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Tran Van Hoa	ASEAN-India Economic, Trade and Integration Relations: Modelling the Challenges and Opportunities
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	CONTENTS	Page
Ravindra H. Dholakia & Amey A. Sapre	Speed of Adjustment and Inflation – Unemployment Tradeoff in Developing Countries – Case of India	1
Indrajit Roy & Dipankar Biswas	Construction of Leading Index of Indian Economy: A Weighted-Cumulative Density Function Approach	17
Feng Yao	Efficient Semiparametric Instrumental Variable Estimation under Conditional Heteroskedasticity	32
Radhey S. Singh & Lichun Wang	A Note on Estimation in Seemingly Unrelated Semi-Parametric Regression Models	56
Chin Wen Cheong, Ng Sew Lai, Nurul Afidah Mohamad Yusof & Khor Chia Ying	Asymmetric Fractionally Integrated Volatility Modelling of Asian Equity Markets under the Subprime Mortgage Crisis	70
T.V.S. Ramamohan Rao	Firm Specific Monopoly Power in Differentiated Oligopoly	85
Mohamed El Hedi Arouri, Jamel Jouini, Nhu Tuyen Le & Duc Khuong Nguyen	On the Relationship between World Oil Prices and GCC Stock Markets	98
Tran Van Hoa	ASEAN-India Economic, Trade and Integration Relations: Modelling the Challenges and Opportunities	121
Vikash Gautam	Asset Sales by Manufacturing Firms in India	136
Anup Kumar Bhandari	Global Crisis, Environmental Volatility and Expansion of the Indian Leather Industry	156
 <i>Short Paper</i>		
Suresh K G & Aviral Kumar Tiwari	Long Run and Short Run Linkages between Stock Indices in Bombay Stock Exchange: A Structural Cointegration Approach	177

FIRM SPECIFIC MONOPOLY POWER IN DIFFERENTIATED OLIGOPOLY

T.V.S. RAMAMOHAN RAO¹

Abstract

In the context of differentiated oligopoly the monopoly power of any one firm is determined by its ability to develop non-price strategies while taking the reactions of the rivals into account. However, in current practice, estimates of firm level monopoly power account for only differences of prices over costs measured in different ways. Further, these differences are always attributed to the demand conditions and the associated elasticity of demand for the differentiated products. That is, it is presumed that firms maximize their profits based on margins rather than volumes or other aspects that shift their demand curves. By way of contrast, the present study acknowledges that the elasticity of demand per se may not be the only source of monopoly power. Hence, an attempt has been made to develop an empirical procedure to identify firm specific monopoly power incorporating non-price dimensions.

Keywords: Differentiated oligopoly, Monopoly Power, Firm Level Indices

JEL Classifications: L13, L25

“It seems that the great thinkers in the field of central economic theory a hundred or two hundred years ago showed more imagination, more freedom of mind in looking for fruitful basic hypotheses of economic behavior, than is customary among most economists today. I believe the econometricians have a mission in fostering a somewhat bolder attitude in the choice of working hypotheses concerning economic goals and economic behavior in modern society.”

– Haavelmo (1958, p.357).

¹ Indian Institute of Technology, Kanpur. The author is an emeritus professor. He can be contacted at rmrao@iitk.ac.in. Help and comments from Sanjay Singh, R.R.Barthwal, and Mili Shrivastava have been useful. However, the responsibility for the contents is my own.

Address for Correspondence: Dr.T.V.S.Ramamohan Rao, 6-5-45/1 Type 1, Self Finance Colony, Vanastalipuram, Hyderabad, A.P. 500 070, India, Email: rmrao@iitk.ac.in

1. Introduction

From a practical standpoint it must be acknowledged that every firm operates in a market that can be characterized as differentiated oligopoly. As a result, it may be argued that each of the firms in such a market will have a certain monopoly power relative to its competitors in the market. Clearly, aggregate measures of monopoly power, based either on the Lerner measure or the Herfindahl index, do not contain enough information about the monopoly power of any one firm vis-à-vis its rivals in the market. See, for example, Elzinga and Mills (2011). As of now very few attempts have been made to address this issue in any meaningful fashion.

The Lerner measure approaches the measurement of firm specific monopoly power in the following manner. A unique product, though the products of rival firms can be substitutable to some extent, creates a certain inelasticity of demand. This is acknowledged as the source of monopoly power. For all practical purposes this implies an exclusive dependence on price cost margins in the firm's quest to maximize profits.

Product differentiation is generally acknowledged as the distinguishing feature of differentiated oligopoly. It enables a firm to create a niche for itself in the market or carve out a greater share of the market instead of (or, in addition to) changing its elasticity of demand. Product differentiation may be along many dimensions. In particular, product diversification may offer some advantage to the firm. For, by offering a wide range of substitutable, or complementary, products the firm may be in a position to capture a larger share of the market.² Similarly, the firm may indulge in non-price competition to gain some market advantage. There is a consensus that even advertising by a firm enables it to improve its market share instead of price cost margins. Basically, therefore, it must be acknowledged that the firm may depend on the volume of sales, rather than high price cost margins, in its efforts to maximize profits. This approach emphasizes the shifts in the demand curves rather than changes in the elasticity of demand. However, a measure of firm specific monopoly power based on this logic is not available as yet.

Several studies indicated that the current approaches, to the study of monopoly power of firms in differentiated oligopoly, are inadequate.³ Cairns (1999), in particular, suggested that characteristics of the industry, such as the elasticity of demand and conjectural variation, may not be the ultimate sources of profits that firms make in differentiated oligopoly. Similarly, Fischer and

² Landes and Posner (1981) was perhaps the first to utilize the market share as a measure of monopoly power. It emphasizes the position of a firm relative to its rivals in the market. A firm may not increase profits by increasing its price relative to other firms. Instead it may do so by improving its volume of sales.

³ Elzinga and Mills (2011) documented the following features from a historic perspective. First, $p = MC$ is a social optimum only if the products of all the firms in the market are homogenous, perfect competition prevails, and production exhibits constant returns to scale. Second, firms may have monopsony power in factor markets and MC does not represent cost minimizing behavior. Subsequent studies, such as Hausman and Sadak (2007) and Hausman et al (2009), preferred estimating a long run cost curve and utilizing the implied MC for calculating the Lerner index. Third, MC is not an adequate measure if the firms incur fixed costs. In such a case $p = MC$ pricing is not feasible. The Lerner index may reflect the need to cover the fixed cost and, consequently, may not signal the firm's ability to increase prices or reduce output. Fourth, the Lerner measure is static and does not convey the possible changes in a dynamic market where entry and exit are prevalent. Fundamentally, therefore, the Lerner measure is an indication of market inefficiency and cannot capture the relative monopoly power of a firm vis-à-vis its rivals in a market that has firms offering differentiated products.

Kamerschen (2003) acknowledged that observed variations in the behavior of firms cannot be explained by assuming that all of them compete along the same dimensions or characteristics. In a basic sense the differentiating characteristics and the decisions regarding their quantitative magnitudes are the fundamental source of monopoly power of firms. It is therefore necessary to define firm level monopoly power keeping the differences in the strategies and choices of the firm in perspective. Hence, it is important to identify these sources of monopoly power in the first instance. Following up on this the measurement of monopoly power should emphasize these differences alone. Fundamentally, as Classens (2009) pointed out, there is a necessity to develop new concepts designed to address changes that are typical of the structure of differentiated oligopoly.

Assume that the Lerner measure or a variant of the Herfindahl index defined to capture firm specific monopoly power indicates significant differences across firms. It would be pertinent to investigate the sources of such an outcome. To illustrate this viewpoint consider the following. First, a firm may be able to sustain high price cost margins by efficient production organization or advertising and sales promotion. Second, the firm may choose to make profits by increasing the volume of sales instead of depending on price cost margins. It may achieve this by implementing several non-price strategies. From an analytical perspective it is necessary to identify the monopoly advantages of a firm with respect to specific non-price strategies as well. More to the point, the analysis should highlight the monopoly advantages of specific non-price decisions that enabled the firm to pursue its profit maximizing strategy.

It would then be natural to argue that a firm has monopoly power with respect to a certain non-price choice if a suitably defined index is the highest for that firm relative to all other firms. The present study defines a procedure for identifying these underlying monopoly advantages of firms in differentiated oligopoly.⁴

The primary purpose of this study is to set up an appropriate framework in this context. Section 2 identifies the direction in the change of emphasis more specifically. Section 3 presents an approach based on market shares of firms. Section 4 offers procedures based on non-price decisions by means of which firm level monopoly power can be disentangled. Section 5 indicates some dimensions of the problem that require further analysis.

2. Current Methods

Each of the firms in differentiated oligopoly has a distinct demand curve though it is affected by the decisions of rival firms, has a different cost structure, and charges a price that may not be the same as that of competitors. Consider the profit of firm j in a differentiated oligopoly consisting of n firms. Assume that its cost curve can be represented by

$$C_j = c_j y_j; j = 1, 2, \dots, n$$

where

⁴ Will the name of the company be one of the characteristics? Does it automatically give the firm monopoly power? It is easy enough to note that the name per se may indicate monopoly power. In the context of some established firms, and those belonging to well-known business houses, their name may be adequate to offer them some monopoly power. The name is then a reflection of the trust in their products and strategies based on past experience. Clearly, if a particular firm does have monopoly power it must be due to its strategies. It is important to make a pragmatic choice for purposes of the ensuing analysis.

C_j = total cost of production

y_j = volume of production and output sold by firm j

The profit for firm j will be

$$\pi_j = (p_j - c_j)y_j$$

where

π_j = profit of firm j

p_j = price per unit of output

m_j = price cost margin of firm j

$$= (p_j - c_j)/p_j = 1/\eta_j, \text{ where}$$

η_j = elasticity of demand for the product of firm j

Note that, in general, $\eta_j \geq 1$. Hence, $0 < m_j \leq 1$.

This measure would be satisfactory if each firm in the industry is catering to a distinct segment of the market with a different elasticity of demand. Alternatively, it is necessary to make the Cournot assumption that all firms take the output decisions of the rival firms as parametric. See, for example, Kiyota et al (2009). Otherwise it must be presumed that the above reduced form specification already accounts for the conjectural variation across firms in the market.⁵

The effect of product differentiation on the demand curve of a firm is sometimes captured by utilizing the notion of conjectural variation. See, for example, Fischer and Kamerschen (2003b). For, it can be argued that this is the essential aspect of competition and that the changes in elasticity of demand, if any, are incidental to it. Most studies, however, find it difficult to clearly identify this effect. For, if the product differentiation results in less substitutability from the perspective of the consumer it will be expected that the conjectural variation will be low. Quite the contrary, Classens and Laeven (2004) pointed out that differential oligopoly may be a contestable market. That is, competition between incumbent firms, combined with competition made possible by entry and exit, may make firms more competitive. This tends to increase the conjectural variation. There is hardly any consensus on this aspect of monopoly power of firms in differentiated oligopoly.⁶

⁵ Assume that

$$(\partial p_j / \partial y_k)(y_k / p_j) = 1/\eta^*$$

for all k and j . Clearly, η^* represents the cross elasticity of demand. Similarly, assume that the conjectural variation is represented by

$$(\partial y_k / \partial y_j)(y_j / y_k) = \lambda$$

for all k and j . It can be readily verified that

$$m_j = (1/\eta_j) - [(n-1)\lambda/\eta^*]$$

Clearly, the specification of m_j already accounts for conjectural variation.

⁶ Several earlier studies acknowledged reactions of rivals to the choices of a firm. However, such studies, pertaining to the monopoly power of firms in oligopoly, assumed that the market structure is homogeneous oligopoly. The monopoly power of a firm, measured by the Lerner index, is expressed as follows. Let $y = \sum y_j$, where the summation \sum is over $j = 1, 2, \dots, n$. Then, the assumption of homogeneous oligopoly implies that all firms charge the same price p given by

$$p = p(y)$$

Hence, the first order condition to maximize π_j is

Coccorese (2009) suggested that the measured Lerner index may have to be modified for another reason. For, a monopoly firm may voluntarily forego some of its market power to avoid attracting regulatory measures. Rao (2009), on the other hand, noted that in differentiated oligopoly a small group of firms may be monopolies within the group but will face competition from others belonging to other categories. Somewhat more generally Classens and Leaven (2004) argued that conjectural variation may well make such markets contestable. Hence, some part of their monopoly power is eroded by competition. In both these cases

$$m_j = (\theta_j p_j - c_j) / \theta_j p_j ; 0 < \theta_j < 1, j = 1, 2, \dots, n$$

The specification of θ_j is considered to be an empirical issue.

Most of the studies assume that the firm is efficient in its use of inputs and hence the marginal cost is minimal for a given level of output. However, a variety of recent studies made attempts to investigate the inefficiency in the choices of the firm and its implications for the measurement of monopoly power. See, for example, Brissimis et al (2008) and Delis and Tsionas (2009). Two distinct strands of thought are discernible. First, the Panzar and Rosse (1987) method postulates that firms in differentiated oligopoly may also have some monopoly power in factor markets. Hence, the marginal cost of a firm varies with factor prices. Consider a change in the price of one of the factors of production. This creates a certain change in marginal cost. Further, observe that there will be differential changes in factor prices and distinct changes in marginal cost corresponding to each such change. Hence, rather than aggregate all such changes into one measure of marginal cost the Panzar and Rosse approach suggests calculating the elasticity of marginal cost with respect to each of the factor prices distinctly and aggregating them to obtain the measure of firm specific monopoly power. Second, efficiency in production, or the lack of it, and its effect on the profits of the firm has also been a subject of fairly extensive analysis. Studies of regulated markets adopt the lead of Hausman and Sadak (2007) and Hausman et al (2009). Their approach estimates the minimum long run marginal cost, representing the welfare maximizing efficient pricing, and utilizes the Lerner index to redefine monopoly power.

$$p + y_j (\partial p / \partial y) (\partial y / \partial y_j) - c_j = 0$$

Define the conjectural variation by

$$\lambda_j = d \sum_{k \neq j} y_k / dy_j$$

where \sum_1 is summation over $k \neq j = 1, 2, \dots, n$

Hence, the above condition can be written as

$$p - p(s_j/\eta) (1 + \lambda_j) - c_j = 0$$

where

$$s_j = y_j / y$$

represents the market share of firm j , and

$$\eta = -(\partial y / \partial p)(p/y)$$

is the elasticity of demand for all the products in the market. Hence,

$$m_j = (p - c_j) / p$$

$$= s_j(1 + \lambda_j) / \eta$$

Note that $\lambda_j = 0$ under the Cournot assumption. However, this result cannot be extended to the context of differentiated oligopoly. It has not been possible to capture the influence of conjectural variation on monopoly power meaningfully.

In addition, the changes in the marginal costs per se have received a great deal of attention. The contention of such studies is that a firm may exhibit a high price cost margin not necessarily due to the inelasticity of demand but because they will not pass on all their cost reduction, perhaps achieved by their efficient operations, to the consumers. The extent of pass through may depend on the number of firms in the market in addition to other differentiating features. In general, the consumers have no way of identifying such cost reductions achieved by a firm or to alter the nature of demand for the product. See, for example, Zimmerman and Carlson (2010).

Clearly, profit maximization underlies all the approaches alluded to above. However, they consistently ignore one important dimension. Return to the specification of π_j mentioned at the outset of this section. Let

$$\begin{aligned} S &= \text{total sales of the industry} \\ &= \sum p_j y_j \end{aligned}$$

where the summation \sum is over $j = 1, 2, \dots, n$.

It follows that

$$\pi_j = m_j s_j S$$

where

$$\begin{aligned} s_j &= \text{market share of firm } j \\ &= p_j y_j / \sum p_j y_j \end{aligned}$$

From this it can be inferred that the profit of firm j depends on the price cost margins, the market share of the firm, and the product line choice of any one firm as it affects S . Hence, these may be considered as the basic strategies of a firm in differentiated oligopoly. Studies pertaining to the measurement of firm specific monopoly power ignored these aspects so far.⁷

3. Market Shares⁸

One important observation from the previous section is the role of s_j in achieving profit maximization. It is also well known that measures of monopoly power of industries, such as the Hefindahl index, are based on s_j . Hence, an effort must be made to trace firm specific monopoly power utilizing the market share.

The most obvious measure is s_j^2 . It represents a long run, or reduced form, measure assuming that all other firms are in equilibrium. However, note that in the short run, all other firms, who have a positive market share, are potential rivals and they can reduce the effective monopoly power of firm j over time. That is, to the extent the market is contestable, s_j^2 will be an

⁷ Basically this argument suggests that firm j has greater monopoly power relative to its rivals for a given S if π_j is the largest for all j .

⁸ Many recent studies defined measures of industry level monopoly power taking nonprice decisions and oligopolistic interaction into account. Lijesen (2004), Genevicius and Cirba (2007), Morgenroth (2008), Genevicius (2009), Aw and Li (2009), Shi and Chavas (2009), Bailey and Taylor (2009), and Rao (2009) is the exhaustive list of relevant references. Practically all these studies utilize pairwise comparisons of market share and/or other nonprice choices of firms. Morgenroth (2008) prefers statistical measures of the distance between the firms taken together. Most of the methods proposed are not amenable to adaptation at the firm level.

overestimate of the monopoly power of firm j .⁹ Several alternative specifications can be suggested. The following is a representative sample.

(a) Let ρ_{jk} be the probability that a consumer purchasing the product of firm j will shift to that of firm k . Then,

$$\rho_j = \sum_{k \neq j} \rho_{jk}$$

where the summation is over $k \neq j$ is the probability that there will be a switch away from the product of firm j . Hence, the expected market share that firm j can retain will be $(1 - \rho_j)s_j$. One measure of the monopoly power of firm j , taking this competitive response into account, will be

$$m_j = (1 - \rho_j)^2 s_j^2$$

Observe the following. Suppose the firm is catering to a niche segment of the market. Then, none of the other products is substitutable. Consequently, $\rho_j = 0$ and the market share s_j is a good measure of the monopoly power of firm j . On the other hand, let all the n products be perfectly substitutable. In such a case $\rho_j = 1$ and the firm does not have any effective monopoly power whatever may be its market share in the short run.

Bailey and Taylor (2009) suggested that ρ_j can be obtained through direct observation. For, as mentioned earlier, it may be possible to get the data on the number of consumers of firm j that switched to the product of firm k in a certain interval of time. In general, this is rather difficult. An alternative can be conceptualized. For, it can be argued that the closer s_j is to the market shares of others the greater the probability of substitution. Hence, ρ_j may be estimated as

$$\begin{aligned} \rho_j &= s_j \sum_{k \neq j} s_k / \sum_{k \neq j} s_k^2 \\ &= s_j (1 - s_j) / \sum_{k \neq j} s_k^2 \end{aligned}$$

Suppose $s_j = 1/n$ for all j . Then,

$$\begin{aligned} \sum_{k \neq j} s_k^2 &= (n-1)/n^2, \text{ and} \\ \rho_j &= 1 \end{aligned}$$

confirming that firm j has no monopoly power in the contestable market.

(b) Based on the conventional Herfindahl index define the monopoly power of all other firms, excluding firm j , as

$$H = \sum_{k \neq j} s_k^2$$

Then, on an average, the monopoly power of each of the rival firms is

$$H_j = H/(n-1)$$

The competitiveness of other firms with respect to j may then be represented by

⁹ In fact, when $s_j = 1/n$ for all j none of the firms has any monopoly power over the others. It should be noted that since $s_j^2 = 1/n^2 \neq 0$ it cannot be a good measure of the monopoly power of firm j . A Herfindahl index measure, such as $H_j = 1/s_j^2$, will be equal to m_j only in the extreme case where $s_j = 1$ for one j and 0 for all others. For, note that

$$s_j = p_j y_j / S$$

Hence,

$$m_j = 1 - C_j / s_j S$$

If $s_j = 1$ for a specific j and 0 for all other firms then $S = p_j y_j$ and m_j reduces to $(p_j - c_j) / p_j$. These two measures will not be equal in any other configuration.

$$C_j = H_j/s_j^2$$

Define the monopoly power of firm j as

$$m_j = 1 - H_j/s_j^2$$

Suppose, now, that $s_j = 1/n$ for all j . Then, it follows that

$$H_j = 1/n^2, \text{ and}$$

$$m_j = 0$$

indicating that none of the firms has any monopoly power. Similarly, if $s_j = 1$ for this specific j and 0 for all the others, then

$$H_j = 0, \text{ and}$$

$$m_j = 1$$

As expected, the firm j is a monopoly.

(c) Define

ρ_{jk} = monopoly power of firm j relative to firm k

$$= 1 - s_k^2/s_j^2$$

where s_k^2/s_j^2 will be a representation of the degree of competitiveness between j and k .

Let

$$m_j = (\sum_1 \rho_{jk}) / (n-1)$$

measure the monopoly power of firm j vis-a-vis all the other firms in the market. Consider the case where $s_j = 1/n$ for all n . In such a case $\rho_{jk} = 0$ and $m_j = 0$. That is, firm j has no effective monopoly power. On the contrary, if $s_j = 1$ for one j and 0 for all others $\rho_{jk} = 1$ for all $k \neq j$ and $m_j = 1$ indicating that firm j has absolute monopoly power. This approach generalizes the one-to-one comparisons suggested by Martin and Voltes-Dorta (2009) in a related context.

(d) Both Rao (2009) and Bailey and Taylor (2009) pointed out another pragmatic possibility. There can be several groups of firms in such markets, who between themselves within each group, are perfectly competitive, or entirely monopolistic. However, they may compete differentially with other firms. The monopoly power of any one firm in the industry will depend on these nuances.

The product line choice of each firm can also be summarized in the form of a Herfindahl diversification index and measures of firm specific monopoly power defined along the above lines. However, this entails loss of information. Further, an altogether different approach will be necessary if the monopoly power is due to a variety of nonprice choices which cannot be summarized by such measures. It is as yet important to consider such situations in detail.

4. Non-price Decisions

In the context of differentiated oligopoly the non-price choices of firms may be along a variety of dimensions. For instance, the range of products the firm offers, the nature of such products (substitutable or complementary either in demand or in production), quantum and type of advertising, distribution networks, and the entire method of supply chain management, and so

on.¹⁰ Studies relating to the performance of firms find it difficult to incorporate the vast amount of choices, of the firm under consideration and all its existing and/or potential rivals, into the analysis. Concentration and diversification measures, like the Herfindahl index, have not been adequately generalized to deal with the type of data that differentiated oligopoly presents. The multidimensional nature of the data is at the apex of the problem.

In general, the data is of the following form. For each of the n firms in the industry the data relates to p characteristics. Let x be the resulting $n \times p$ matrix. The basic problem is to define the monopoly power of a firm that can summarize the information contained in the characteristics of any one firm as they relate to the competitiveness reflected in the data regarding the rest of the firms. As Rao (2009) pointed out, in the context of defining industry level monopoly power, two broad approaches are discernible. The first is reflected in the work of Martin and Voltes-Dorta (2004). The basic strategy is to define a Herfindahl type of index on each of the characteristics and then aggregate the indices over all the characteristics. The second approach can be developed from Bossert et al (2008). The basic principle underlying this approach is to compare any two firms at a time utilizing a distance metric over all the characteristics and then aggregating such a measure over all firms.

Consider any one characteristic α . Clearly, the share of firm j in the industry can be defined by

$$s_{j\alpha} = x_{j\alpha} / \sum x_{j\alpha}$$

where \sum is the summation over $j = 1, 2, \dots, n_\alpha$

with n_α representing the number of firms for which $x_{j\alpha}$ is not zero. The three measures of firm level monopoly power, defined in section 3, may then be utilized to obtain $m_{j\alpha}$. However, it may be necessary to define monopoly power over several characteristics, e.g., over the product range, over different distribution channels, with respect to the financial mix, and so on. The issue is one of specifying the importance of a specific characteristic in imparting monopoly power to the firm. The following alternatives may be conceptualized.

(a) If n_α is small only a few firms are utilizing that characteristic. Perhaps the characteristic provides much monopoly power to the few that use it. Then, assigning a weight $1/n_\alpha$ to $m_{j\alpha}$ would be appropriate. That is, the monopoly power of firm j can be defined as

$$m_j = \sum m_{j\alpha} / n_\alpha$$

where the summation is over α .

(b) $s_{j\alpha}$ represents the relative importance of characteristic α . Hence, a weight $s_{j\alpha}$ may be assigned to $m_{j\alpha}$. Consequently,

$$m_j = \sum s_{j\alpha} m_{j\alpha}$$

can be utilized as a measure of the monopoly power of firm j .

(c) Consider the case where $x_{j\alpha}$ for different α have the same units of measurement. Then, a weight

$$w_\alpha = x_{j\alpha} / \sum x_{j\alpha}$$

¹⁰ It is pertinent to note that non-price choices of the firm, say its advertising intensity, can affect either its elasticity of demand or its market share. The additional profit that it generates per unit of revenue will then be a good representation of its monopoly power.

where the summation is over α for the same j , may be appropriate.

Several alternatives of m_j , based on the Bossert et al (2008) approach, can be conceptualized. For, a variety of approaches to defining the distance between two vectors are available.

(a) Suppose the data is categorical, i.e., of the (0,1) type for all values of α . The following measure is adapted from Bossert et al (2008). Define, for a given j ,

$$s_{jk\alpha} = 1 \text{ if } x_{j\alpha} = x_{k\alpha} \\ = 0 \text{ otherwise}$$

where $k \neq j = 1, 2, \dots, n$,

$$s_{jk} = (\sum s_{jk\alpha})/p$$

where this summation is over α , and

$$m_j = 1 - (\sum s_{jk})/(n-1)$$

where the summation is over k .

Suppose $x_{j\alpha} = x_{k\alpha}$ for all α and all j, k combinations. Then,

$$s_{jk\alpha} = 1 \text{ for all } \alpha \text{ and } j, k \text{ choices.}$$

Consequently,

$$s_{jk} = 1, \text{ and}$$

$$m_j = 0$$

confirming that none of the firms has any monopoly power. On the other hand, let $x_{j\alpha}$ be non-zero for one specific j and all values of α while it is zero for all other j and α values. Then,

$$s_{jk\alpha} = 0 \text{ for that } j$$

$$s_{jk} = 0, \text{ and}$$

$$m_j = 1$$

This corresponds to firm j being a monopoly. Clearly, it can be defined over a subset of characteristics p_j as well.

(b) One possible adaptation suggests itself if the data is continuous. Define

$$s_{jk\alpha} = (x_{j\alpha} - x_{k\alpha}) / (x_{j\alpha} + x_{k\alpha}) \text{ if } x_{j\alpha} > x_{k\alpha} \\ = 0 \text{ otherwise,}$$

$$s_{jk} = (\sum s_{jk\alpha})/p, \text{ and}$$

$$m_j = (\sum s_{jk})/(n-1)$$

It can be readily verified that this index reproduces the monopoly power expected in the two extreme cases considered in (a) above. This formulation presumes that a higher value of each characteristic imparts a firm with greater monopoly power. Suppose, however, that one of the α s corresponds to the debt of the firm. The firm may then experience a cost disadvantage and lose its monopoly power. $s_{jk\alpha}$ may then be redefined appropriately.

It is, of course, pertinent to note that different weights may have to be attached to each α . Their determination remains an open issue. Clearly, many other measures of distance between two vectors can be conceptualized as well.

Each of these measures indicates that every firm has some monopoly power in each of the directions considered. The integration of several of these measures toward firm level monopoly power is not obvious as yet. It can be developed as follows. Let only one measure be used. Then, the firm with the highest value of this measure has the monopoly power and all others should be interpreted as following passively. It is more likely that the rival firms would create monopoly power for themselves along some other dimension. This suggests that some other firm has monopoly power with respect to another dimension.

Consider the Lerner measure of monopoly power. Suppose it is the highest for firm 1 (F_1). It can then be inferred that F_1 targets margins in its efforts to maximize profits. Similarly, let firm 1 exhibit the largest monopoly power with respect to advertising intensity. It will be concluded that F_1 utilizes advertising to achieve the monopoly power implicit in high margins. The procedure can be repeated with all the measures until the strategies to obtain monopoly power and the policies that each firm adopts to execute its strategy have been identified.

The following possibilities arise in a larger empirical setting.

(a) The difficulty in identifying the sources of monopoly power becomes more acute if one or more firms cannot be said to have outright monopoly power with respect to any of the chosen measures. In this case, it becomes necessary to go to the second highest number corresponding to each of the measures and make a decision on a similar comparative basis. However, a firm may not exhibit monopoly power with respect to any of the chosen measures even after several iterations. Of course it is possible that some firms are not aggressively targeting any sort of monopoly power. In that sense they may be followers of others. On the other hand, the possibility that the characteristics chosen for analysis missed a major source of monopoly power should be considered afresh.

(b) It is also plausible that a firm is adopting multiple strategies to derive its monopoly power in the market. More specifically, when a firm introduces a product line for the first time it generally tries to exploit the novelty by setting high price-cost margins and flood the market to prevent competitive inroads. These inferences can only be empirical in nature.

Monopoly power, attributed to any firm, is a relative concept. Hence, it does not rule out the possibility that many firms have some degree of monopoly power in every direction considered by the analytical structure. The overall monopoly power of a firm is an amalgam of all these dimensions in varying degrees. It would be useful to add the monopoly power scores of individual firms based on the several measures computed.

Some judgment will be involved in the empirical implementation as the number of firms in the industry increases. At the present stage of analysis any further generalization may be erroneous.

5. Going Forward

The present study offered a heuristic approach to the problem of determining firm level monopoly power in differentiated oligopoly. It is important to realize that the method takes many dimensions of product differentiation, not merely elasticity of demand and market shares, into account while constructing the indices.

In actual practice, almost every firm in differentiated oligopoly produces a range of products. A single firm in the market may then target market share for one product, price-cost margins for another, and so on. Such extensions do not pose any new analytical problems.

These methods can eventually enrich our understanding of the reasons for differential pricing adopted by such firms and the factors that give them the market shares they have and the profits they earn. The approach can be improved iteratively as more empirical evidence accumulates. Further research along these lines should be encouraged given the immense potential to appreciate the behavior of firms in differentiated oligopoly and its implications for management strategy.

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