



Estimating Market Power and Strategies of Automobile Industry in Iran (Saipa and Iran Khodro 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, Car Industry, Non-cooperative Game, Generalized Maximum Entropy Estimator

JEL Classifications: C72, L13, L62

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1. INTRODUCTION

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 happened in a competitive framework.

Automobile industry of Iran is one of the important manufacturing industries that has 40 years experiences. This industry due to enjoying high level of economic and social values is recognized as a strategic sector for the country. Accordingly, the government over the age of this industry has supported the producers by different policies and strategies including energy subsidy, tariff measures, and various resources of loans. This is while; the supports have not improved the condition of the industry so 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 near to 90% of the market share of the industry during the last 10 years. The strategies adopted by these two dominant companies seems to be an implicit collusion pricing strategy regardless of Customer Satisfaction (Shahiki and Zadeh, 2013).

There are a lot of studies on the marker power estimation implemented in the Iranian domain in the framework of different industries including banking industry, insurance industry, manufacturing industries (Khodadad, 2000; 2001; Ebadi and Shahiki, 2004; Ghandi Nejad, 2007; Pajoyan and Shafiei, 2008; Soori et al., 2010; Hossaini and Parme, 2010; Talebloo and Pour, 2012; Ebrahimi et al., 2014; Ebrahimi et al., 2014; Shahiki et al., 2015; Khodadad et al., 2016). All the researches have employed the conventional methods for estimating the market power of the industries and they don't consider the interaction of the players jointly. The main important advantages of this study are divided into two parts: (1) Modeling the interaction of the market players

in accordance with the game theory under the economic and information restrictions, and (2) using a comprehensive and efficient estimation method entitled generalized maximum entropy (GME) which is consistent with the small samples and includes more equality and inequality restrictions.

This study is divided into four sections. The first section evaluates the literature review of the market power theories. All the weakness and strengthens of the theories are stated in this section by order of theory evolution. More addition, we also show that why the Game theory framework and the GME technique is more powerful and useful to calculate market power. The next section is how to model the interaction of dominant companies in the auto car makers under a game-information theory empirically. Objective of the empirical section is to test the market power of the two dominant companies, whether they are played in a competitive or monopolistic condition. Finally, the last section concludes all the topics.

2. LITERATURE REVIEW

Generally, there are several approaches to measure the market power in the literature. A price equal with marginal costs is one of the important features of a competitive market. The firms active in an incomplete structure have ability to determine the price of their products more than their marginal costs. This idea is introduced by Lerner (1934).

The margin of price and marginal cost is defined as the Lerner index. Given the Lerner index we can say that the higher the Lerner index, the greater is market power (Lerner, 1934, p. 161). It should also be noted that the interpretation of the index is sensitive to either the price or marginal cost. This is while, the interpretation is correct when the Lerner index is changed only through the price changes not marginal costs. For instance, If the index is raised by the marginal cost, the interpretation doesn't reflect market power rather it indicates the efficiency concept. This kind of ambiguity is seen in one- period equilibriums that can be a barrier for new firms' entry. In other side, the price- marginal cost margin in multidimensional states can be either a cause for absorbing new firms in market or an incentive for producing more products by the rivals. This process is continued in competitive market until the prices is equal to thire marginal costs.

Thus, a positive price- margin is an evidence for the market power if its realization moves during the time. Though the Lerner index is recognised as a criterion for specifying the level of market power, the studies don't employ it directly; Because determining the marginal costs is not possible easily. Accordingly, the researchers use its alternative approaches. These alternatives can be divided into two the Structure-Conduct- Performance (SCP) and the New Emperical Industrial Organiation (NEIO) approaches (Perloff et al., 2007).

Structure-Conduct-Performance paradigm was introduced by Mason (1939 and 1949). He suggests that the market power can be extracted from the positive relationship between the market

structure and market performance. The variables of market structure which is measured by market concentration, vertical integration, product differentiation and entries to barrier indices are considered as the exogenous variables. In other side, the variobles of market performance wich are measured by rate of return, price- cost margin and Tobin's q indices are cosidered as the dependant variable. In this approach, the structure variable is regressed on the performance variable to measure the market power.

This approach is criticed for three reasons: (1) The variables of market structure in fact have endogenous essence and not exogenous nature. For instance, the market comcentration index can be affected by the firm efficacy. The firms which are more efficient have lower costs and therfor they have more ability to produce. This is while, the firms with lower efficiency are not able to do as so and accordingly they are forced to have more cost. As a result, this issue can lead to more concentration in their market. Accordingly, the relationship between the market performance and market structure is adverse of the SCP approach (Bresnahan, 1989; Delorme et al., 2002). (2) Measurement of two market structure and market performance variables is hard. Though concentration variable and specifically Herfindahl-Hirschman Index is the most extensive usable ones but this index is criticized due to its sensitivity to the definition of market in terms of geographical borders and homogeneity of goods. Measurment of the proxies of product differentiation such as advertising strategy, marketing or technical changes also is hard. Additionally, even if the proxies are measured, their differneces could be various among the firms (Rodas, 1985. p. 344-347). This ambiguity of estimation is also confirmed for the vertical integration variable due to the lack of data for transaction costs and Ambiguous interpretation.

The rate of return measurment is also controversial among the variables of market performance. For expamle, the data of capital has different concept economically and under the accountancy principles. More addition, it is not easy to measure the price-cost margin because of unavailability to the data for marginal costs. Furthermore, computation of intangible costs and expenditures like advertisemnt and R and D spendings in the Tobin's q is not easy (Carlton and Perloff, 2005; Perloff et al., 2007). Thus, these difficulties can cause imprecise calculation of the market performance criteria. (3) The SCP paradigm assumes that the industries have the same structure - performance framework. This is while, each industry has a unique properties and contradicts the assumption. When it is supposed that there is a casual relationship between the dependant variable and explanatory variables in the SCP approach, this relationship is correct if the data of different industries be collected in accordance with the different relationships of structure and performance. These relations among the variables can be interpreted only as correlation or descriptive analysis. Consequently, the positive coefficient of such a relationship doesnot reflect the market power necessarily (Carlton and Perloff, 2005; Perloff et al., 2007; Karp and Perloff, 1989).

Th weaknessess of SCP approach causes the NEIO approach. Carlton and Perloff (2005) believe that the NEIO approach is a better tool than the SCP paradigm for 3 reasons: (1) The models based on

the NEIO approach can give us a direct estimation and tests for measuring market power which are supported by the corresponding theories, (2) this approach does not have the endogeneity problem and consider the institutional factors, (3) it is not dependent to the symmetric assumptions among the industries. The NEIO approach consists of two static and dynamic methods. These methods essentially calculate the market power through the deviation of prices from marginal costs under a competitive pricing framework. The static models are classified into two comparative static models and models of conjectural variations. The comparative static models use the longterm equilibrium assumption for determining the competitive or non-competitive structures. Hall (1988) and Panzar and Rosse (1987) are two well known models of this method. Hall (1988) evaluates the market power through the movement of prices and marginal costs while the Panzar and Rosse (1987) consider the movement of revenues and input prices. In other side, the models of conjectural variations use the profit maximization condition in order to calculate the Lerner index.

The dynamic models are in contrast to this approach. The dynamic models consider the ability of each player in response to action of the rival player. Interdependency consideration is not applicable in the static framework. This is while; this interdependence can be considered in the dynamic framework by using a time dependent variable that discount the future benefits. More addition, the game theory application, specifically forming either an iterative game or State Space model, can be an appropriate tool for considering the interactions (Karp and McCalla, 1983. p. 641).

3. 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 of oligopolistic firms using data pertaining to prices, advertising, quantities, and variables that affect cost or demand, such as input prices. There is a difference of view over the data observation between econometrician and firms. The econometricians observe the payoff-relevant public data like demand and cost shifters, *z*, this is while the firms know their private information that is not observed by the econometricians such as marginal costs or some other payoff-relevant random variable $\varepsilon^i(t)$ in period $t = 1, \dots, T$.

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

Let the set of possible *K* realizations, $\{\varepsilon_1, \varepsilon_2, \dots, \varepsilon_K\}$, 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 $\{x_1^i, x_2^i, \dots, x_n^i\}$, 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 $\alpha_k^i(z) = (\alpha_{k1}^i(z), \alpha_{k2}^i(z), \dots, \alpha_{kn}^i(z))$ in which $\alpha_{kr}^i(z)$ is the probability that firm *i* chooses action x_r^i 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 *j* firm.

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 symbol of $Y_k^i(z)$ is the firm *i*'s maximum expected profits then the firm expected loss under the action x_r^i is:

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

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

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

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

$$Y^i(z) \equiv E_k Y_k^i(z) \quad (3)$$

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

Given the equations 1 and 2 plus considering the aforementioned simplicity we can obtain:

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

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

Where,

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

Estimating the model in accordance with the traditional techniques we face 2 problems: (1) Employing several quality and inequality restrictions is hard under the traditional estimation techniques, (2) problem pertaining to the small samples. Accordingly, we use the GME technique to estimate the firm's strategies. It is also should be noted that the GME technique does not require explicit distributional assumptions (Perloff et al., 2007).

4. EMPIRICAL RESULTS

Now using the data pertaining to the prices and advertisement we attempt to estimate the firms' strategies under the GME technique.

This study uses the following demand specification:

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

Where,

$$i = 1, 2 \quad i \neq j$$

The symbol of A^i is real advertisement for firm i , the word P^i is real price, q^i indicates the quantity sold, I is income, d is dummy variable and finally the symbol of U^i assign to the error term.

Based on the equation 7, the corresponding theoretical sign of coefficients should be given the following Table 1.

It also should be noted that we have applied an original and not a lagged based model for the demand function (like Gasmi, Laffant and Vuong 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 divide the possible prices into seven intervals. More addition, if this process is implemented for the advertisement variable based on their ranges, it is appropriate to divide the range into five intervals.

The results 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% statistically while the Iran Khodro's advertisement is not significant at the conventional levels. The coefficient related to the own prices of Iran Khodro company indicates that one unite increase in prices can decrease quantity of demand about 0.71 unite.

The results in the Table 3 indicate that all variables except of the Iran Khodro prices are significant statistically at 5%. Here, the price coefficient value for Saipa is less than the Iran Khodro coefficient value. The value shows that one unit increase in the prices can lead to decrease the quantity of demand for Saipa products near to 0.44 units.

4.1. Lerner Index

The Lerner index is one of the appropriate tools for evaluating the market structure. Given the Lerner index we can measure the size of competitiveness of a market. This index ranges between zero and one which one indicates monopoly and zero assign to perfect competition.

At this part of our study and after estimating firms' strategies we measure the expected size of 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 is the estimates of firm's marginal costs.

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

Table 1: The Corresponding theoretical sign of coefficients

Coefficient	Expected theoretical sign	Mathematical form
γ_1^i	Negative	$\gamma_1^i < 0$
γ_2^i	Positive	$\gamma_2^i > 0$
γ_3^i	Positive	$\gamma_3^i > 0$
γ_4^i	Negative	$\gamma_4^i < 0$
γ_5^i	Positive	$\gamma_5^i > 0$
γ_6^i	Positive	$\gamma_6^i > 0$

References: Current research, 2016

Table 2: The corresponding theoretical sign of coefficients for Iran Khodro company

Coefficient	Coefficient value	Significant level (%)	The symptom of the coefficient
γ_0^i	+5.65	5	Based on the theory
γ_1^i	-0.71	5	Based on the theory
γ_2^i	+0.53	5	Based on the theory
γ_3^i	+0.24	12	Based on the theory
γ_4^i	-0.36	5	Based on the theory
γ_5^i	+6.32	5	Based on the theory
γ_6^i	+3.05	10	Based on the theory

References: Current research, 2016

Table 3: The corresponding theoretical sign of coefficients for Saipa company

Coefficient	Coefficient value	Significant level (%)	The symptom of the coefficient
γ_0^i	4.33	5	Based on the theory
γ_1^i	-0.44	5	Based on the theory
γ_2^i	0.86	9	Based on the theory
γ_3^i	+1.32	5	Based on the theory
γ_4^i	-0.12	5	Based on the theory
γ_5^i	+8.5	5	Based on the theory
γ_6^i	1.77	5	Based on the theory

References: Current Research, 2016

5. CONCLUSION AND RECOMMENDATIONS

This study was divided into four sections. The first section evaluates the literature review of the market power theories. All the weakness and strengthens of the theories are stated in this section by order of theory evolution. More addition, we also showed that why the Game theory framework and the GME technique is more powerful and useful to calculate market power in this research. The second section demonstrated how to model the interaction of dominant companies, Iran Khodro and Saipa companies in Iran, under a game-information theory empirically. Objective of the empirical section was to test the market power of the two dominant companies whether they are active in a competitive or monopolistic condition.

Auto maker industry of Iran is one of the important manufacturing industries that has 40 years experiences. This industry due to enjoining high level of economic and social values is recognized as a strategic sector for the country. Accordingly, the government over the age of this industry has supported the producers by different policies and strategies including energy subsidy, tariff measures, and various resources of loans. This is while, the supports have not

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

Given 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 the Iran Khodro company has more power than the Saipa Company. Shahiki and Zadeh (2013) study also concluded that the 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 the 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 organization should make an appropriate pavement for the industry to be more competitive in one side and in the other side the consumer has satisfaction for the consumption.

Additionally, after signing the new deal between Iran and 5+1 countries which remove the economic sanctions imposed on Iran, the Iranian officials should make a mechanism of the following measures in order to first reforming the production and technology usage; second enhancing at least domestic customers' satisfaction and finally compete with the regional and global rivals:

- Upgrading technology of the industry through transferring the ties high- technologies.
- Absorbing some of the foreign capitals which are coming in this industry.
- Reforming the tariff rules in order to create more competitive conditions in the industries and specifically for the automobile industry.
- Making a legal framework for the merging with the best automobile ties in order to compete with at least the middle-east market.

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