Ranking Iran's Monopolistic Industry Based on Fuzzy TOPSIS Method

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Abstract

The aim of this paper is to identify the industrial markets coordinates with the help of Herfindahl–Hirschman concentration index, cost disadvantage ratio (CDR) index and Comanor and Wilson's economies of scale index (MES). The paper also attempts to recognize Iran's monopolistic industries through the Fuzzy TOPSIS method presented by Chen (2000) under triangular fuzzy membership function. Given the findings raised from three market structure components (HHI; CDR and MES) it is confirmed that the most monopolistic industries respectively include: Manufacturers of tobacco products, manufacturers of games and toys, manufacturers of industrial process control equipment and tanning and dressing of leather, manufacturers of luggage, handbags, saddlery and harness, dressing and dyeing of fur. The Entry barrier criterion has also had an essential role in expanding the monopolies in Iranian markets.

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1. Introduction

Promoting competition in the economic sectors under the Iranian economic and social development plans is one of the obligations that has been highlighted in the third plan (especially articles 38, 40 and 41) and the rules of fourth plan (articles 69, 93, 95 and 99) and the fifth plan (article 107). Accordingly, Iranian government has to promote the level of competition as well as control non-competitive behaviours aiming to prevent the monopolies.

In recent years, privatization programs and removing the government dominance in different economic sectors has been one of the solutions adopted in order to promote competition in the country. With respect to the classical microeconomic theories, it is expected that a competitive economy within a framework of privatization process happens in a manner that it leads to a change in the role of the government; creates financial facilities and expands public welfare. But the basic question is whether privatization always provides a good platform to promote competition. The answer to this question depends on the different conditions including rate of administration loyalty and belief in the competition, political context, methods of power transition, and economic structure of each country and Effectiveness of Regulatory Institutions in countries. If privatized markets have the ability to compete it will ensure gaining all efficiency interests through privatization. Accordingly, it is necessary to regard competition, this institutional element, in order to design an optimum pattern based on the competition-oriented structure in the privatizations. It means that we should follow an operational and administrative mechanism that in the stage of transfer has competitive traits and not a monopolistic structure after transfers. Hence, it is important to understand the structure of industrial markets besides focusing on the level of competition prior to transferring governmental activities to private sector as well as predicting the market structure after divestures. Thus, the study aims to determine the degree of competition faults in addition to analysing the structural variables of industrial markets to identify the most monopolistic industries. In order to investigate this issue, at first the paper presents status of structural variables of market briefly, then examines the competition and monopoly

conditions in the industries through introducing the Fuzzy TOPSIS method. It also should be noted that some studies like Ashenfeller and Sullivan (1987); Azam (1997); Azzam and Pagovlatos (1990); Azzam et al. (2002); Basu and Fernald (1995); Berndt et al. (1986); Brenahan (1982); Bresnahan (1989); Domowitz et al. (1988); Diana and Esfahani (2006); Hall (1988); Hakura (1998); KHodadadKash (2000 & 2001); KhodadadKash and ShahikiTash (2005 & 2007); Lau (1982); Martin (1988); Perloff (1991); Panzar and Rosse (1987); Shapiro (1987); Saving (1970) and Schroeler (1988) have reviewed the literature.

2. Literature Review

Bahatar and Baloch (2000) evaluated changes of concentration at 4 digit ISIC codes in Australia for the period 1977-1984according to the partial adjustment model. They applied the Herfindahl– Hirschman index and its lag value as the dependent and independent variables, respectively and finally estimated the linear model using the Ordinary least Square (OLS) approach and the non-linear model by Maximum likelihood (ML) technique. The findings resulting from the model estimation for the adjustment pattern imply an incomplete adjustment towards its long run state.

Bhattacharya and Bloch (2002) examined the concentration level in addition to the competition condition under the partial adjustment model in the Malaysian industries based on the 102 industries at 5 digits ISIC codes for the periods 1986-1996. Their results from OLS and ML estimates for linear and non-linear models, respectively, indicated that concentration is more in the Malaysian industries relative to the developed countries. The findings of this paper also verified the significance of capital intensity, advertisement intensity, and size of market in correlation with the concentration level for the industries so the theory of concentration dynamics has a low and gradual movement relative to the developed countries.

Yildrim and Philippatos (2006) in a paper entitled "Restructuring, Merging, Competitiveness in Latin America Banking Industry" evaluate the competitive condition for banking system of 11 countries of Latin American region for the period 1993-2000. The results indicated that the

profitability of these banks rises if they perform in a monopolistic competition structure. They also found that the competition level has had a decrease after integration in Brazil, Chili, and Venezuela for the 9o's decade. Moreover, their findings implied that whenever the power of competition is more, the gross profit of banks is low; this is while a decrease in profitability leads more efficiency.

Hatirli et al. (2006) in a survey entitled "Application of Measuring Market Power and Cost Efficiency in the Milk" investigated the market power and cost effect of milk industry in Turkey. Their results indicated that the milk industry in Turkey has a monopolistic completion structure.

Kasman and Trogutlu (2007) examined the competitive structure of 38 insurance companies in Turkey for the period of 1996-2004. In order to measure the market share, this study employed the Herfindahl–Hirschman index in addition to the concentration ratio for 4 companies. Their findings demonstrated that the structure of insurance market has not changed in the investigated period so as the recent increasing trend in the concentration has not have a significant impact on the market share. Hence, they concluded that though the Turkish government has followed the financial liberation policies in the insurance industry, the industry is still in a monopolistic structure.

Jourli et al (2008) studied the concentration level of electricity market under the power plant integration condition in Iran. The results indicated that if the power plants are integrated into one other, the market indices approach towards the threshold limit or exceed from it. The value of Herfindahl- Hirschman and concentration index for 111 plans changes if there is not any restriction in the capacity of power plant. This is while 22 power plants raise the market concentration.

Mugume (2008) examined the market structure and performance in the Uganda banking industry during two different periods, 1995-1999 and 2000-2005. He used several indices including SCP, Herfindahl-Hirschman and Lerner in order to measure the market structure, concentration and technology levels, respectively. They found that there is a positive and significant relationship between the productivity and performance. They didn't find a significant relationship between performance and efficiency.

According to the data pertaining to the industry of paper product in the United States, Li and Luo (2008) found that the producers of this industry decided to be integrated into each other in order to improve their profitability and decrease the costs of competition. Their findings show that a monopolistic market with a high degree of concentration has a significant effect on the product price and as a result on the profitability.

Kanyenga and Managisoni (2009) using the measures of market concentration attempted to identify the size distribution as well as the level of concentration in the tobacco industry of Malawi based on the annual firm- level data for the period of 1996-2006. The industrial concentration ratios and share distribution among the firms, in this paper confirmed high level of concentration. In fact, the 4-firm concentration ratio, Herfindahl-Hirschman index and Gini index were 98 percent, 3.119 and 0.57, respectively in the industry.

Seelanatha (2010) studied the improvement in productivity and competitiveness under a behavioral performance approach in Sri Lanka banking industry for the period of 1977-2005. Given the results rising from Herfindahl-Hirschman index for the measurement of market share, he concluded that there is a positive and significant relationship between the structure indicator and performance variable in the industry.

Hossaini and Parme (2010), based on the different indices including Herfindahl-Hirschman, Concentration, and Lerner, evaluated the structure of monopoly, competition, and concentration in the Iranian Poultry meat and eggs. The findings obtained from the concentration ratio in the egg market indicated that this ratio for 1, 4, 8, and 16 firms of eggs crop are 1.94, 6.58, 10.868 and 17.05 percent, respectively in 2005. Accordingly, the structure of market is a completion framework in the egg market. The concentration ratio for one firm has decreased from 3.2 per cent in 1996 to 1.94 per cent in 2006. Additionally, the Herfindahl–Hirschman index also confirmed this results but with more level of competition structure, so that this index is 0.005 in 1996 but 0.003 in 2005. Finally, given the Lerner indicator, they concluded that this index has increased from 0.06 and 0.13 to 0.43 and 0.37 representing a rise in the competition degree under the poultry and eggs market.

Molkan (2011), based on the ISIC codes, examined the relationship

between the concentration ratio and economies of scale on the profitability of the Iranian industries for the period 2000-2004. The findings indicated that all variable related to the economies of scale and concentration ratios have a significant effect on the industries profitability. In fact, Manufacture of coke, refined petroleum products and nuclear fuel had the highest profitability level among the industries while manufacture of textiles had the lowest level. Moreover, the variables for concentration ration and economies of scale explain near to 59 percent of profitability changes in the Iranian industries.

Asiabani et al. (2012), in a paper entitled "Investigating the trend of production and trade of cotton with the global market structure", studied the trend of production and trade of cotton globally by using the different tools including Herfindahl-Hirschman, Hannah Key, the first order of Shannon entropy, and logarithmic standard deviation. Their findings indicate that the countries, USA, Uzbekistan, Australia and India have been the largest importing countries while the countries such as China, Turkey, Pakistan and Indonesia had the highest level for importing. Moreover, the results raised from the indices application signified that the market has moved from a monopolistic structure to an oligopoly structure.

Sadraei Johari and Manochehri (2012) in a paper entitled "Dynamics of industrial concentration in the Iranian manufacturing industries" studied the level of difference of industrial concentration and the level of smoothness of Iranian industries for the period of 1999-2007 under the ISIC Codes. The results of this paper show that the adjustment of industrial concentration towards its smooth level is negligible. By employing the Herfindahl-Hirschman index they also concluded that the concentration level has decreased in almost the industries for the period.

Iveta (2012), based on the Lerner index, Herfindahl-Hirschman index and Concentration index, measured the market power of Czech Banking sector for the period of 2000-2010. The results for the Lerner index do not support either perfect competition or monopoly in the country. However, the findings verify an increasing tendency of completion in the period 2005- 2010. They also said that the deposit market has the lowest level of competition.

3 .Variables of the Market Structure Assessment

This part of paper briefly mentions the theoretical framework concerning the measurement criteria of market structural components comprising concentration, entry barrier and economies of scale. Finally the study presents the computational results of the indices.

3.1 Entry Barrier Intensity

This research in order to assess the intensity of entry barrier employs Cost Disadvantage Ratio (CDR) as:

$$CDR = \frac{(n-\nabla)\sum_{i=1}^{\nabla-1}(v_i/l_i)}{(\nabla-1)\sum_{i=\nabla}^{n}(v_i/l_i)}$$

Where the numerator, represents the average of per capita value added of labour (v_i/l_i) for small firms generating 50 percent of industry value added, while the denominator indicates the average of per capita value added of labor for large firms generating 50 percent of industry value added, n is total firms and finally ∇ is number of firms at the median level. The findings show that value of CDR in all Iran's manufacturing industries at the *4-digit*is less than one. These results imply that whenever the size of firms is larger, they enjoy greater benefits. Only two industries have a CDR size between 0.75 and 0.5 and other industries' CDR size is less than 0.5. Additionally, this index is less than 0.1 in 114 industries. If the CDR value is close to zero, then it indicates high level of entry barriers. Hence it is concluded that most Iranian industries have high entry barriers.

3.2 Market Concentration

It is necessary to determine the number of producers or sellers as well as mode of market distribution for assessing degree of their concentration in a market. In other words, is the market share of firms distributed fairly or not? The measure of concentration degree of selling is specified as

$C = f(I,n), \quad \frac{\partial C}{\partial I} > 0, \frac{\partial C}{\partial n} < 0$, where n is number of firms and term I

represents mode of market distribution. Accordingly, whatever number of firms is less and mode of market distribution among the firms is more dispersed implying that market structure in terms of competition degree is more imperfect and more concentrated. The study applies Herfindahl-Hirschman Concentration index as:

$$HHI = \sum_{i=1}^{K} S_i^2 = \sum_{i=1}^{K} (x_i (\sum_{i=1}^{K} (x_i)^{-1})^2$$

$$S_i = \frac{x_i}{\sum x_i} \qquad i = 1,...,K$$

The index is obtained from sum of squares of market share of all active firms in an industry where Si is the market share of i-th firm and K is the number of active firms. Evaluating the frequency distribution of industries based on H-H index in 2007 demonstrates that 47 percent of the country's industries have a concentration value less than 1000 ($HHI < 1000$) with 40 percent of selling and 53 percent of other industries have 60 percent of industry's selling (a concentration value with more than 1000) out of 131 active industries at 4-digit code.

3.3 Economies of Scale

There are various methods such as "Profitability Analysis", "statistical methods presented by Florence, Comanor and Willson", "Stigler's Survivors technique", "Delphi technique" and econometric techniques" for evaluating economies of scale and determining optimum size of Manufacturing Enterprise Systems (M.E.S)[KhodadadKashi, 2005].This paper, in order to evaluate distribution of economies of scale in the Iran's industry, has employed the Florence, Comanor techniques. The findings imply that the optimum production level (MES) and number of industries with high MES are not so much. For instance, just one industry with $MES = 1$ has been active and seven industries with $MES \geq 0.5$ in the industry's sector. Generally the firms' activities tend to a level that is negligible in comparison with whole market size in most Iranian industrial markets. Size of MES has been less than 0.1 among the 127 industries at all level of 4-digit code for active industries. It means that the activity level of a firm is determined in lower level of o.1 of the

whole market.

4. Designing a Composite Fuzzy Index

In order to identify the most monopolies industries, this study has employed three indices based on the fuzzy approach including a composite index of entry barrier intensity (CDR), Economies of scale (MES) and Herfindahl's concentration index (HHI). A fuzzy logic is a multi-value logic that includes a vast spectrum of theories and techniques which have been conducted based on four concepts comprising fuzzy sets, linguistic variables, membership functions and if-then fuzzy rules (Yen and Langari, 1999). The fuzzy sets, unlike the deterministic sets, are not classified into two member and non-member classes; this is while the value of membership is unsteady between zero and one. The fuzzy logic is reasoning with fuzzy sets (Azar and Faraji 2010).This research applied the fuzzy TOPSIS method for ranking. The method gives us a possibility to evaluate numerous options under several indicators. The TOPSIS method has the ability to find an optimum option based on proximity to the optimal solution besides dissimilation to the non-optimal solution. Mathematically, it means that despite considering the available choices distance of ideal point, it can regulate their distances from anti-ideal point (Asgharpour, 2004). Several methods at table 1 have been reported to utilize the TOPSIS techniques under the fuzzy approach as follows:

Table 1. various presented techniques of Fuzzy TOPSIS

Name	Weight of Indices	Type of Fuzzy Numbers	Ranking Methods	Method for Normalization
Chen and Hwang (1992)	Fuzzy Numbers	Trapezoidal Numbers	Generalized Mean Method	Linear Normalization
Liang (1999)	Fuzzy Numbers	Chen's Fuzzy Numbers	Ranking by stochastic set	Manhattan Distance
Chen (2000)	Fuzzy Numbers	Triangular Numbers	Fuzzy Positive and Negative Ideal Solution	Linear Normalization
Chu (2002)	Fuzzy Numbers	Triangular Numbers	Ranking based on Marginal Integral value	Improved Manhattan Distance

Name	Weight of Indices	Type of Fuzzy Numbers	Ranking Methods	Method for Normalization
Tsaur et al (2002)	Deterministic Numbers	Triangular Numbers	Centerior Method	Vector Normalization
Zhang and Lu (2003)	Deterministic Numbers	Triangular Numbers	Fuzzy Positive and Negative Ideal Solution	Manhattan Distance
Chu and Lin (2003)	Fuzzy Numbers	Triangular Numbers	Moving Average Method	Linear Normalization

Source: Kahraman et al. (2007).

The study applies the fuzzy TOPSIS technique and triangular fuzzy numbers presented by Chen (2000). Let $A = \{A_i \mid i = 1, \cdots, n\}$ is an available options set for evaluation, $C = \{C_j \mid j = 1, \cdots, m\}$ is a desired benchmark set and $\tilde{X} = \{\tilde{x}_{ij} \mid i = 1, \cdots, n; j = 1, \cdots m\}$ includes fuzzy numbers indicating the assigned scores to option A_i given the C_j criterion. Set $\tilde{W} = \{\tilde{w}_j \mid j = 1, \cdots, m\}$ is the fuzzy weights of C_j standards. At the first stage, we should measure normalized value of assigned scores given the relation below:

$$\tilde{r}_{ij}(x) = \frac{\tilde{x}_{ij}}{\sqrt{\sum_{i=1}^{n} \tilde{x}_{ij}^2}}, \quad i = 1, \cdots, n; \quad j = 1, \cdots, m \tag{1}$$

Then using equation (2) the normalized value is calculated by applying weights:

$$\tilde{v}_{ij}(x) = \tilde{w}_j \tilde{r}_{ij}(x), \quad i = 1, \cdots, n; \quad j = 1, \cdots, m \tag{2}$$

In the next step, the positive ideal point (PIS) and negative ideal point (NIS) are obtained from the relations (3) and (4) as:

$$PIS = \tilde{A}^+ = \{\tilde{v}_1^+(x), \tilde{v}_2^+(x), \cdots, \tilde{v}_j^+(x), \cdots, \tilde{v}_m^+(x)\}$$

$$= \{(\max_i \tilde{v}_{ij}(x) \mid j \in J_1), \ (\min_i \tilde{v}_{ij}(x) \mid j \in J_2) \mid i = 1, \cdots, n\} \tag{3}$$

$$NIS = \tilde{A}^- = \{\tilde{v}_1^-(x), \tilde{v}_2^-(x), \cdots, \tilde{v}_j^-(x), \cdots, \tilde{v}_m^-(x)\}$$

$$= \{(\min_i \tilde{v}_{ij}(x) \mid j \in J_1), \ (\max_i \tilde{v}_{ij}(x) \mid j \in J_2) \mid i = 1, \cdots, n\} \qquad (4)$$

Where J_1 and J_2 are benefits and costs indicators of TOPSIS technique. Both CDR and MES indices are considered as member of J_1 while HHI index as member of J_2. In the next step, the available options distance from the negative and positive ideal point should be separately calculated so that these values can be accounted by using the Euclidean distance separately as:

$$\tilde{S}_i^+ = \sqrt{\sum_{j=1}^m [\tilde{v}_{ij}(x) - \tilde{v}_j^+(x)]^2}, i = 1, \cdots, n \qquad (5)$$

$$\tilde{S}_i^- = \sqrt{\sum_{j=1}^m [\tilde{v}_{ij}(x) - \tilde{v}_j^-(x)]^2}, i = 1, \cdots, n \qquad (6)$$

Where $\tilde{S}_i^+$ and $\tilde{S}_i^-$ are the options distance from the positive and negative ideal point, we also have:

$$\max\{\tilde{v}_{ij}(x)\} - \tilde{v}_j^+(x) = \min\{\tilde{v}_{ij}(x)\} - \tilde{v}_j^-(x) = 0 \qquad (7)$$

Then by using one of the de- Defuzzification techniques like Center of Area method we can calculate the separate non-fuzzy quantities values (i.e. $D(S_i^+)$ and $D(S_i^-)$). It is possible to obtain the closing value of index (C_i^*) according to the values of $D(S_i^+)$ and $D(S_i^-)$ for every option as bellow:

$$C_i^* = \frac{D(S_i^-)}{[D(S_i^+) + D(S_i^-)]} \ , i = 1, \cdots, n \qquad (8)$$

For any i, $C_i^* \in [0,1]$. If the option A_i is closed to the positive ideal point and farther from negative ideal point therefore C_i^* goes toward one. Finally, based on acquired C_i^* it can proceed to rank options. In fact, the options which enjoy grater C_i^* have upper rank. Accordingly, it will

present the ranking of monopolistic industries given the structural components of the market.

5. Identifying Monopolistic Industries

This part of paper firstly has employed three structural market measures including HHI, CDR and MES to identify the monopolistic industries. After that, the marginal amount of the closing index (C_i^*) concerning 129 industries has been calculated.

As seen at table 2, the most monopolistic industries based on the fuzzy TOPSIS include, respectively: Manufacturers of tobacco products, Manufacturers of games and toys, Manufacturers of industrial process control equipment and Tanning and dressing of leather; manufacturers of luggage, handbags, saddlery and harness; dressing and dyeing of fur.

Table 2. Identifying Monopolistic Industries under the Fuzzy TOPSIS

Order	Monopolistic Industries	C*
1	Manufacture of tobacco products	0.689457923
2	Manufacture of games and toys	0.484271412
3	Manufacture of industrial process control equipment	0.480979164
4	Tanning and dressing of leather; manufacture of luggage, handbags, saddlery and harness; dressing and dyeing of fur	0.464777675
5	Manufacture of cordage, rope, twine and netting	0.46107642
6	Service activities related to printing	0.458332544
7	manufacture of carpets and hand-woven tapestry	0.448095344
8	Manufacture of sports goods	0.428904512
9	Manufacture of watches and clocks	0.4132974
10	building and repairing of ships and boats	0.410263115
11	Manufacture of machinery for metallurgy	0.402619748
12	Manufacture of coke oven products	0.39987577
13	Manufacture of footwear	0.399047032
14	Manufacture of man-made fibres	0.398893157
15	printing of newspapers, magazines and other	0.395953873

Order	Monopolistic Industries	C*
	periodicals	
16	Manufacture of motor vehicles	0.382459437
17	Manufacture of lifting and handling equipment	0.38073378
18	Cleaning and grading and packing nut	0.38040199
19	Building of ships and floating structures	0.379479894
20	Manufacture of cocoa, chocolate and sugar confectionery	0.379407505
21	Manufacture of office, accounting and computing machinery	0.379041808
22	Manufacture of bicycles and invalid carriages	0.377114536
23	Tanning and dressing of leather; dressing and dyeing of fur	0.376954648
24	Manufacture of dairy products	0.376190694
25	Manufacture of wooden containers	0.375476586
26	Manufacture of bricks	0.374550247
27	Manufacture of products of wood, cork, straw and plaiting materials	0.374449696
28	Manufacture of bakery products	0.374177793
29	Manufacture of sugar	0.374144276
30	Manufacture of tanks, reservoirs and containers of metal	0.373588416

Source: Research Findings.

Table 3 elaborates the status of monopolistic industries and the main reason behind their monopoly. The findings indicate that entry barrier has had an essential role in expanding the monopolies in Iranian markets.

Table 3. The Status of Structural Variables Concerning Iranian Monopolistic Industries

ISIC	industry	The Main Root of Monopoly in a market
1517	Cleaning and grading and packing nut	High barriers to entry
1520	Manufacture of dairy products	High barriers to entry
1542	Manufacture of sugar	High barriers to entry
1543	Manufacture of cocoa, chocolate and sugar confectionery	High barriers to entry
1545	Manufacture of bakery products	High barriers to entry
1600	Manufacture of tobacco products	Economies of Scale, High Concentration
1723	Manufacture of cordage, rope, twine and netting	High Concentration
1725	manufacture of carpets and hand-woven tapestry	Economies of Scale, High Concentration
1732	Manufacture of footwear	High barriers to entry
1911	Tanning and dressing of leather; dressing and dyeing of fur	High barriers to entry
1912	Manufacture of luggage, handbags and the like, saddlery and harness	High Concentration and High Barriers to Entry
2023	Manufacture of wooden containers	High barriers to entry
2029	Manufacture of products of wood, cork, straw and plaiting materials	High barriers to entry
2212	printing of newspapers, magazines and other periodicals	High barriers to entry
2219	Service activities related to printing	Economies of Scale, High Concentration and Entry Barriers
2310	Manufacture of coke oven products	Intense Concentration and Economies of Scale
2430	Manufacture of man-made fibres	Intense Concentration and Entry Barriers
2697	Manufacture of bricks	Entry Barriers
2812	Manufacture of tanks, reservoirs and containers of metal	Entry Barriers
2915	Manufacture of lifting and handling equipment	Entry Barriers

ISIC	industry	The Main Root of Monopoly in a market
2923	Manufacture of machinery for metallurgy	Intense Concentration and Entry Barriers and Economies of scale
3000	Manufacture of office, accounting and computing machinery	Entry Barriers
3313	Manufacture of industrial process control equipment	Intense Concentration and Entry Barriers and Economies of scale
3330	Manufacture of watches and clocks	Intense Concentration and Entry Barriers and Economies of scale
3410	Manufacture of motor vehicles	Intense Concentration and Entry Barriers
3511	building and repairing of ships and boats	Intense Concentration and Entry Barriers and Economies of scale
3512	building and repairing of ships and boats	Entry Barriers
3592	Manufacture of bicycles and invalid carriages	Intense Concentration, Economies of scale and Entry Barriers and
3693	Manufacture of sports goods	Intense Concentration, Economies of scale and Entry Barriers and
3694	Manufacture of games and toys	Intense Concentration, Economies of scale and Entry Barriers and

Source: Research Findings.

6. Conclusion

This paper investigated the status of structural variables of industrial markets. Accordingly, the results showed that:

1. Most Iranian industries have high entry barriers.

2. Evaluating the frequency distribution of industries based on H-H index in 2007 demonstrates that 47 percent of the country's industries have $HHI < 1000$ with 40 percent of selling and 53 percent of other

industries have 60 percent of industry's selling (a concentration value with more than 1000) among 131 active industries at 4-digit code.

3. The level of optimum production (MES) and number of industries with high MES is very small.

4. the most monopolistic industries based on the fuzzy TOPSIS include, respectively: manufacturers of tobacco products, manufacturers of games and toys, manufacturers of industrial process control equipment and Tanning and dressing of leather; manufacturers of luggage, handbags, saddlery and harness; dressing and dyeing of fur.

5. The entry barrier criterion has had an essential role in expanding the monopolies in Iranian markets.

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