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Estmating Market Power and Strategies of Automobile Industry in Iran (Saipa and Iran Khoddro Companies Case Studies)

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Abstract

Determining the structure of a market plays an important role for policy makers to adopt efficient policies to enhance social welfare of their societies. This welfare is fulfilled more and more whenever the industry is reached to a competitive framework.

The Car maker industry is one of the important industries that create a considerable value added in terms of the pre and post production chains in all the countries. This industry is the second largest industry in Iran that uses about 600 thousands workers. Accordingly, this study first aims to estimate the strategies adopted by the dominant players of the industry, Iran Khodro and Saipa companies, based on a game-information theoretic framework and then measure the market power of them in accordance with the generalized maximum entropy estimator. The results show that the Lerner index value for Iran Khodro and Saipa is 0.67 and 0.49 respectively indicating that the two companies play an important role in the industry and the industry is so far from the competitive environment.

Keywords: Market Power, Dominant Car Maker Companies, Non-Cooperative Game, Generalized Maximum Entropy Estimator.

Jel Classification: C72, L13, L62.

1. Introduction

Determining the structure of a market plays an important role for policy makers in adopting efficient policies to enhance social welfare of their societies. This welfare happens in a competitive framework.

The Iranian automobile industry is one of the important manufacturing industries with 40 years of experience. This industry is recognized as a strategic sector for the country due to it high economic and social value. Accordingly, the government over the age of this industry has supported the producers using different policies and strategies including energy subsidy, tariff measures, and various loan resources. However, the supports have not improved the status of

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the industry as it is still inefficient and cannot compete with its foreign rivals in terms of price and quality.

Given the facts and data released by the Iranian statistical databases, we can see that two companies including Iran Khodro and Saipa corporations have had about 90 percent of the market share of the industry during the last 10 years. The strategies adopted by these two dominant companies seem to be an implicit collusion pricing strategy regardless of Customer Satisfaction (Shahiki Tash and Kazemzadeh, 2013).

There are many studies on the marker power estimation conducted in the Iranian domain in the framework of different industries including banking, insurance, and manufacturing industries (Khodadad Kashi, 2000 & 2001; Ebadi, and Shahiki Tash, 2004 ; Ghandi Nejad, 2007; Pajoyan and Shafiei, 2008; Soori, et al, 2010; Hossaini and Parme, 2010 ;Talebloo and Bahman Pour, 2012; Ebrahimi, et al, 2014; Khoda Dad Kashi, et al, 2014; Shahiki Tash, et al, 2015; Khodadad Kashi et al, 2015). All the studies have employed the conventional methods for estimating the market power of the industries and they have not examined the interaction between the players. The present study has two major advantages : 1- it models the interaction between the market players in accordance with the game theory under the economic and information restrictions and 2- uses a comprehensive and efficient estimation method called generalized maximum entropy (GME), which is consistent with small samples and includes more equality and inequality restrictions.

This study is divided into four sections. The first section presents an evaluation of the literature review of the market power theories. All the weaknesses and strengths of the theories are pointed out in this section in order of theory evolution. In addition, we also show why the Game theory framework and the GME technique are more powerful and useful for calculating the market power. The next section discusses how the interaction of dominant companies in the auto car makers can be modeled under a game-information theory. The empirical section tests the market power of the two dominant companies, whether in a competitive or a monopolistic condition. Finally, the related conclusions are presented.

2. Economic Modeling

We suppose two firms Iran Khodro, i, and Saipa, j, which play a static game in each period of time. Our goal is to specify the strategies used by the oligopolistic firms based on the data pertaining to prices, advertising, quantities, and variables that affect cost or demand such as input prices. There is a difference of view over data observation between econometricians and firms. The econometricians observe the payoff-relevant public data like demand and cost shifters, z, while the firms know the private information that is not observed by the econometricians such as marginal costs or some other payoff-relevant random variables $\varepsilon^i(t)$ in period $t = 1,...,T$.

In this study, we assume that two variables including prices and advertisement are the decision variables for the firms. In addition, each continues price-advertisement action is divided into a grid over prices and advertisement.

Let the set of possible K realizations, $\{\varepsilon_1, \varepsilon_2, ..., \varepsilon_K\}$, is common for both the firms. The distribution of the set is supposed to be constant over time but different across firms. Additionally, we assume that the firms know the distribution. For simplicity, it is also supposed that ε^i and ε^j are private, uncorrelated information.

If the set of *n* possible actions for firm *i* is $\{x_1^i, x_2^i, ..., x_1^i\}$, then the profit of the firm in a particular period can be written as $\pi_{rsk}^i(z) = \pi^i(x_r^i, x_s^j, \varepsilon_k^i, z\}$ where *r* and *s* are the actions played by the firm *i* and *j*, respectively. According to the profit function, it can be stated that firm *i*'s strategy in state *k* is $\alpha_k^i(z) = (\alpha_{k1}^i(z), \alpha_{k2}^i(z), ..., \alpha_{kn}^i(z))$ in which $\alpha_{kr}^i(z)$ is the probability that firm *i* chooses action x_r given private information ε_k^i and public information z. Let firm j doesn't know the firm i's strategy (as a result, the conditional probability cannot be seen by the firm j). This is while, it is supposed that the distribution of the firm *i*'s private information is known by the firm *j*.

Given the aforementioned assumptions, in state *k* if firm *i* chooses $\alpha_k^i(z)$ to maximize its expected profits, $\sum_s \alpha_s^j(z)\pi_{rsk}^i(z)$, and $Y_k^i(z)$ is the firm *i*'s maximum expected profits, then the firm's expected loss under action x_r is:

$$L_{rk}^i(z) \equiv \sum_s \alpha_s^j(z)\pi_{rsk}^i(z) - Y_k^i(z) \leq 0 \tag{1}$$

This inequality is non-positive. Optimality condition says that the above inequality must be zero for the firm under action x_r. Hence, the following condition is required in optimality:

$$L_{rk}^i(z)\alpha_{rk}^i(z) = 0 \tag{2}$$

Because of using the private information, ε_k^i, employed in the equations we can use the above constrains directly to estimate the firm's strategies. Taking expectations is a good way to eliminate this kind of unobserved variable. Hence, we use the following simplicity as:

$$Y^i(z) \equiv E_k Y_k^i(z) \tag{3}$$

$$\pi_{rs}^i(z) \equiv E_k \pi_{rsk}^i(z) \tag{4}$$

Given equations 1 and 2 and considering the aforementioned simplicity the following equation can be obtained:

$$\sum_s \alpha_s^j(z)\pi_{rs}^i(z) - Y^i(z) \le 0 \tag{5}$$

$$\left(\sum_s \alpha_s^j(z)\pi_{rs}^i(z) - Y^i(z)\right)\alpha_r^i(z) + \delta_r^i(z) = 0 \tag{6}$$

Where $\delta_r^i \equiv \text{cov}(L_{rk}^i, \alpha_{rk}^i) \ge 0$. This is the only error term in the equation.

There are two problems associated with estimating the model in accordance with the traditional techniques, : first, employing several quality and inequality restrictions is difficult under the traditional estimation techniques. The second, problem pertains to the small samples. Accordingly, we used the generalized maximum entropy (GME) technique to estimate the firm's strategies. It should be also noted that the GME technique does not require explicit distributional assumptions (Perloff, et al, 2007).

3. Empirical Results

Using the data pertaining to the prices and advertisement, we estimated the firms' strategies under the GME technique.

The following demand specification was used in the present study:

$$q_t^i = \gamma_0^i + \gamma_1^i P_t^i + \gamma_2^i P_t^j + \gamma_3^i (AD_t^i)^{1/2} + \gamma_4^i (AD_t^j)^{1/2} + \gamma_5^i D + \gamma_6^i I + U^i \tag{7}$$

Where $i = 1,2 \quad i \ne j$, A^i is real advertisement for firm *i*, P^i represents real price, q^i indicates the quantity sold, I denotes income, *d* is dummy variable and, finally, U^i represents the error term.

Based on equation (7), the corresponding theoretical sign of coefficients should be given in Table 1:

Table 1: The Corresponding Theoretical Sign of Coefficients

Coefficient	Expected Theoretical Sign	Mathematical Form
γ_1^t	Negative	$\gamma_1^t < 0$
γ_2^t	Positive	$\gamma_2^t > 0$
γ_3^t	Positive	$\gamma_3^t > 0$
γ_4^t	Negative	$\gamma_4^t < 0$
γ_5^t	Positive	$\gamma_5^t > 0$
γ_6^t	Positive	$\gamma_6^t > 0$

Source: Current Research, 2016.

It should be also noted that we have applied an original and not a lagged-based model for the demand function (as in Gasmi, Laffant and Vuong's study). This kind of non-lagged based model is used for considering a static-repeated game.

According to the range of prices for both companies, we divided the possible prices into seven intervals. Furthermore, if this process is implemented for the advertisement variable based on their ranges, it is appropriate to divide the range into five intervals.

Table 2: The Corresponding Theoretical Sign of Coefficients For Iran Khodro Company

Coefficient	Coefficient Value	Significant Level	The Symptom of the Coefficient
γ_0^t	+ 5.65	%5	Based on the Theory
γ_1^t	-0.71	%5	Based on the Theory
γ_2^t	+0.53	%5	Based on the Theory
γ_3^t	+0.24	%12	Based on the Theory
γ_4^t	-0.36	%5	Based on the Theory
γ_5^t	+6.32	%5	Based on the Theory
γ_6^t	+3.05	%10	Based on the Theory

Source: Current Research, 2016

The results presented in the Table 2 indicate that the variables including own prices of Iran Khodro, the rival prices, Saipa's advertisement and Iran Khodro's income are significant at 5 percent statistically while Iran Khodro's advertisement is not significant at the conventional levels. The coefficient related to the own prices of Iran Khodro company indicates that a one-unit increase in prices can decrease quantity of demand about 0.71 unit.

Table 3: The Corresponding Theoretical Sign of Coefficients For Saipa Company

Coefficient	Coefficient Value	Significant Level	The Symptom of the Coefficient
γ_0^t	4.33	%5	Based on the Theory
γ_1^t	-0.44	%5	Based on the Theory
γ_2^t	0.86	%9	Based on the Theory
γ_3^t	+1.32	%5	Based on the Theory
γ_4^t	-0.12	%5	Based on the Theory
γ_5^t	+8.5	%5	Based on the Theory
γ_6^t	1.77	%5	Based on the Theory

Source: Current Research, 2016

The results shown in Table 3 suggest that all the variables except for Iran Khodro prices are statistically significant at 5 percent. The price coefficient value for Saipa is lower than that of Iran Khodro. The value shows that a one-unit increase in the prices can decrease the quantity of demand for Saipa products by 0.44 units.

Lerner index

The Lerner index is one of the appropriate tools for evaluating the market structure. Using the Lerner index, the size of competitiveness of a market can be measured. This index ranges from zero to one (0-1); one indicates monopoly and zero shows perfect competition.

At this part of our study and after estimating the firms' strategies, we measured the expected size of the market based on the Lerner index as:

$$E[(p^i - c^i)/p^i] = \sum_r a_r^i [(p_r^i - c^i)/p_r^i] \quad (8)$$

Where c^i represents the estimates of firms' marginal costs.

The results indicate that the Lerner index for Iran Khodro and Saipa is 0.67 and 0.49, respectively indicating that Iran Khodro has more market power than the Saipa company.

4. Conclusion

Based on the estimated strategies, the results indicated that the Lerner index for Iran Khodro and Saipa is 0.67 and 0.49, respectively. These quantities indicate that Iran Khodro has more power than Saipa. Shahiki Tash and Kazemzadeh (2013) also concluded that these companies have the highest level of monopoly relative to the other active auto car makers in Iran under the concentration indices.

The high level of market power for the two dominant companies in the Iranian auto car industry is obvious. Accordingly, the companies can dictate their prices to the consumers without considering satisfaction and quality upgrade. Hence, the corresponding officials such as the policy makers, government sectors, and the consumer protection organizations should pave the way for making the industry more competitive on the one hand, and promote the consumers' satisfaction, on the other.

Additionally, after signing the new deal between Iran and 5+1 countries, which removed the economic sanctions imposed on Iran, the Iranian officials should take the following measures to, first, reform the use of production and technology and, second, enhance at least domestic customers' satisfaction and, finally, compete with the regional and global rivals:

- Upgrade technology of the industry through transferring the high technologies.

- Absorb some of the foreign capitals which are coming into this industry.
- Reform the tariff rules in order to create more competitive conditions in the industries and, specifically, for the automobile industry.
- Make a legal framework for the merging with the best automobile ties in order to compete with at least the middle-east market.

References

Aguirregabiria, V., Chun-Y.H. (2006). *A Dynamic Oligopoly Game of the US Airline Industry: Estimation and Policy Experiment*. University of Toronto Working paper.

Bag Well, K. (2005). *The Economic Analysis of Advertising*, [Online, Avaliable from<URL: http:// www.stanford. Edu/kbagwell/pdf>.

Bajari, P., Han, H., Stephen, R. (2004). *Identification and Estimation of Discrete Games of Complete Information NBER*, Technical Working Paper 301.

Bresnahan, T. F. (1989). *Empirical Studies of Industries with Market Power, In Richard Schmalensee and Robert D. Willig, eds., The Handbook of Industrial Organization*. 1011–57 (Amsterdam: North-Holland).

De Jonghe, O., Vander V. R. (2008). "Competition versus Efficiency: What Drives Franchise Values in European Banking". *Journal of Banking and Finance*, 32, 1820-1835.

Federico, C., Murry, C., Elie, T. (2016). *Market Structure and Competition in Airline Markets*, Department of Economics, Penn State.

Golan, A., George, J., Douglas, J. M. (1996). *Maximum Entropy Econometrics: Robust Estimation with Limited Data*, New York: John Wiley & Sons.

Lerner, A. P. (1934). "The Concept of Monopoly and the Measurement of Monopoly Power". *The Review of Economic Studies*, 1, 157-175.

Perloff, J. M., Karp, L. S. and Golan, A. (2007). *Estimating Market Power and Strategies*. Cambridge Books, Cambridge University Press.

Pakes, A., Michael, O. and Steve, B. (2004). *Simple Estimators for the Parameters of Discrete Dynamic Games (with Entry/Exit Samples).* NBER: Working Paper 10506.

Salz, T., Emanuel, V. (2017). *Estimating Dynamic Games of Oligopolistic Competition: An Experimental Investigation,* Colombia University, Working Paper. 12688.

Tamer, E. (2003). "Incomplete Simultaneous Discrete Response Model with Multiple Equilibria". *Review of Economic Studies*, 70, 147-167.

Zhao, W., Kwok, L. (2016). "Game Theory Application and Strategic Bidding in Electricity Supply Market", *World Journal of Engineering and Technology*, 4, 72-81.