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RESEARCH ARTICLE

Strategic market power of firms in imperfect markets

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ABSTRACT

Studies dealing with the market power of a firm depend on the elasticity of demand even when market imperfection is acknowledged. This study suggests that a firm derives its market power due to its interface with consumers on the market as well as its interaction with rival firms on the market. As a result, its market share and market power over a unit of sales in the industry require attention in the context of imperfect markets. Similarly, non-price strategies of firms offer some market power that should be incorporated in the definition. Thus the modified market power indices are a significant contribution to the theoretical results.

Keywords: imperfect markets; market power; market shares; non-price strategies

1. Introduction

Imperfect markets for industrial products invariably consist of many firms offering related products. Consequently, every firm derives its market power in its interface with consumers taken in conjunction with its interaction with rival firms on the market. That is, the market power of a firm in imperfect markets is determined by the elasticity of demand and its market share.

To begin with consumer valuation of products should be reckoned with as the major driving force behind the variations in the demand for the products of firms[1]. However, it can be argued that even when consumers provide some market power to the firm, based on the elasticity of demand for its products, rival firms reduce the market share of the firm and the market power that its interaction with the consumers provides. Thus, the firm derives its market power in its interface with the consumers (represented by the elasticity of demand) as well as its interaction with rival firms (that will be reflected in the changes in the market share of the firm).

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[1] In such a context, the notion of value may encompass the quality of products, product durability, promptness of delivery, service after sales, and several other characteristics that consist of technological features, details of production organization, and service management along with other considerations. More emphatically, it can be argued that a consumer does *not* buy a product because the firm is offering a lower price and/or charging a lower price cost margin. Instead, the value of the products will be essential in the determination of the decision to buy.

In general, consumers may not have full information about the various products on offer. The search costs of obtaining the requisite information may be quite large in comparison to the expected gains. This defines a limit on the demand for any one product on the market. It should also be acknowledged that consumers experience transaction costs while switching between products. Such switching costs, not necessarily the differences in product valuation, may give rise to consumer loyalty for the products of a firm and the resulting inelasticity of demand. Further, consumers must incur an additional cost if they attempt any comparison across products. It may turn out to be disproportionate to the expected increase in value. As a result, the demand for a firm's products may not reflect the valuation of the product by the consumers alone. For all practical purposes such a limit on the market share of the firm also limits the ability of a firm to achieve the market power that it wishes to obtain.

Other mechanisms through which market dominance is achieved should be identified as well. Firms tend to utilize non-price strategies to convey the value of their products to the consumers as well as offer comparisons with other products that determine their market share. A firm utilizing a single and unique strategy to convey information about the value of its products may be ideal. However, the management of a firm may feel that rivals can easily recognize its strategy and imitate it. A firm may also find that its products are unique over more than one dimension and as such different strategies may attract consumers looking for alternate characteristics of value. While some consumers may find certain strategies to be important others may not. As a practical reality consumers may underestimate the value of some strategies (e.g., advertising) and ignore them. Similarly, rival firms may find it simpler to imitate several features of the non-price strategies of firms as their number increases and the impact of each of them on the consumer decreases. Effectively, the number of non-price choices that are relevant in the context of a firm will be rather small. However, as Yannopoulous (2011) noted, firms adopt selected strategies to avoid being surpassed by rival firms and/or overcome strategies of rival firms in their attempt to project the value of their products to the consumers. As a result, there is an upper limit on the competitive strategies that a firm may adopt. Such choices of the firm account for the transient market power that it achieves.

Therefore, it should also be acknowledged that the market power, defined per unit of sales, must keep the total market sales of all related products in perspective given the interaction of rivals on the market. That is, effectively the market power of a firm depends both on the elasticity of demand, often represented by the popular Lerner measure, the market share of the total market that consumers provide it while evaluating the product, and the market share of a firm resulting from the interaction with rivals on the market.

In general, economic policy will be directed to all firms in a given industry. In such a context the market power of all firms in an industry becomes relevant. However, as of now, studies emphasize the Lerner measure and problems associated with its measurement. They ignore the effect of non-price strategies and considerations related to market imperfection.

In sum, the existing literature on the market power of a firm (a) concentrates on the elasticity of demand

for a firm taken in isolation (even when it acknowledges that market interaction exists), (b) does not adequately account for its market share obtained in its interaction with rival firms, (c) deals with the measurement of the marginal cost of the firm as reflected in the work of Hall (1998) and Pefloff et al (2007) (though the latter acknowledges the influence of non-price strategies on the marginal cost), and (d) Rao (2017,2020) and Rao and Bhattacharyya (2021) provided empirical evidence of the transient market power of firms based on the market shares as well.

By way of contrast, the present study provides a theoretical basis for the determination of the market power of a firm taking both its interface with consumers and its interaction with rival firms. The importance of such a measure in relation to the total market sales of all the firms in the industry is emphasized. The study also acknowledges the role of non-price strategies of firms and accounts for their influence on the market power of a firm in imperfect markets.

Against this background the present study makes an attempt to define market power per unit of sales in the entire industry. For all practical purposes the study acknowledges that a unit increase in the sales of the industry results in the market share of a firm which when combined with the Lerner measure defines the market power of a firm. Section 2 provides an outline of the existing measures and their drawbacks. A new index, acknowledging market imperfection will be presented in section 3. The concluding section highlights some directions in which the present study can be extended.

2. Literature review

A detailed review of the theoretical literature is available in Rao (2020). Rao and Bhattacharyya (2021) provided an exhaustive review of the empirical results. Syverson (2019) contains a review of the macroeconomic implications of market power as well. Hence, only the relevant theoretical aspects will be highlighted in this section.

The most popular measure of the market power of a firm is the Lerner (1934) measure. It is given by

$$v = \frac{p - MC}{p} = \frac{1}{\eta}$$

where p = price per unit of sales Y, MC = marginal cost, and η = elasticity of demand. Conceptually, this measure can be used for each firm[2]. Elzinga and Mills (2011) noted that the welfare maximizing choice of the output of a product satisfies p = MC if η = ∞. Hence, the market power, irrespective of the way it is measured, is due to the nature of the market. It accounts for the interface of the firm with the consumers. It is not meant to acknowledge the possible interaction between firms.

An alternative is the Herfindahl index $H = \sum s_i^2$ where s_i is the market share of firm i in the total sales of the industry. The basic assumption is that all firms in the industry have the same demand curve based

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2 This measure was developed in the context of a monopoly firm. It retained its prominence even in the more general context of imperfect markets.

on the total industry sales. Let $p = p(Y)$ where $Y = \sum Y_i$ and Y_i= sales of firm i.

The total profit for firm i is

$$\pi_i(Y_i) = \pi_i\, p(Y) - C(Y_i)$$

where $C(Y_i)$ = cost of production of firm i

Maximizing π_iw.r.to Y_i holding all other Y_j; $j \neq i$ constant yields

$$p(Y) + Y_i\left(\frac{\partial p}{\partial Y}\right)\left(\frac{\partial Y}{\partial Y_i}\right) - MC_i = 0$$

However, $\partial Y/\partial Yi = 1$so that

$$(p - MC_i) = \frac{s_i}{\eta}$$

Thus, the market power of firm i depends on s_i in addition to η. The market power of the industry per unit of its sales is then

$$L = \frac{\sum s_i^2}{\eta} = v \sum s_i^2$$

Since v is a constant the Herfindhal index

$$H = \sum s_i^2$$

is defined as a measure of the market power of the industry.

Two criticisms of the Herfindahl index were noted. First, Scherer (1970, p.73) argued that the use of the quadratic term cannot be justified on economic grounds. Second, Hall and Tideman (1967, p.164) noted that equal weights to all s_i^2 cannot be justified. Syverson (2019) pointed out other limitations. All these limitations relate to the mechanics of measurement rather than the economic process that underlie the conceptualization. Note that none of these measures account for the market imperfection and the influence of non-price choices of firms in imperfect markets.

Fischer and Kamerschen (2003a,b) acknowledged the interaction between firms. They took into account the conjectural variations in the output of each firm in response to the output choice of other firms. They neglected the differences in demand between firms since they postulate the market as a homogenous oligopoly. Their emphasis was only on the differences in market shares.

Rao and Bhattacharyya (2021) provided an intuitive basis to combine these two measures and utilize

$$M = \sum v_i s_i^2$$

However, a satisfactory theoretical basis was not forthcoming.

3. New index

Consider an industry consisting of n firms producing differentiated products. Let the price p_i of product i decrease. It is expected thaty_i (where y_i = output of firm i) will increase. The adjustments of the consumers and rival firms may be detailed as follows: (a) the product of the ith firm will be substituted for each of the rival firms' products. A reduction in y$_j$ can be expected. However, some consumers would have developed loyalty to

the products of firm j based on (i) the positive experiences with the use of the product, (ii) the reputation of the firm reflected in its brand name, and (iii) the search and transaction costs in locating and procuring the product of firm i. The reduction in y_j tends to be small. Conjectural variation of rival firms will not be significant if brand loyalty is significant. (b) The sum total of the reduction in the products of all the rival firms may overtake the increase in y_i only if the rival products are of very low quality. This cannot be expected as a general proposition. (c) Since most firms operate at less than full capacity a decrease in y_j may increase the AC_j (average cost of production). This may induce firm j to offer a lower y_j and increase p_j. Note that this effect is from the supply side in addition to the reaction from the consumers. (d) Ceteris paribus, as y_j decreases there will be an increase in the price p_j. This may reduce y_j further. There will be a series of subsequent changes that culminate in the demand for the total output of the industry.

In general, an increase in both y_i and $y = \sum y_i$ will be expected. Along with it the industry will experience some changes in s_i. Hence, it would be necessary to postulate that $p_i = p_i(y); \partial p_i < 0$ indicating that only the effect of the change in p_i on y should be accounted for. With the above conceptualization in perspective the elasticity of demand may now be defined as

$$\eta_i = -(\partial y / \partial p_i)(p_i / y)$$

Observe that these functions are specific for different firms. Further, the effect of changes due to rival outputs will be only on the market shares. Such changes in the market shares should be incorporated in the process of specifying the market power index.

The following conceptualization of the market power index will keep these changes in perspective. Let the cost of production be $C_i(y_i)$. Assume that the firm chooses y_i to maximize profits. Then, maximizing

$$\pi_i = y_i p_i(y) - C_i(y_i)$$

results in

$$p_i(y) + y_i(\partial p_i / \partial y)(\partial y / \partial y_i) - MC(y_i) = 0$$

However, $\partial y / \partial y_i = 1$ and hence

$$p_i - MC_i = p_i y_i / \eta_i y = p_i s_i / \eta_i$$

Therefore, the following definition of market power will be pertinent.

$M_i =$ market power attributable to firm i per unit of its sales is

$= v_i s_i$ where

$v_i = 1/\eta_i$ is the conventional Lerner measure, and

$s_i = y_i / y =$ market share of firm i in the total sales of the industry

Clearly, accounting for market imperfection necessarily alters the definition of the market power of a firm as it relates to a unit change in the sales of the industry.

The total market power attributable to firm i will be

$M_i^* = v_i s_i y_i = v_i s_i^2 y$

That is, the market power of the ith firm in the total output of the industry will be $v_i s_i^2$, and the market power of the industry is $M = \sum v_i s_i^2$ per unit of y.

Observe that the following special cases arise.

(a) Suppose $s_i = \frac{y}{n}$ for all n. In such a case M_i is proportional to v_i alone. The Lerner measure is then relevant.

(b) Consider the case where the market is a homogenous oligopoly. As such, $v_i = v$ for all i. Consequently, $M_i = s_i^2$. The Herfindahl index is appropriate in such a context.

(c) These special cases will be applicable even if M_i per unit of sales is deemed appropriate.

In general, M_i or M need attention depending on the notion of market power. Clearly, the Herfindahl index will not be relevant unless the market power of all firms in the industry is important.

Turn to the effect of non-price choices. Let x$_i$ be a measure of the choice of firm i. It can be argued that x = $\sum$ x$_i$ will determine p$_i$ just as it was with y having an effect on p$_i$. That is, $p_i = p_i(y, x)$. Similarly, $C_i = C_i(y_i, x_i)$ represents the cost of production. Maximizing π w.r.to y$_i$ and x$_i$ yields

$$M_i = v_i s_i \quad \text{, and } y_i (\partial p_i / \partial x) = MC_{ix}, \text{ where } MC_{ix} = \frac{\partial C_i}{\partial x_i}$$

Observe that

$$\eta_i = \eta_x \eta_y$$

where $\eta_x = -\left(\frac{\partial x}{\partial p_i}\right)(p_i / x)$ and $\eta_y = \left(\frac{\partial y}{\partial x}\right)\left(\frac{x}{y}\right)$

Hence, v_i changes due to the inclusion of x.

Introduction of x_i may shift the demand curve in addition to changing its slope. In such a case the specification would be

$$p_i = p_i(y, x) g\left(\frac{x_i}{x}\right)$$

and there will be a change in η_i. These additional considerations will change the market power of the firm.

4. Conclusion

This study defined the market power index of a firm in an imperfect market. An extension to include the effect of non-price strategies of a firm is also developed. The basic conclusions are that (a) the market power should be defined per unit of sales in the entire market, and (b) that the market share of the firm, in addition to the elasticity of demand, has an effect. When non-price strategies are taken into account the definition of the elasticity of demand needs a revision. Further, the Herfindahl index does not reflect the market power of a firm. Instead, it represents the market power of the entire industry in the specific case where the demand curve for all the firms is identical.

Further extensions of the study would certainly be to make the measurement of marginal cost operational. Similarly, a behavioral definition of the influence of non-price decisions on the demand curve of

a firm is warranted.

References

1. Elzinga,K., and D.Mills (2011), The Lerner Index of Monopoly Power: Origins and Uses, American Economic Review, 101, 558-564.
2. Fischer,T., and D. Kamerschen (2003a), Measuring Competition in the U.S. Airlines Industry using Rosse-Panzar Test and Cross-Section Regression Analysis, Journal of Applied Economics, 6, 73-93.
3. Fischer,T., and D.Kamerschen (2003b), Price Cost Margins in the U.S. Airline Industry using a Conjectural Variations Approach, Journal of Transport Economics and Policy, 37, 227-254.
4. Hall,M., and N.Tideman (1967), Measures of Concentration, Journal of the American Statistical Association, 62, 162-168.
5. Hall,R.E. (1998), The Relationship between Price and Marginal Cost in U.S. Industry, Journal of Political Economy, 96(5), 921-947.
6. Lerner, A. (1934), Concept of Monopoly and Measurement of Market Power, Review of Economic Studies, 1, 157-175.
7. Perloff,J., L.Karp, and A.Golan (2007), Estimating Market Power and Strategies (Cambridge: Cambridge University Press).
8. Rao,T.V.S.R. (2017), Objectives, Product Choice, Non-Price Instruments, and Firm Specific Dominance in Differentiated Oligopoly, International Journal of Economics and Business Research, 14 (1), 1-11.
9. Rao,T.V.S.R. (2020), Market Dominance and Market Power (New Castle upon Tyne: Cambridge Scholars Publishing).
10. Rao,T.V.S.R., and S. Bhattacharyya (2021), Transient Market Power of Firms (New Castle upon Tyne: Cambridge Scholars Publishing).
11. Scherer,F. (1970), Industrial Market Structure and Performance (Chicago: Rand McNally).
12. Syverson,C. (2019), Macroeconomics and Market Power: Context, Implications, and Open Questions, Journal of Economic Perspectives, 33, 23-43.
13. Yannopoulous,P. (2011), Defensive and Offensive Strategies for Market Success, International Journal of Business and Social Science, 2(13), 1-12.