economic agent, a firm attracts necessary production factors by paying their owners factor incomes as a compensation[7]. The excess of the total income over the opportunity (economic) costs, amounting to the total payments to the owners of the production factors used, is the firm's own income—economic profit. The firm is therefore interested in its maximization.

At the same time, proponents of this idea accept that a firm is a special inanimate participant in economic life. However, they stress that an entrepreneur is its personification. It is him who determines the combination of production factors used by the firm and evaluates the risks related to its activity. From the point of view of the neoclassical theory, it is him who realizes the task of profit maximization by the firm. They attribute no importance to who is that agent performing entrepreneurial functions—the owner of capital, the owners of labor force, or "independent entrepreneurs." In all cases, an entrepreneur should be interested in the provision of a maximal excess of total income over economic costs.

However, these are mere assertions and not proof. The thesis, according to which an entrepreneur (who-

[6] A. Marshall wrote: *{The causes that govern Earnings of Management have not been studied with any great care till within the last fifty years. The earlier economists did not do much good work in this direction because they did not adequately distinguish the component elements of profits, but searched for a simple general law governing the average rate of profits—a law which, from the nature of the case, cannot exist}* (Marshall, VI.VIII.1).

[7] *{Under the enterprise system, a special social class—businessmen—direct economic activity; in the strict sense, they are producers, while a great mass of the population merely furnish them with productive services, placing their persons and their property at the disposal of this class; entrepreneurs also guarantee to those who furnish productive services a fixed remuneration}* (Knight, III,IX,12).

ever he is) will always seek to maximize economic profit, needs to be accurately explored.

Let us suppose that we examine a firm wherein entrepreneurial functions are carried out by the owner of the capital. Under such conditions, the combination of production factors used by the firm will depend on his decisions. A question arises: will he choose this combination seeking to maximize the economic profit or the rate of accounting profit?

From the position of methodological individualism, it is quite logical to believe that the owner of capital, as any other economic agent, will do his best to maximize his own welfare within an infinite period of time. L. de Mesnard thinks that the neoclassical view regarding economic profit as the objective of a firm is based on this very assumption: "As profit is included in the owner's income, when maximizing its activity, the owner wants the company to maximize the profit and, as the owner's behavior is supposed to influence the firm's behavior, the company does maximize its profit" (Mesnard, p. 13)[8].

However, it is not as simple as that. Of course, there is no doubt that it is the income that determines utility and not its amount correlated with the invested capital. Nevertheless, this is exactly the reason why the owner of capital is interested in getting the highest profit rate. It is also true that under the conditions of a fixed amount of capital invested in a firm the objectives of profit maximization and maximization of economic profit lead to the same result. However, can we be sure that firms following these objectives will invest the same amount of capital?

A precise answer to this question can only be given as a result of an analysis. Right now we can however assert the following: if firms maximizing profits and the rate of profit maximizing firms do need different combinations of production factors[9], then only one situation is possible; i.e., a firm striving to maximize the rate of profit will exploit less capital than a firm trying to get the highest amount of economic profit. Only under this condition, a smaller volume of economic profit may be accompanied by its higher rate.

To better understand the consequences of this conclusion, let us consider a simple example. Suppose that for getting maximal economic profit a firm needs X units of money capital and this amount perfectly coincides with the amount that the owner of capital has at his disposal. Assume further that if the capital owner attempts to maximize the rate of profit he would need less capital: $X - g = H$ (g being less than H, which means that the amount of "excessive" capital is not sufficient to set up another similar firm). The overall yield of capital would have been bigger had the owner invested all of it in the firm than if he had directed H units of it for this purpose, which maximizes the rate of profit, but would have not used at all his capital in the amount of g. Nevertheless, he has a better option: to invest H units of money in a firm which maximizes the profit rate and g units of money in a similar second firm. Of course, to realize this option, additional capital will be needed. However, taking into account the high return on capital, we can be sure that there will be no deficit of entrepreneurs willing to become partners. However, then the general conclusion becomes obvious: an capital owner, striving to maximize personal welfare, has to invest it in a firm (firms) maximizing the rate of profit[10].

A similar situation emerges in companies, the capital of which belongs to their shareholders. All of them are objectively interested in getting maximum profit on capital, and they will therefore do their best to set up such a system of corporate governance, which would direct hired managers to achieve this objective.

Maximization of economic profit becomes a natural aim in cases when entrepreneurial functions are not carried out by the owners of a firm's capital. Companies based on the labor self-management system can serve as an example. Theoretically, a firm, which is entirely based on state-owned capital, can have the same objective function. This is because the state, being a specific economic agent, should not necessarily request the firms using its capital to put forward an objective of maximizing the rate of profit. If, because of social considerations, the state believes that the most efficient type of a firm is one which maximizes the economic profit, then it may take measures to generate this very motivation for the managers of firms with state capital.

The subject of this article is the capitalist firm, which is a firm where a private owner (private owners) of capital plays a key role. Due to the above-mentioned arguments, we will base our analysis on the presumption that such a firm is interested in getting the maximal yield on the invested capital. Our aim is to determine whether the behavior of such a firm (from here on, the classical firm) differs from the behavior of a firm, which maximizes economic profit (from here on, the neoclassical firm).

[8] Based on this assumption, Mesnard believes that the rate of profit is the objective for only those firms, the behavior of which is determined by "financial shareholders, allocating freely their capital between firms." Firms with "strategic shareholders," determining their behavior, according to the French economist, maximize economic profit (Mesnard, pp. 13–19).

[9] It should be noted immediately that if the same behavior of firms results from both types of motivations under consideration then there is no sense to distinguish between them.

[10] D. Katzner comes to the same conclusion: "If the firm did not achieve its greatest attainable rate of return, then higher rates of return would be more likely to be available elsewhere and, thus, the firm would increase the risk of losing its money capital to these opportunities" (Katzner, p. 546). By the way, realizing the principle of moving from simple to complex issues, at the first stage of research, the author uses a model of a firm, which does not invest any money capital at all. Thus, Katzner, for the time being, justifiably believes that the firm maximizes its economic profit (Katzner, Ch. 5). However, as soon as the existence of physical and money capital is taken into account, the necessity of corresponding modifications to the firm's objective function becomes obvious for the author.

Measurement of the rate of profit. Before starting directly analyzing the behavior of the classical firm's peculiarities, it is necessary to specify what kind of profit rate indicator we will use. It is obvious that the profit amount should be in the numerator of the formula determining the capital yield, whereas the sum of advanced (invested) capital should be in the denominator. The problem therefore consists in how to determine that part of the total income of a firm which represents profit, on the one hand, and the amount of advanced capital, on the other hand.

Let us begin with the problem of measuring the amount of invested capital. We have two options at hand here.

One of them presupposes the inclusion of both fixed and working capital outlays in the composition of investment expenditures. This is the way D. Katzner proceeded when he introduced in the analysis an average money capital requirement function: $c = \Lambda(p, r, x, y)$, where p is the price vector of a firm's output; r is the price vector of a firm's inputs,; x is the vector of a firm's outputs,; and y is the vector of a firm's inputs (Katzner, Ch. 13).

The second (simplified) approach consists in considering as investments only those expenditures, which provide for the acquisition of fixed capital by a firm. Correspondingly, a firm's costs associated with the procurement of raw materials and hiring of labor force are exclusively accounted for as current money expenditures. This is a standard approach, which is used in the majority of cases when the behavior of a firm, which maximizes economic profit, is under examination. It is this very approach that is applied in this paper.

As far as profit is concerned, according to any definition, it is the difference between the total income, on the one hand, and the current costs, on the other hand. If we ignore changes in the stock of primary materials and goods for sale (and that is what we will do for the sake of simplicity), then the gross income will adequately reflect the scale of a firm's production activity during the respective period. The problem is thus reduced to the determination of costs, which the firm bears during the same period of time.

The table demonstrates an algorithm of cost determination.

First of all, one has to take into account the money expenditures by a firm to buy raw materials and pay for the labor force used during the respective period. We can define their total amount as the firm's *money costs*.

As was already mentioned, the *opportunity costs associated with the application of its own scarce natural and managerial resources by a firm* should be accounted for, along with the money costs, as part of the costs of a firm maximizing the rate of profit.

The difference between a firm's gross income and the total amount of money costs and the above-mentioned opportunity costs represents the *gross return on capital*. The latter in turn is divided into three categories: amortization of physical capital, interest return on capital, and economic profit. The sum of the amortization accruals and the interest return on capital will be referred to as the *normal return on capital*.

As is well known, amortization is an accrual: the respective sum of money[11] is saved from the gross income to provide for the timely replacement of worn-out physical capital.

We get the *total* (*accounting*) *profit* of a firm if we subtract the amount of the amortization accruals from the gross return on capital. The essence of excluding the amortization of fixed capital from the income to be compared with the amount of advanced capital consists in getting an indicator, which would ideally characterize income flows from invested capital within an unlimited period of time. As a result, an opportunity appears to compare the yield of capital at firms with different technological structures. Thus, it is an indicator of accounting profit which has to be used in the model of profit rate maximization.

According to the tradition, we will qualify the sum of amortization accruals and money costs as *accounting costs*. We will call the sum of accounting costs and the opportunity costs of the application own scarce natural and managerial resources by a farm as the firm's *incomplete total economic costs*. Incomplete total economic costs differ from total economic costs by the amount of interest return on capital.

For simplicity, we will further examine the case when a firm hires all scarce natural and managerial resources and, consequently, the relevant money expenditures are part of the accounting costs. In this case, accounting profit is a result of subtracting accounting costs from total income.

Role of the uncertainty factor. The following question deserves attention: should we take into account at the very initial stage of the analysis (and this is where we are) the uncertainty factor and, if we should, in what particular form? The problem is that the very emergence of a firm as an institute is linked to uncertainty in economic processes[12]. If it was not so, every owner of production factors would know for sure (and, what is important, for an unlimited period of time) where they can be applied best. As a result, the difference between the intrafirm and social division of labor would completely disappear, as well as the need in firms as specific economic agents.

[11]The amortization accruals per unit of physical capital, the market price of this unit, and the market interest rate are functionally dependent on each other. In the simple case, when a capital good maintains its productivity unchanged during its entire life cycle, this dependence can be expressed as follows: $A = p_K/(2 + r + (1 + r)^2 + (1 + r)^3 + ... + (1 + r)^{T-1})$, where p_K is the price of the capital good and T is its lifespan. For a more detailed description of this and a more complex case when the capital good productivity reduces as it becomes older, see (Nekipelov, pp. 186–188).

[12]Yet F.Knight noted that "its [of enterprise and the wage system-A.N.] existence in the world is a direct result of the fact of uncertainty" (Knight, III. IX. 12).

It is certainly true that the problem of an optimal combination of production factors within technological systems, which serve under the conditions of uncertainty, as the basis on which firms emerge, would also exist in such a situation. However, the prerequisites of optimality seem obvious here: each and every factor of production within such technological systems will have to get (and will indeed get) remuneration corresponding to the permanently maintained general equilibrium. Thus, the rate of profit would always stay at the level of the normal yield of capital, whereas economic profit would equal to zero everywhere. The problem of maximization of the rate of profit under such conditions acquires a purely formal character.

Taking this into account, we should start from a model, which, so to say, combines both the existence and nonexistence of uncertainty. Its specific feature is that an entrepreneurial capitalist takes decisions dealing with the use of production factors exclusively on the basis of the expected state of the market (the price level and the interest rate), but without allowing for any probable deviation of the corresponding indicators from their expected values. In fact, such an approach is used within standard microeconomic analysis.

Output of the classical firm: general case. We begin our analysis of a classical firm's behavior with a model, in which the price of a good produced by the firm (for simplicity, a single-product firm will be considered) is a function of its output ($p = p(Y)$). We do not specify the character of the price function, which means that the conclusions of our research will be applicable to both competitive and uncompetitive classical firms. So, the general case is the first object of our analysis[13].

We will further make a usual assumption, according to which the production function of a firm $Y = f(K, L)$, where K and L represent the physical capital and labor force[14], respectively, is characterized by variable returns to scale. The market price of a unit of physical capital p_K, the amortization accruals for a unit of capital goods within the period under consideration (A), and the factor price of labor force (w_L) will be regarded as parameters of the firm's objective function, which are determined by entrepreneurial capitalist expectations.

Having all this in mind, the firm's objective function will take the following form:

$$\mathrm{Max}\,\Pi = \left[Y(K,L)p(Y(K,L)) - w_L L - AK\right]/(p_K K). \quad (1)$$

Now we differentiate the objective function by variables L and K (hereinafter, for the sake of compactness, the resulting formulas will be presented without the arguments of the production and price functions):

$$\Pi_L = \left[Y_L(p + p_Y Y) - w_L\right]/(Kp_K), \quad (2)$$

$$\Pi_K = \left[Y_K K(p + p_Y Y) - (Yp - w_L L)\right]\Big/\left(K^2 p_K\right). \quad (3)$$

Let us equate these partial derivatives to zero. As a result, we get the following first-order conditions of the maximum for the objective function:

$$Y_L(p + p_Y Y) = w_L, \quad (4)$$

$$Y_K(p + p_Y Y) = (Yp - w_L L)/K. \quad (5)$$

Now pay attention to the following. First, the multiplier $(p + p_Y Y)$ in the left-hand side of Eqs. (4) and (5) determines the amount of marginal income. The right-hand side of Eq. (5), i.e., $(Yp - w_L L)/K$, determines the amount of gross capital income per unit. The latter can be split into two elements: leasing payment w_K and economic profit π_{ec}/K (both for the respective period of time). Taking this into account, we can rewrite Eqs. (4) and (5) as follows:

$$MR(Y)Y_L = w_L, \quad (6)$$

$$MR(Y)Y_K = w_K + \pi_{ec}/K. \quad (7)$$

Now let us turn to the analysis of the sufficient conditions for the maximum of the rate-of-profit function. We will be especially interested in the following question: will a production function, which satisfies the necessary conditions, possess the same properties as a production function, which makes the maximization of economic profit possible? After all, a comparison of classical and neoclassical firms' behavior only makes sense in the case of a positive answer to this question.

As is known, the function of two arguments has a maximum if its second partial derivatives by the respective arguments are negative and their product is less than the square of the second mixed derivative: $\Pi_{KK} < 0$, $\Pi_{LL} < 0$, $\Pi_{KK}\Pi_{LL} - \Pi_{KL}^2 > 0$. With this in mind, let us first determine the second partial derivatives by each of the arguments of the rate-of-profit function:

$$\Pi_{LL} = \left[Y_{LL}(p + p_Y Y) + Y_L(2p_Y Y_L + p_{YL}Y)\right]/(Kp_K), \quad (8)$$

$$\Pi_{KK} = (Y_{KK}K + Y_K)(p + p_Y Y)\Big/(K^2 p_K) + \left[Y_K K(p_Y Y_K + p_{YK}Y + p_Y Y_K)\right]\Big/(K^2 p_K) - (Y_K p + p_Y Y_K)\Big/(K^2 p_K) - \left\{2\left[Y_K K(p + p_Y Y) - (Yp - w_L L)\right]\right\}\Big/(K^3 p_K). \quad (9)$$

The last member in Eq. (9) equals zero under conditions when the rate of profit is at its maximum. This is because it represents a product of one of the first-order conditions for the maximum of the objective function,

[13] If the price remains constant at all output levels, then we deal with a competitive firm (see the next section). When $p = p(y)$ is a decreasing function, an uncompetitive firm becomes the object for our analysis. An increasing price function is an isolated case, which will not be considered in this article.

[14] Natural resources possess a very important specific feature as a production factor. They are not a product of human activity, and, as a result, their market price is formed on the basis of the factor price (rental payments). It is a well-known fact that in the case of physical capital the situation is the opposite. However, this specificity is of no importance for our task; therefore, it is justifiable to unite natural resources and man-made physical capital within a production function.

presented in Eq. (5) ($Y_K(p + p_Y Y) - [(Yp - w_L L)/K] = 0$), by the expression $2/(K_2 p_K)$. Taking this into account and substituting the marginal product formula $(p + p_Y Y)$ by its designation $MR(Y)$, we can somewhat simplify Eqs. (8) and (9)

$$\Pi_{LL} = [Y_{LL} MR(Y) + Y_L(2p_Y Y_L + p_{YL} Y)]/(Kp_K), \quad (10)$$

$$\Pi_{KK} = [(Y_{KK} K + Y_K) MR(Y) + Y_K K(2p_Y Y_K + p_{YK} Y) - Y_K MR(Y)]/(K^2 p_K). \quad (11)$$

Output (Y), the quantities of the production factors applied (K and L), and the price of the firm's produce (p) and physical capital (p_K) are all characterized by positive values. The demand function (and its inverse function—the price function) is nonincreasing; therefore, a derivative of the firm's produce price by output is nonpositive ($p_Y \le 0$). The mixed derivative of the price by output and by the amount of any production factor will have a nonpositive value ($p_{YL} \le 0$, $p_{YK} \le 0$), because output increases together with an increase in the quantities of the production factors used. The value of the marginal income $MR(Y)$ (and this follows from the very task facing the firm) cannot be in the negative zone.

It is easy to note that under such conditions the value of the second derivative of the objective function by the amount of labor Π_{LL} (see Eq. (8)) will be less than zero if the marginal productivity of this production factor is a decreasing function (that is, if $Y_{LL} < 0$). In turn, it follows from Eq. (11) that the guarantee for the second derivative of the objective function by the amount of the capital used Π_{KK} to have a negative value is provided under the following conditions: (a) the marginal productivity of this production factor should be a decreasing function, and (b) the following condition has to be fulfilled: $|Y_{KK} K| > Y_K$. By all means, it is also necessary that the last sufficient condition be satisfied: $\Pi_{KK}\Pi_{LL} - \Pi_{KL}^2 > 0$.

Nevertheless, our analysis of the sufficient conditions shows that *a modification of the objective function from the maximization of economic profit to the maximization of the rate of profit is not accompanied by the appearance of substantially new requirements for the characteristics of the production function*. It should still be characterized by variable returns to scale, together with diminishing marginal productivities of production factors. As was mentioned, this means that we can directly compare the behavior of classical and neoclassical firms with the same production functions.

To carry out such a comparison, let us recall the first-order conditions for the maximum of economic profit[15]:

$$MR^{neo}(Y) Y_L^{neo} = w_L, \quad (12)$$

$$MR^{neo}(Y) Y_K^{neo} = w_K. \quad (13)$$

The comparison of Eqs. (6), (7) and (12), (13) allows us to prove that a classical firm's output will never be higher than that of a "neoclassical firm"[16].

Note from the very beginning that, when the economic profit of a classical firm equals zero, the first-order conditions for both types of firms coincide. It follows then that the combinations of production factors used and, as a result, the level of output will be the same for these firms. It will become clear in the next section what output level and what combination of production factors correspond to such a case. However, if the classical firm and, more so, the neoclassical firm have a positive economic profit, then the output of the firm maximizing the rate of profit will be strictly less than that of the neoclassical firm.

The proof by the contradiction method will be used to confirm this statement.

Let the output of the classical firm be higher than that of the firm maximizing economic profit; that is, $Y^{class}(K,L) > Y^{neo}(K,L)$. Accordingly, the marginal income of the classical firm will be less or equal to that of the neoclassical firm: $MR^{class}(Y) \le MR^{neo}(Y)$. However, from Eqs. (6), (7), (12), and (13), it follows that the marginal products of labor and capital of the "neoclassical firm" should exceed the corresponding indicators of the classical firm:

$$Y_K^{neo} = Y_K^{class} + \delta_K > Y_K^{class}, \quad Y_L^{neo} = Y_L^{class} + \delta_L > Y_L^{class}. \quad (14)$$

Next, in the optimal case, the classical firm should use less capital[17] and, correspondingly, more labor[18] than the neoclassical firm, because both types of firms possess the same production function. In other words,

$$Y^{class} = Y^{neo} + \Delta_Y(K,L), \quad L^{class} = L^{neo} + \Delta_L, \quad K^{class} = K^{neo} - \Delta_K, \quad (15)$$

where $\Delta_Y(K,L)$ is the output excess by the classical firm over that of the firm maximizing economic profit (note that this excess is a function of the amounts of the production factors used); Δ_L is the difference between the amounts of labor used by the classical and neoclassical firms; and Δ_K is the difference between the amounts of physical capital used by the neoclassical and classical firms.

[15] As is well known, the objective function of the neoclassical firm is as follows: $\text{Max}\,\pi_{ec} = Yp(Y) - w_L L - w_K K$.

[16] Hereinafter, the abbreviation "neo" is used to denote indicators relating to the neoclassical firm, whereas the abbreviation "class" is used for indicators the classical firm.

[17] Otherwise, the neoclassical firm, which maximizes economic profit, would also have the highest rate of profit as well.

[18] Otherwise, the neoclassical firm would have produced more than the classical firm, which would have contradicted the initial assumption.

Let us show that the conditions set by Eqs. (14) and (15) cannot be simultaneously respected.

The following statement is correct as a result of the decreasing productivity of physical capital:

$$\partial Y^{class}/\partial K^{class} = \partial Y^{class}/\partial[K^{neo} - \Delta(K)] > \partial Y^{class}/\partial K^{neo} \quad (16)$$

In other words, at the point ensuring the maximal rate of profit, the partial derivative of the output of the classical firm by the amount of physical capital exceeds the partial derivative of the same function at the point where the same amount of labor is used, but the amount of capital corresponds to the optimal output by the neoclassical firm. The latter partial derivative can in turn be presented in the following way:

$$\partial Y^{class}/\partial K^{neo} = \partial\left[Y^{neo} + \Delta_Y(K,L)\right]/\partial K^{neo} = \partial Y^{neo}/\partial K^{neo} + \partial[\Delta_Y(K,L)]/\partial K^{neo} > \partial Y^{neo}/\partial K^{neo}. \quad (17)$$

It immediately results from a comparison of Eqs. (16) and (17) that under optimal conditions the marginal product of the capital of the classical firm should be higher than that of the firm maximizing economic profit. Nevertheless, this conclusion directly contradicts the statement presented by the first equation in. The latter in turn results from the assumption that the classical firm's optimal output exceeds that of the neoclassical firm. Thus, we proved the statement, according to which the output of a classical firm with some positive economic profit margin is strictly less than that of a neoclassical firm.

Mesnard (Mesnard, pp. 3–7) comes to the same conclusion using a more compact form of objective functions for the classical and neoclassical firms. However, his proof seems to contain an error.

Both objective functions proposed by the French researcher have a single argument—amount of output (hereinafter, to avoid confusion, the notation, used in this article, is substituted for that used by Mesnard):

$$\begin{aligned} &\mathrm{Max}\,\pi_{econ}(Y) = \pi_{accnt}(Y) - rI(Y), \\ &\mathrm{Max}\,\Pi_{accnt}(Y) = \pi_{accnt}(Y)/I(Y)\ , \end{aligned} \quad (18)$$

where r is the market yield of capital and $I(Y)$ is the amount of advanced capital. At the same time, the accounting profit margin is determined as a difference between gross income and total costs: $\pi_{accnt}(Y) = TR(Y) - TC(Y)$.

Having differentiated objective functions (18)18) by output, the author gets the following expressions representing the first-order conditions for the maximum of the respective functions:

$$\begin{aligned} &\pi'_{econ}(Y) = \pi'_{accnt}(Y) - rI'(Y), \\ &\Pi'_{accnt}(Y) = \pi'_{accnt}(Y) - \Pi_{accnt}(Y)I'(Y). \end{aligned} \quad (19)$$

Next, Mesnard expresses the first equation in (19) through the second one:

$$\pi'_{econ}(Y) = \Pi'_{accnt}(Y) + [\Pi_{accnt}(Y) - r]\,I'(Y). \quad (20)$$

He seems to have no doubts that this operation is correct (we will later show that it is not so). The follow up is quite simple: given that the profit rate of the classical firm should not be less than the market yield of capital (that is, $\Pi_{accnt}(Y) - r \geq 0$), curve (20) should lie above or coincide with the second curve (19), which characterizes the function of the marginal rate of profit of the classical firm. The result is that the first curve (19) crosses the x axis, which measures output, to the right of the point (or at the same point) where the second curve crosses it. Nevertheless, this means that the firm, which maximizes the economic profit margin, will set its output at a higher level than the classical firm.

Unfortunately, the above-mentioned operation aimed to express the first function in (19) through the second one is not correct, because the accounting profit function and, consequently, the $\pi'_{accnt}(Y)$ marginal accounting profit function have different values for these two types of firms at the same output. This, in turn, as will be shown in the next section, is related to the fact that firms maximizing economic profit and the rate of profit have different cost functions.

Specific features of a competitive classical firm's behavior. It is a well-known fact that competitive firms do not affect the price of goods they produce. Correspondingly, to reflect specific features of a competitive classical firm's behavior as compared to the general case we have explored, it is sufficient to introduce a single correction to objective function (1): to express the market price of its produce not as a function of the scale of productive activity, but as a constant. However, we will go a little bit further and, having in mind the obvious equivalence between the maximization of the rate of accounting profit and the rate of economic profit, will formulate the objective function of the competitive classical firm in the following way:

$$\mathrm{Max}\,\Pi_{econ} = [p_0 f(K,L) - w_K K - w_L L]/(p_K K), \quad (21)$$

where Π_{econ} is the rate of economic profit and w_K is the factor price of physical capital, which at the optimal position is equal to the normal yield of a unit of capital $(w_K = KY_{norm}/K = A + p_K r)$[19].

First, we determine the first-order conditions for the maximum of the objective function (21) by differentiating it by arguments K and L:

$$\partial\Pi_{econ}/\partial L = [p_0(\partial f(K,L)/\partial L) - w_L]/(p_K K) = 0, \quad (22)$$

$$\partial\Pi_{econ}/\partial K = [(p_0 f'_K - w_K)p_K K - p_K(p_0 f(K,L) - w_K K - w_L L)]/(p_K K)^2 = 0. \quad (23)$$

[19]It is evident that in the case of natural resources the amount of amortization equals zero.

		The Firm's Total Income			
1.	Opportunity costs of the application of own scarce natural and managerial re-sources by the firm (TCrents&wages)	Money costs (TC_{money})	Amortization of physical capital ($A \cdot K$)	Interest income on capital($KY_r = r \cdot K \cdot p_K$)	Economic profit (π_{ec})
2.	TCrents&wages	TC_{money}	TNormal income on capital (KY_{norm})		π_{ec}
3.	TCrents&wages	TC_{money}		The Gross Income on Capital (KY_{total})	
4.	TCrents&wages	TC_{accnt}		Accounting profit(π_{accnt})	
5.	The Incomplete Economic Costs (TC_{part})			π_{accnt}	
6.	Total economic (opportunity) costs (T_{Cec})				π_{ec}

Fig. 1. Value structures of the firm's output.

From here, it follows that

$$p_0\left[\partial f(K,L)/\partial L\right] = w_L, \tag{24}$$

$$p_0\left[\partial f(K,L)/\partial K\right] = \left[p_0 f(K,L) - w_L L\right]/K. \tag{25}$$

Thus (see Eq. (24)), at the optimal level of output of the competitive classical firm, (as well as its neoclassical counterpart), the marginal value product of labor equals its factor price—the wage rate.

As far as the marginal value product of capital is concerned, it turns out to be equal to the amount of gross return on capital per unit of physical capital. Having equated the right-hand side of Eq. (25) to the factor price of physical capital w_K, we can determine the conditions, under which the optimal level of output and the optimal quantities of production factors will be the same for the classical and neoclassical firms. It turns out that such a result will only take place when the expected price for a firm's produce equals the average economic costs $(p_0 f(K,L) = w_L L + w_K K)$ and the economic profit equals zero. In all other cases, as we already know, the output of the classical firm will be less than that of the neoclassical firm.

The system, consisting of Eqs. (24) and (25), can be solved with respect to variables K and L. As a result, we will get demand functions for production factors which characterize the quantities maximizing the rate of profit at different values of parameters w_L and p_0:

$$K = K^*(w_L, p_0), \tag{26}$$

$$L = L^*(w_L, p_0). \tag{27}$$

The analysis (because of its complexity, it is not presented here) shows that it is not possible to determine uniquely the direction, in which the factor price of labor influences the demand for this factor of production by the classical firm. Paradoxically (but this directly follows from Eq. (25)), the price for services of physical capital has no impact upon the demand for it from the firm, which maximizes the rate of profit. In the long run, in the case of a growing factor price of capital, the classical firm will continue production with the same combination of production factors until the gross yield of capital exceeds the normal yield. As soon as it happens, the firm just has to cease production (see Fig. 2).

After replacing the arguments of the production function by the firm's demand functions for production factors, we get a supply function of the classical firm:

$$Y^*(w_L, p_0) = f\left(K^*(w_L, p_0), L^*(w_L, p_0)\right). \tag{28}$$

There exists a possibility to specify the structure of the right-hand side of this expression. From Eq. (24), it follows that the rate of profit reaches its maximum when the marginal value of labor equals the firm's wage-to-output price ratio $\left(\partial f(K,L)/\partial L = w_L/p_0\right)$. Having divided both sides of Eq. (25) by p_0 and having under-

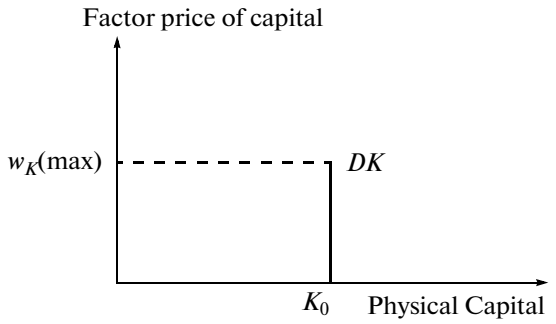

Fig. 2. Demand function of physical capital by the classical firm.

Notes: An awesome feature of the firm, which maximizes the rate of accounting profit, is the absolute inelasticity of the demand function for physical capital DK by the price of services rendered by this production factor. The price of services of this production factor does not affect the demand for labor force (see Eq. (24)). Thus, other things being equal, a change in the the price of capital up to a certain level does not affect at all the combination of production factors used by the classical firm in the long run. If the price of physical capital exceeds the $w_K(\max)$ *level, at which a normal return on capital is received, then the firm should go out of business.*

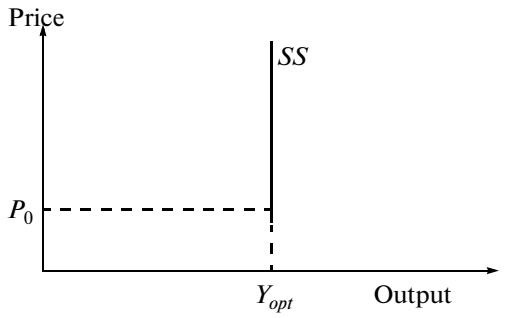

Fig. 3. Supply function of the competitive classical firm.

Notes: Let p_0 be a firm's output price, which ensures the normal return on the capital invested in it. Then if in the long run the price goes lower than this level, the firm should go out of business. An awesome feature of the competitive classical firm is the fact that, within range p_0 and above, the amount of supply by the competitive classical firm remains the same and this is exactly why the supply schedule is represented by vertical line SS. Obviously, this is linked to the fact that the function of the rate of accounting profit attains its maximum only at output Y_0, at which the production function of the firm exhibits constant returns to scale.

taken some minimal transformations, including the replacement of w_L/p_0 by $\partial f(K,L)/\partial L$, we get

$$f(K^*,L^*) = \partial f(K^*,L^*)/\partial K^* K^* + \partial f(K^*,L^*)/\partial L^* L^*. \quad (29)$$

According to the inverse Euler theorem, this means that the maximal value of the profit rate will be reached at such a level of output, which corresponds to the point (to the range) of the production function, characterized by constant returns to scale. It follows from this that the supply curve of the competitive classical firm turns out to be vertical: at any price equal or above average economic costs, such a firm will, in the absence of restrictions on the application of production factors, supply the same quantity of output (see Fig. 3).

However, the price of output does affect the combination of production factors employed by a firm. It is easy to verify this by taking into account the fact that at an optimal position the marginal product of labor has to equal the factor price—the price of the firm's output ratio. Correspondingly, if the expected output price changes, then the marginal product of labor moves in the opposite direction and, thus, the quantity employed of this production factor also changes.

This fact becomes even more obvious after analyzing the function of economic costs of a competitive classical firm. It is necessary to keep in mind that the substance itself of economic costs undergoes here significant metamorphosis. If for the neoclassical firm the corresponding function characterizes minimal opportunity costs at each level of output, in the case under consideration, it represents the amount of opportunity costs, which maximizes the rate of profit at each level of output:

$$\mathrm{Max}\,\Pi_{econ} = [p_0 f(K,L) - w_K K - w_L L]/(p_k K), \quad (30)$$

with the restriction

$$f(K,L) = Y_0. \quad (31)$$

The Lagrange function and its first partial derivatives, equated to zero, will look like this:

$$\mathrm{Max}\,\Im = [p_0 f(K,L) - w_K K - w_L L]/(p_k K) + \lambda(Y_0 - f(K,L)), \quad (32)$$

$$\partial f/\partial L(p_0 - \lambda K p_k) - w_L = 0, \quad (33)$$

$$\partial f/\partial K(p_0 - \lambda K p_k) - [p_0 f(K,L) - w_L L]/K = 0, \quad (34)$$

$$Y_0 - f(K,L) = 0. \quad (35)$$

Let us compare now Eqs. (33)–(35) with the well-known first-order conditions for the minimization of economic costs by the neoclassical firm at each level of output:

$$\Im_L = w_L - \lambda(\partial f/\partial L) = 0, \quad (36)$$

$$\Im_K = w_K - \lambda(\partial f/\partial K) = 0, \quad (37)$$

$$\Im_\lambda = Y_0 - f(K,L) = 0. \quad (38)$$

It is easy to note that for the neoclassical firm the relation of the marginal product of labor to the marginal product of capital equals the relation of their factor prices. In the case of the classical firm, the situation is different: the relation of the marginal products of capital and labor equals the relation of total yield of capital per its unit to the wage.

It follows from Eq., (33) that in the optimum position the wage should equal the product of the marginal productivity of labor by the expression $(p_0 - \lambda K p_k)$. It is obvious that this expression should not be negative, because both the marginal productivity of labor and the wage are nonnegative. However, then Lagrange multiplier λ should not exceed $p_0/(Kp_k)$. Wage w_L will be lower than the marginal value productivity of labor if $0 < \lambda < p_0/(Kp_k)$, will exceed the marginal value productivity if $\lambda < 0$, and will equal the marginal value productivity if $\lambda = 0$.

Similar considerations are applicable when one examines the expression $[p_0 f(Z,K,L) - w_L L]/K$. Correspondingly, the marginal value productivity of capital $\frac{\partial f}{\partial K} p_0$ can, depending on the λ value, be higher, lower, or equal to the income per unit of physical capital, expressed in such a way.

As far as the sign of Lagrange multiplier λ is concerned, it depends on the character of returns to scale at the respective level of output. It is easy to verify that when $\lambda = 0$ Eqs. (33) and (34) turn out to be equivalent to (24) and (25). As we know, however, this means that output Y_0 is set at a level corresponding to constant returns to scale. An additional analysis testifies to the fact that at increasing returns to scale

$0 < \lambda < [p_0/(Kp_k)]$, whereas at decreasing returns to scale $\lambda < 0$.

The system of equations (33), (34) lends itself to further transformations, which simplify their solution in relation to K and L. Let us move w_L and $[p_0 f(K,L) - w_L L]/K$ in the left-hand side of Eqs. (33) and (34), correspondingly, and then divide the resultant equations by each other. Thus, we get Eq. (39). After all, instead of a system of three equations with three unknowns, we receive a system consisting of two equations with two unknowns:

$$f_L/f_K = (w_L K)/[p_0 f(K,L) - w_L L], \quad (39)$$

$$f(K,L) = Y_0. \quad (40)$$

We should pay attention to the following fact. The amounts of production factors K and L, employed by the neoclassical firm at the optimum within a similar model are functions of three parameters—output level Y_0 and factor prices w_K and w_L. The classical firm also has three parameters, which determine K and L, but their composition is somewhat different: instead of the price of capital services w_K, the price of the firm's output p_0 is present here (one can see it from Eq. (39)).

Let us make a comparison of technologies, which would be used by both types of firms at different prices for their output when they are at the level of constant returns to scale.

As we know, the neoclassical firm will not react to a change in the price of its output by modifying the combination of production factors, which minimizes average economic costs. We also know that, when the price of output equals the minimal average costs of the neoclassical firm, the optimal levels of output and the combinations of production factors will be the same for both types of firms. However, when the price is higher than that, the classical firm will employ less physical capital. In fact, the rate of profit direct depends on the volume of profit and inversely depends on the amount of capital used. By definition, the classical firm cannot excel the neo-classical firm in terms of profit. Nevertheless, under the conditions considered, it should have a higher rate of profit. This can only happen if at higher prices it uses less capital-intensive technologies than the neoclassical firm.

Knowing the optimal amounts of production factors, resulting from the maximization of the objective function of the classical firm, we can easily construct the functions of its accounting (TC_{accnt}) and economic costs (TC_{econ}):

$$TC_{accnt}(Y_0, p_0, w_L) = K^*(Y_0, p_0, w_L) A + L^*(Y_0, p_0, w_L) w_L, \quad (41)$$

$$TC_{econ}(Y_0, p_0, w_L) = K^*(Y_0, p_0, w_L) w_K + L^*(Y_0, p_0, w_L) w_L. \quad (42)$$

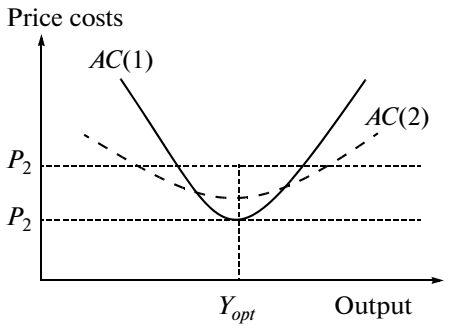

Fig. 4. Competitive classical firm: dependence of average economic costs upon the price of output

Notes: The economic costs of the classical firm are, along with other factors, a function of the market price of goods it produces. In all cases, a minimal amount of average costs is ensured at an output level corresponding to constant returns to scale of the production function (point Y_{opt} on the graph). At price p_1, the function of average economic costs is presented by the AC1 curve. Here (and only here), the minimal economic costs are precisely equal to the market price, and the combination of production factors used coincides with that, which provides for the maximization of economic profit by the neoclassical firm. Increased market price p_2 for goods produced by the firm leads to the modification of the level of costs at each level of output by the classical firm (curve AC2). The classical firm owes this specific feature to the fact that at each level of output it chooses a combination of production factors that maximizes rather the rate of accounting profit than the amount of economic profit.

So far, as the optimal amounts of the production factors employed by the classical firm are, in particular, a function of the price of goods produced, such a firm will (at different price levels but at the same production level) chose different combinations of production factors and, correspondingly, have different total costs (both accounting and economic). This most important specific feature of the classical firm is presented in Fig. 4.

It is a well-known fact that the neoclassical firm sets the scale of output in such a way that the marginal economic costs equal the marginal revenue. What can we say about a firm, which maximizes the rate of profit? By definition, the total income of a competitive firm equals

$$TR = p_0 Y_0. \quad (43)$$

The accounting profit is correspondingly equal to

$$\pi_{accnt} = TR(Y_0, p_0) - TC_{accnt}(Y_0, p_0, w_L). \quad (44)$$

The accounting costs at a fixed level of output are formed on the basis of such a combination of production factors that maximizes the rate of accounting profit. That is why the amount of accounting profit π_{acc} in Eq. (44) is optimal in terms of the objective function of the classical firm. With this in mind, the amount of

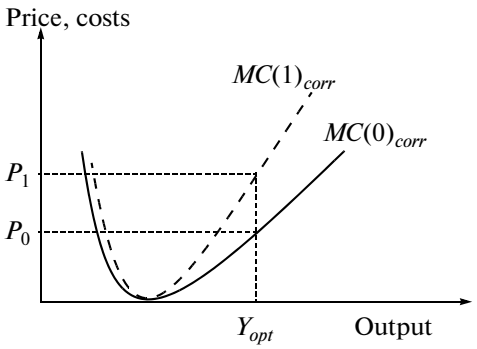

Fig. 5. Maximization of the rate of accounting (economic) profit by the classical firm.

Notes: The point of intersection of the curves of marginal income (it is always presented by a horizontal line in the case of a competitive firm) and corrected marginal costs determines the output level maximizing the rate of accounting (economic) profit. A change in the market price modifies the curve of corrected marginal costs ($MC(0)_{corr}$) at price p_0 and $MC(1)_{corr}$ at price p(1)) because both its position and configuration for the classical firm depend upon the market price of the firm's output. However, the point of intersection of the curves of marginal income and corrected marginal costs will always be found strictly above the point of minimal economic (as well as accounting) costs. This is because the level of output maximizing the rate of accounting (economic) profit always corresponds to the point (it is Y_{opt} on the graph) where the production function is characterized by constant returns to scale.

the rate of accounting profit at output Y_0 can be determined with the aid of the following formula:

$$\Pi_{accnt}(Y_0, p_0, w_L) = [TR(Y_0, p_0) - TC_{accnt}(Y_0, p_0, w_L)]/[K^*(Y_0, p_0, w_L)\, p_K], \quad (45)$$

where $K(Y_0, p_0, w_L)$ is the optimal amount of physical capital employed by the firm in terms of (a) the maximization of the rate of profit at fixed levels of output and (b) the price of firm's output and the wage paid.

Let us differentiate now the function $\Pi_{accnt}(Y_0, p_0, w_L)$ by Y_0 and equate the resultant derivative to zero. After a minimal regrouping, we get

$$MR(Y_0, p_0) = MC_{accnt}(Y_0, p_0, w_L) + [\partial K^*(Y_0, p_0, w_L)/\partial Y_0] \times \{[TR(Y_0, p_0) - TC_{accnt}(Y_0, p_0, w_L)]/K^*(Y_0, p_0, w_L)\}, \quad (46)$$

where $MR(Y_0, p_0)$ is the marginal income and $MC_{accnt}(Y_0, p_0, w_L)$ is the marginal accounting costs of the classical firm.

It is easy to check that the formula will remain similar if we substitute the marginal and total economic costs for the respective accounting costs in Eq. (46):

$$MR(Y_0, p_0) = MC_{econ}(Y_0, p_0, w_L) + \{[\partial K^*(Y_0, p_0, w_L)/\partial Y_0] \times [TR(Y_0, p_0) - TC_{econ}(Y_0, p_0, w_L)/K^*(Y_0, p_0, w_L)]\}. \quad (47)$$

We will call the expressions from the right-hand sides of Eqs. (46) and (47)[20] "corrected marginal costs (both accounting and economic)." *Thus, we can draw the following conclusion: the equality of the marginal income and the corrected marginal costs is a condition for the maximization of the rate of accounting (or economic) profit by the competitive classical firm*. The corrected marginal costs are an algebraic sum of marginal costs (both accounting and economic) *and the product of the instant velocity of change, with output growth, of the optimal quantity of physical capital by the amount of accounting (economic) profit per unit of physical capital*.

Now we can give a clear geometrical interpretation to the process of the rate of accounting profit maximization (see Fig. 5). An optimal level of output is reached at the point of intersection of the curve of marginal income (for a competitive firm, the latter is always equal to the market price of the firm's output) and the curve of corrected marginal costs. In contrast to the traditional curve of marginal costs, the position of the curve of corrected marginal costs depends upon the price of the firm's produce. That is why a change in prices results in a new optimal position, determined by the intersection of the shifted curve of marginal income and the new curve of corrected marginal costs. It is important that the point of intersection of these two curves will always be positioned strictly above the point of minimal average economic (respectively, accounting) costs of the classical firm. This is the result of the already mentioned fact that the minimal level of average economic (accounting) costs is obtained at an output level characterized by constant returns to scale.

CONCLUSIONS

We have discovered significant differences in the behavior of the classical firm as compared to the behavior of a firm striving to maximize economic profit.

In the general case, relevant for classical firms acting both in perfect and imperfect markets, the scale of their production and the amount of physical capital used cannot exceed (and in all cases, but one, will be less than) the respective parameters of neoclassical firms, which are in the same position.

Competitive classical firms possess some remarkable features.

In the long run, at any market prices, they will set their output at a level, which is characterized by con-

[20] As was already mentioned, D. Katzner based his analysis of the behavior of a competitive firm, which maximizes capital yield, on an objective function, which is different in form and more complex in terms of substance: $\Phi = (pf(y) - ry)/\Lambda(p, r, x, y)$, where p is the price vector for the firm's output; r is the price vector for the firm's inputs; x is the vector of output; y is the vector of inputs; and $\Lambda(p, r, x, y)$ is the average money capital requirement function. Several conclusions that he came to perfectly correlate with ours: (a) the market prices of a firm's output directly affect its cost function; (b) at an optimum output level, a firm's marginal costs do not equal its price; and (c) the marginal value products of those production factors, the acquisition of which required capital outlays, do not coincide with their factor prices (Katzner, pp. 551–555).

stant returns to scale. In other words, their long-term supply curve is absolutely inelastic. Also, absolutely inelastic by the factor price of physical capital is the demand function for this production factor. Under these conditions, the cost functions (both accounting and economic) depend not only upon the scale of output, but also upon the price of the firm's output. In an optimal situation, the market price and the so-called "corrected marginal economic costs" turn out to be equal to each other, the position of the latter curve being in direct dependence upon the firm's output price.

Under the conditions of a general equilibrium for both the neoclassical and classical firms, the market price turns out to be equal to average economic costs; economic profit, to zero; and the profit rate, to the market interest rate. In the long run, under these conditions (and only under these conditions), the behavior of the classical firm does not differ in any respect from that of a firm, which maximizes economic profit.

Interesting conclusions, referring to the specific features of short- and medium-term adaptation by the classical and neoclassical firms to violations of the long-term equilibrium can also be drawn from our analysis.

The short-term adjustment of both types of competitive firms to deviations from the general equilibrium position will be similar. This is quite natural because under these conditions the amount of physical capital remains fixed and, as a result, the task of maximization of economic profit coincides with that of maximizing the rate of profit.

One might think that the same applies to the short-term adaptation of uncompetitive firms of both types. However, it is important to keep in mind the following thing. Under the conditions of a market equilibrium, which preceded a shock, the neoclassical and classical firms employed different combinations of production factors and set different levels of output. That is why the results of their short-term adjustment will be different, although in both cases it will proceed through changes in the quantity of the labor employed.

In the medium-term perspective, each competitive and uncompetitive firm has an ability to fully adjust the amounts of their production factors to the market conditions, the quantity of firms in the market remaining the same. Under these conditions, the classical and neoclassical firms will use different combinations of production factors and set different levels of output. The equilibrium prices on classical and neoclassical markets will also be different in the medium term.

And now the last comment.

The concept of the neoclassical firm is now reigning in microeconomic theory. The mathematical perfection of the model of the firm, which maximizes economic profit, achieved by the efforts of several generations of economists, is probably the only foundation of such a state of affairs. However, the provision of logical soundness for the general economic theory puts on the agenda the necessity to return to the classical understanding of the motivation, which drives the behavior of such an important agent of economic relations as the firm.

The firm is a "social construction," and it is not correct to mechanically endow it with features of a human being. That is why the raising of the problem of the firm's objective function should be intimately linked to the aspirations of those persons who determine its economic behavior. Owners of capital are such persons in a capitalist firm, and, therefore, the maximization of the yield of capital, which they have provided for the firm, should be put at the basis of a firm's motivation. Heterogeneity of the profit thesis should be thrown away as irrelevant.

REFERENCES

1. D. Kreps, *A course in microeconomic theory* (Princeton University Press, 1990).
2. L. Mesnard, *On companies' microeconomic behavior: profit rate versus economic profit*; http://leg.u-bourgogne.fr/documents-de-travail/e2008-05.pdf
3. R. Nelson and S. Winter, *An evolutionary theory of economic change* (Belknap/Harvard University Press, Cambridge, Mass., 1982).
4. A. C. Pigou, *The economics of welfare*, Fourth Ed. (Macmillan and Co., London, 1932).
5. A. Marshall, *Principles of economics* (Macmillan and Co., Ltd., London, 1920); http://www.econlib.org/library/ Marshall/marP.html
6. F. H. Knight, *Risk, Uncertainty, and profit* (Boston, MA, Hart, Schaffner & Marx; Houghton Mifflin Co., 1921); http://www.econlib.org/library/Knight/knRUP8. html
7. D. Katzner, "An introduction to the economic theory of marker behavior," *Microeconomics from a Walrasian perspective* (Edward Elgar Publishing Limited, 2006).
8. A. Nekipelov, Formation and functioning of economic institutions. From "Crusoe model" to market economy based on individual production (*Stanovleniye i functsionirovaniye ekonomicheskych institutov. Ot "robynzonady" do rynochnoy ekonomiki, osnovannoy na individualnom proizvodstve*) (Publishing House "Economist", Moscow, 2006).

Nekipelov, Aleksandr Dmitrievich, Dr. Sci. (Econ.), professor, Academician RAS, Vice-president RAS