DEVELOPMENTS IN THE THEORY OF MONOPOLISTIC COMPETITION

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I. INTRODUCTION

In the context of Economic Theory, there is very often use of abstract terms relating to firm, industry, commodity and market. Law of supply of products, investment of equipment or stock, and factor demand are usually deduced from the maximizing behavior of the firm, which is in the industry with pure competitive or pure monopolistic market structure. However, it is common knowledge that the real world is evidently between these polar cases. And it comes to our knowledge that we cannot be too careful in paying attention to the structure of the industries and to properties of the commodities. As G. J. Stigler says, "The importance of the trade mark and of advertising, and the need for study of product structure and evolution, have become more generally recognized." ([11], p. 24)

Some of our predecessors have endeavored to bridge the important gap between the real world of business and the conceptual world described by economic theorists. Particularly, E. H. Chamberlin's theory of Monopolistic Competition is the most distinguished achievement in respect of greater *realism*. Moreover, broad conceptualization and recognization of ideas are the major contribution of the theory of monopolistic competition. And his theory of monopolistic competition has a significant welfare implication that in the framework of his theory there are unexploited economies of scale.

However, the plain fact is that the theory of monopolistic competition has had little impact on economics (L. Telser, [13], p. 312). E. H. Chamberlin does not develop a logically consistent theory which leads to testable predictions and contains more accurate implications than the theory of pure competition (or pure monopoly). And his theory is incomplete because its implications are not formally worked out. G. C. Archibald [1] amplified these criticisms, and in the concrete form of expression he has shown why the theory of monopolistic competition is not able to be a more suitable medium of investigation of market phenomena than the neoclassical theory. According to his elucidation, the most important reason for the failure of the theory of monopolistic competition to win adherents lies in the lack of qualitative content. In general, when we build the economic model in compliance with our request, we are most concerned with the derivation

of meaningful theorems and predictions from that model. If the model is such a system that cannot yield qualitative (or quantitative) predictions at all, it is called an *empty theory*. Chamberlin's theory of monopolistic competition, as Archibald pointed out, is one. That is, "The qualitative calculus has failed in the Chamberlin case simply because the relation between the variables and the parameters is such that the traditional qualitative restrictions are not sufficient." ([1], p. 165)

Monopolistic competition concerns itself not only with the problem of an *individual* equilibrium but also with that of a *group*. And a study on whether an unambiguous qualitative prediction can be obtained, when the demand on a firm changes and when the cost condition of a firm changes, was examined by Archibald [1] and [3], respectively. Then he had a result that the theory of monopolistic competition has not even the minimum of qualitative information necessary for comparative statics. To be sure, his formal results are correct, but it is worthwhile to re-investigate what conditions are required in order to deduce meaningful and testable hypotheses from the system of the theory of monopolistic competition.

In this paper, we explore one such way that surmounts defects of the theory of monopolistic competition, summarized above, without imposing arbitrary restrictions.

II. FORMAL EXPRESSION OF QUALITATIVE CALCULUS IN THE THEORY OF MONOPOLISTIC COMPETITION

P. A. Samuelson proposed three sources of meaningful theorems in economics[1]: (i) "qualitative economics", (ii) the hypothesis that equilibrium positions are stable, and (iii) the hypothesis that equilibrium positions correspond to the extreme of some function. The system of the theory of monopolistic competition has remained static since E. H. Chamberlin proposed it. So we consider qualitative economics in the theory of monopolistic competition separately. First we consider the case in which the cost conditions of the individual firm change. Second, we investigate the case in which a change in the demand conditions of the individual firm (or group) occurs.

(i) The firm in the model of monopolistic competition includes three decision variables: price, quality, and advertising. Similar to Archibald [3], H. Demsetz [6], and J. Hader [7], we begin the analysis with the comparative statics of the model under the circumstances which make

[1] P. A. Samuelson [9], Chap. 3.

advertising a profitable activity, only[2]. Then we can denote the demand function of the individual firm as the following,

$$p=f(x, v), \qquad f_x<0,\ f_v>0,\ f_{vv}<0, \tag{1}$$

where p, x and v are the price level, output level and the amount of advertising, respectively. And assume for convenience that the total cost function is separable, so that we may write

$$C=g(x)+sv, \tag{2}$$

where s is unit price of advertising, a constant. First- and second- order conditions for a maximum of the monopolistic firm's net profit are simply

$$f+xf_x-g'=0 \tag{3-a}$$

$$xf_v-s=0 \tag{3-b}$$

and

$$a<0, \quad \begin{vmatrix} a & b \\ b & c \end{vmatrix}>0, \tag{4}$$

where

$$a=2f_x+xf_{xx}-g''$$
$$b=f_v+xf_{xv}$$
$$c=xf_{vv}.$$

we want to see whether the direction of changes in the variables in respect to a parameter change can be determined in our model. By total differentiation of (3-a) and (3-b) with respect to s, we obtain

$$\begin{bmatrix} a & b \\ b & c \end{bmatrix} \begin{bmatrix} dx \\ dv \end{bmatrix} = \begin{bmatrix} 0 \\ ds \end{bmatrix} \tag{5}$$

(5) is solved by (denoting $ac-b^2$ *as* D),

$$\frac{dx}{ds}=\frac{-b}{D} \tag{6}$$

$$\frac{dv}{ds}=\frac{a}{D}<0$$

and

$$\frac{dp}{ds}=\frac{af_v-bf_x}{D}.$$

Except for dv/ds, we cannot yield the unambiguous results unless the signs of cross-partial derivatives are known; but not even this is sufficient to

[2] Here, we do not introduce a quality variation into our model. The reason for doing so is not only for convenience but also that quality of a commodity is not a definitive economic measurement, yet.

sign of dp/ds. Besides, the effects of a change in another cost condition added, e.g., a special tax or an *ad valorem* tax, cannot be derived from the model.

(ii) It is reasonable to think that the shift of demand occurs when entry or exit takes place. Now, our question is the following, when the number of firms changes, what are the effects on price, output level, and amount of advertising?

As Demsetz asserted, we introduce the hypothesis such that entry makes it "more difficult (expensive) for a seller to differentiate his product" ([6], p. 634). By introducing a shift parameter, t, into the individual firm's demand function (1), we can examine whether our system has sufficient information necessary to determine what happens to individual equilibrium as demand shifts. Instead of (1), the firm's demand function is

$$p=f(x, v, t), \qquad f_t<0. \tag{1'}$$

Then, the effect of a change in demand condition can be calculated by the following system,

$$\begin{bmatrix} a & b \\ b & c \end{bmatrix}\begin{bmatrix} dx \\ dv \end{bmatrix}=-\begin{bmatrix} \alpha \\ \beta \end{bmatrix}dt, \tag{7}$$

where

$$\alpha=f_t+xf_{xt}$$
$$\beta=xf_{vt}.$$

In the same way as (i), (7) is solved by

$$\frac{dx}{dt}=-\frac{\alpha c-\beta b}{D} \tag{8}$$
$$\frac{dv}{dt}=-\frac{\beta a-\alpha b}{D}$$

and

$$\frac{dp}{dt}=-\frac{f_x(\alpha c-\beta b)-f_v(\beta a-\alpha b)}{D}+f_t$$

There is no doubt that we cannot yield the unambiguous qualitative predictions at all in this case. Even if we specify the conditions of the demand function as Demsetz [6], we cannot derive the meaningful predictions from our model. The key which surmounts these difficulties does not consist in the way of specifying the restrictions arbitrarily, but in the way of considering the meaning of *product differentiation*. In the next section, we propose one way of examination.

III. DEMAND FUNCTION REVISED AND QUALITATIVE CALCULATION

Now, we define the new individual firm's demand function which is derived as a result of considering the firm's rational behaviour. Our new demand function is by no means such a special one that strict restrictions are assumed. And then, we shall re-examine the comparative statics about the problems expressed in the last section.

(i) In the absence of qualitative variation, the firm must differentiate his product from other firm's by the medium of advertising activity only. An entrepreneur certainly differentiates his product from others in order to increase his profit, even a cent. That is, because he finds it profitable to differentiate his product, he pays a selling (advertising) cost.

Let $p_0=f(x_0, v_0)$ and $p_1=f(x_0, 0)$ in the demand function (1). Hader [7] referred to the quantity p_0-p_1 as the *discount equivalence* of the advertising ratio v_0/x_0. "If the combination p_0 and v_0 generates a demand of x_0 unit of x, and the firm reduces its advertising to zero, then it will be able to maintain the level of demand x_0 if it cuts its price by p_0-p_1 dollars." (p. 68) Fig. 1 shows the meaning of this terminology, the discount equivalence. The firm's long-run average cost is shifted by the advertising outlay, from LAC_1 to LAC_0. But also his demand curve (the partial demand curve) is shifted upward and is changed its slope through the medium of advertising activity, depicted by D_0 D_0. At the points of A and B, the firm's amount of product demanded is the same, x_0. If $\bar{x}$ is the output level corresponding with the minimum average production cost and A moves to the point C corresponding with the selling plan (combination) $(\bar{x}, \bar{v})$, as Demsetz [5] asserted, full equilibrium does not necessarily involve excess capacity[3].

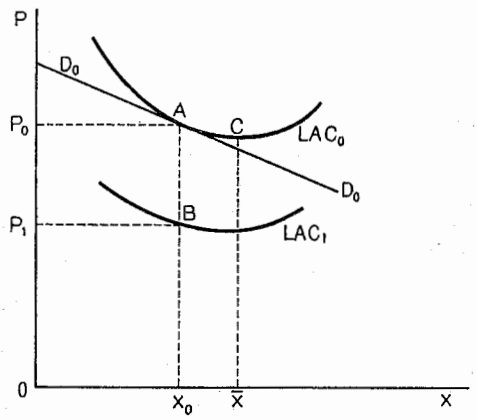

Fig. 1.

For a monopolistic firm, holding the advertising-sales ratio constant over time is an optimal decision[4]. And it is reasonable to assume that the discount-equivalence of the advertising ratio varies with the level of

[3] This proposition is opposed to the famous excess capacity theorem which is regarded as one of the significant results obtained by Chamberlin.

[4] It is easy to derive this condition. See G. Matsumoto [8] for details.

advertising. The effect of advertising activity on the product differentiation may be diminishing. Hence, given the definition of discount-equivalence, we can write

(9–a) $$f(x, v)-f(x, 0)=\theta(z)$$

or equivalently

(9–b) $$f(x, v)=f(x, 0)+\theta(z),$$

where $z=v/x$, $\theta'(z)>0$, and $\theta''(z)<0$. And $f(x, 0)$ is the usual demand function faced by the firm when it has decided not to advertise at all. Replacing $f(x, 0)$ by $F(x)$, (9–b) is re-written as

(10) $$f(x, v)=F(x)+\theta(z), \qquad F'(x)<0.$$

This revised demand function allows us to derive the unambiguous qualitative predictions from the system of our model which is expressed in the last section. Hader got the definitive results in the case of unit price of advertising, s, and a tax increase[5].

(ii) However, he did not explore the possibility of comparative statics in the case of (ii) of the last section. It is no less important to investigate the effects on prices and size of plant of a change in demand than the problem explored by Hader.

Now, in the same way as (1′), we choose such a method that introduces the demand shift parameter into the revised function (10). We already suggested that the effect of entry is to weaken the degree of product differentiation of the existing firms. Since, in our demand function, equation (10), the function of differentiation is represented by the second term, $\theta(z)$, only, so we can write, instead of (1′)

(10′) $$f(x, v, t)=F(x)+\theta(z, t), \qquad \theta_t<0.$$

Let us examine the comparative statics when entry occurs. In the present calculation, b, c, α, and β in the equation (7) are re-written as the following

(11)
$$b=f_v+xf_{xv}=-\frac{1}{x}z\theta_{zz}$$
$$c=xf_{vv}=\frac{1}{x}\theta_{zz}$$
$$\alpha=\theta_t-z\theta_{zv}$$
$$\beta=\theta_{zt}.$$

By employing the revised demand function provided above, our model is solved by

[5] See Hader [7] for detailed procedure.

$$\frac{dx}{dt}=-\frac{1}{D}\cdot\frac{\theta_i\theta_{zz}}{x}<0 \tag{12}$$

$$\frac{dv}{dt}=-\frac{1}{D}(\beta a-\alpha b)\gtrless 0$$

Thus, we can derive one unambiguous qualitative prediction, the direction of change in the amount of product (or plant size) in response to the demand shift caused by entry. On the other hand, the effect of entry on the amount of advertising does not become clear. But we may obtain the sign of dv/dt, by means of introducing the some conditions in the theory of monopolistic competition. As we described before, one of the monopolistic firm's optimal behaviour is to choose such an advertising ratio, z, that is constant over time. And Chamberlin's theory of monopolistic competition concerns the case in which numerous firms are existent and each too small to take into account the effect of its strategic decisions on others. So, the hypothesis such that the monopolistic firm will not alter his advertising ratio in response to entry, is not a very strict hypothesis. This hypothesis is shown as the following

$$\frac{dz}{dt}=\frac{1}{x}\left(\frac{dv}{dt}-z\frac{dx}{dt}\right)=0. \tag{13}$$

Since $dx/dt<0$ is already known, dv/dt must be negative. But even in this case, we need more restrictions to obtain the unambiguous sign of dp/dt. From (7) and substituting (13), we obtain

$$\frac{dp}{dt}=\frac{1}{x}(xf_x+vf_v)\frac{dx}{dt}+f_t \tag{14}$$

$$=F'(x)\frac{dx}{dt}+f_t.$$

If there are so numerous firms that the slope of the partial demand curve with no advertising, $F'(x)$, is approximately zero, dp/dt may be negative[6].

IV. SUMMARY AND CONCLUSION

We are confident that the theory of monopolistic competition has contributed to the modern economic theory in such respects as its greater realism, broad conceptualization and recognization of ideas, welfare implication, and so on. However, E. H. Chamberlin's Theory of Monopolistic Competition has not been accepted as a general theory of value.

Many economists have criticized that Chamberlin did not develop

6) This conclusion is consistent with our experience. But in the strict sense, we can hardly escape the charge of arbitrariness.

a logically consistent theory which leads to the testable predictions and contains the more accurate implications than the neoclassical theory. Particularly, in the concrete form of expression, G. C. Archibald emphasized that the most important defect lies in the impossibility of deriving the qualitative predictions from the system of the theory of monopolistic competition.

In this paper, we examined the problem of how we can surmount these difficulties. Investigating this issue, our revised function, which resulted from considering the meaning of product differentiation and an entrepreneur's rational behaviour, played a crucial role. And we proposed one method such that makes our model able to derive the unambiguous signs of comparative statics.

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