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The Effects of the Structural Variables of the Iranian Industries on the Social Cost: The SCP Approach

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Abstract

This paper studies the effects of the structural variables of the Iranian industries sector on the welfare cost using to the Structure-Conduct-Performance (SCP) theory. In other words, we investigate the role of structural components and their effects on the size of the welfare cost in Iran's industry sector. We have used the Leibenstein's model to calculate the deadweight loss and then the panel data model has been used to quantify the model. Leibenstein believed that in many cases the monopolistic industries operate inefficiently due to being on the margin of safety. So in addition to the welfare triangle, the costs of the inefficiency of monopolistic industries should be also considered as the welfare cost. Our results demonstrate that there is a direct relationship between the welfare cost and all of the parameters of the model (barriers to entry, market concentration, economies of scale, state ownership share and firm size).

Keywords: Leibenstein model, Inefficiency, Social Cost, SCP Approach.
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1. Introduction

The results of the conducted studies in Iran's industry sector confirm the fact that the monopoly structure is dominant in more than 50% of the activities of the industry sector. Theoretically, dominance of monopoly structure in a sector leads to disruption in optimal allocation of resources and creation of the economic rents; and the consequences of such a structure is the social cost imposed on the receivers of these services. Based on the microeconomics and industrial economics theories it is expected that the monopoly leads to disruption in optimal allocation of resource and welfare costs for the consumers. In other words, there is a direct relationship between effective monopoly and welfare cost in the society and proportional to the deviation of the competitive situation, the social costs are imposed on society. Looking at the studies conducted in the country it is observed that one of the prominent features of the industry sector is a lack of competition in most of the activities of this sector. These studies confirm that in 2005 the industries with $CR_4 < 40$ (four firms concentration ratio), have had possession of 74% of the country's industrial firms and their share has been 35% of sales of industry sector. More accurately, the industries with $CR_4 < 40$ have had 1194 firms. The industries with $CR_4 \geq 40$ have covered about 4077 firms and the industries with $CR_4 \geq 60$ have covered about 1910 firms. The industries with $CR_4 \geq 60$ have had 55% of industry sector's sales. If we consider the industrial markets with concentration ratio of upper 40% as the non-competitive industries (effective monopoly), in this case, we can accept that among the 132 four-digit industries, in 84 industries, the monopolistic forces are more effective than competitive forces and the effective competition exists only in 51 four-digit industries. On this basis, the non-competitive industries have account for over 65% of industry's sales in 2005 and the competitive industries have account for 35% of industry's sales (Khodadad Kashi, 2009).

Also, according to Khodadad Kashi's studies, about 74.4% of firms operating in the industrial sector in 2007 are related to industries with $CR_4 < 40$ and 30% of industry's sales belonging to this group, while the concentrated industries ($CR_4 \geq 40$) have had about 25.6 percent of country's firms and have account for over 70 percent of industry's sales. In 2007, among 140 International Standard of Industrial Classification (ISIC) four-digit industries, 92 industries have had concentration

intensity of more than 40percent. Also, based on the Herfindahl-Hirschman Index (HHI) in 2005, it is seen that 46 percent of the country's industries which have 40 percent of industry's sales, have a concentration ratio less than 1000 and 54 percent of the country's industries which have more than 60 percent of industry's sales, have the concentration intensity more than 1000. This confirms that the concentrated industries possess most of volume of industry's sales. The Herfindahl-Hirschman index in 2007 confirms also the results of CR_4 index, so that 47 percent of country's industries had H–H<1000 which possessed 40 percent of sales and the remaining 53 percent that possessed 60 percent of sales have the concentration ratio of more than (1000). This situation indicates that the effective monopoly structure is dominant on most of the industrial activities of Iran. In this study after investigating the factors effective on welfare cost, analyzing them, presenting an appropriate model, and finally interpreting results of the model, we offer some appropriate solutions to reduce welfare cost.

2. Literature Review

A quick look at the studies conducted inside and outside Iran, we find out that there are various methods for calculating the deadweight welfare loss; each researcher has introduced a different indicator for calculating the welfare loss. In this section, some of the most important studies conducted in this field will be shortly discussed and the welfare loss will be measured using various approaches.

As an overall conclusion, Table1 presents the most important studies in the field of measuring welfare cost of monopoly conducted inside and outside Iran.

Table 1: The most impsortant studies conducted inside and outside Iran

Research(year)	Author	Market and Country Scale	Indicator used	Social cost calculated
"Monopoly and Resource Allocation" (1954)	Harberger	37 USA industries based on 4-digit codes	Harberger	welfare triangle
"The Social Cost of Monopoly and Regulation" (1975)	Posner	USA Industry	Posner	welfare triangle+economic rent
"Allocative Efficiency , X-Efficiency and the Measurment of Welfare Losses" (1969)	Comanor, W. S., Leibenstein, H.	USA Industry	Leibenstein	welfare triangle + inefficiency of monopoly industries
"Concentration Barrier to Entry and Economies of Scale in the Water Airconditioner Industry in Iran and Evaluation of Social Welfae Cost" (2011)	Shahiki Tash, M. N. & Nasiri Aghdami, A.	Iranian Airconditioner Industry	Harberger + Posner	Welfare triangle+ economic rent
"Estimation of Social Cost of Monopoly in Insurance Industry: A Case Study of Iran" (2009)	Shahiki Tash, M. N.& Foyouzi, N.	Iranian Insurance Industry	Harberger , Posner, and Cowling-Muller	welfare triangle+ economic rent+ Cost of acquisition and maintenance of monopoly power
"Evaluating the Effects of Structure on Iranian Banking Industry" (2012)	Khodadad-Kashi, F. & Jafari, L.	Iranian banking industry	(SCP) hypothesis+ index (TTI)	The results of this research didn't confirm the SCP hypothesis.
"estimation of social costs of monopoly in Iranian industrial sector" (2001)	Khodad Kashi	Iranian industrial sector	Harberger and Cowling-Muller	welfare triangle+ Cost of acquisition and maintenance of monopoly power
"An Investigation on the Effects of Advertising and Industrial Concentration on Profitability in Iranian Food Products and Beverages" (2011)	Sadraei Javaheri. & Zabihidan. M. S. & Balaghi.	Iranian Food Products and Averages	(SCP) hypothesis	The study confirms the validity of Structure Conduct Performance (SCP) approach

3. Data

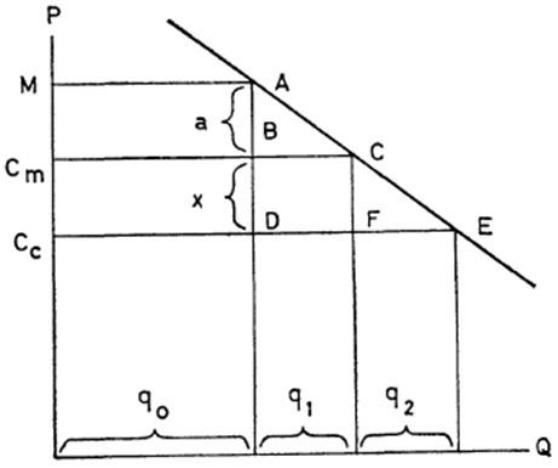
In this research, the data used are 4-digit industries information based on International Standard of Industrial Classification (ISIC) during 1999-

2008 collected by Iran statistics center. Also, Eviews and Excel software are used; moreover, in order to quantify the above model, panel model is used. Panel data provides a very suitable environment for developing estimation methods and theoretical results so that researchers are able to use periodical data and time series to study problems which are not possible to study in an only periodical or time series environment.

4. The Model

There are two important views in the investigation of the welfare effects of performance in an industry. The first view assuming the efficient allocation of inputs in the production units (satisfying the x-efficiency) calculates the difference between production in the competitive conditions and non-competitive conditions as well as the price pressures arising from this difference (allocative inefficiency). According to this view, the welfare loss, due to the non-competitive performance, is equal to "welfare triangle "or "welfare triangle and economic rent".

In the second view which was first proposed by Leibenstein (1966), by addressing the concept of x-inefficiency, the cost of non-competitive performance is considered beyond the welfare triangle. According to this view, in calculating the welfare cost of an industry's performance, it is required that the allocative social cost and inefficiency social cost of x-inefficiency be calculated together.



Graph1. Welfare (deadweight) loss in the Leibenstein index

In the situations where the assumption of adaptation of real costs with the decisions based on cost minimizing in production units is satisfied (x-efficiency) and there is only allocative inefficiency $(W_x = 0, W_a \neq 0)$ and there is just the allocative inefficiency ($W_x = 0, W_a \neq 0$), the welfare costs of monopolistic behavior are obtained from triangle ABC in the above chart. Quantitatively, the area of triangle ABC can be calculated as follow:

$$S_j(ABC) = \frac{1}{2} dp_j \times dq_j \quad (1)$$

Then, by defining the price elasticity of demand of good j as η_j and $t_j = \frac{dp_j}{p_j}$ we get:

$$dp_j = t_j p_j, dp_j = q_j \eta_j t_j \quad (2)$$

$$W_a = S_j(ABC) = \frac{1}{2} p_j q_j \eta_j t_j^2 \quad (3)$$

$$W_a = S_j(ABC) = \frac{1}{2} dp_j dq_j = \frac{1}{2} q_m p_j \eta \left(\frac{P - C_m}{p} \right)^2 \quad (4)$$

So, in terms of governance of x-efficiency, the welfare loss due to the allocative inefficiency (W_a), is obtained from calculating the area of welfare triangle. W_a is so-called Harberger welfare cost.

Social costs in terms of allocative inefficiency and x-inefficiency are as follows:

Leibenstein (1966) and Leibenstein and Comaron (1969) suggested that the social cost of an industry's performance is beyond the welfare triangle. In their viewpoint, in many studies evaluating the social cost of an industry's non-competitive performance, the assumption is that the first order optimal equilibrium condition is satisfied. At this time, the welfare loss of monopoly resulting from non-optimal allocation of resources occurs and its amount will be equal to the area of triangle ABC.

In contrast, if the assumption of equality of inputs efficiency is ignored in terms of competitive and monopolistic performance, then deadweight loss due to performance of monopolistic units which could be

created even artificially (state licenses), will include the x-inefficiency and also the expansion of allocative inefficiency. In these conditions the deadweight loss due to the monopoly is much greater from the former approach and will be equal to the area $ADE + C_m C_c BD$. Quantitatively the amount of deadweight loss due to the allocative inefficiency and x inefficiency can be calculated as follow:

$$S_j(ADE) + S_j(C_m C_c BD) = W_{ax} + W_x = \frac{1}{2}(a+x)(q_1+q_2) + xq_0 \qquad (5)$$

In the above relationship, W_{ax} is the comprehensive measure of allocative inefficiency which Leibenstein (1966) considers it equal to the area of triangle ADE. Also, W_x represents the welfare cost of x inefficiency without any allocative inefficiency. To calculate theW_{ax}, the following formula is used:

$$W_{ax} = \frac{(dp \times dq)}{2} = \frac{(a + Xa)(q_1 + q_2)}{2} \qquad (6)$$

Then, like the Harberger relationship, with the definition of price elasticity of demand for commodity j as η_i and assuming $t_j = \frac{dp_j}{p_j}$ we get:

$$(x+a) = dp_j = t_j p_j \qquad dp_j = q_j \eta_j t_{j\,j} \qquad (7)$$

$$W_{ax} = \frac{1}{2} p_j q_j \eta_j t_j^2 \qquad (8)$$

$$S_j(ADE) = \frac{1}{2} qp\eta \left(\frac{a+x}{p} \right)^2 \qquad (9)$$

$$= \frac{1}{2} p_m q \eta \left(\frac{(p - c_m) + x}{p} \right)^2, a = p - c_m \qquad (10)$$

The following relationship is used to calculate the amount of W_x:

$$W_x = q_0 \times x \qquad (11)$$

According to Berger and Mester (1997), to measure the amount of x, a cost equation with combined error term is used as follows:

$$Lnc = f(p,q,z) + Lnu + Lnv \tag{12}$$

Then, by calculating $Ln(\hat{u})$ as the technical inefficiency term in the above relationship, the amount of x-inefficiency is obtained as follow;

$$x = 1 - \frac{C^{\min}}{C^b} = 1 - \left(\frac{\exp f(p^b, q^b, z^b) \times \exp(Ln\hat{u}_c^{\min})}{\exp f(p^b, q^b, z^b) \times \exp(Ln\hat{u}_c^b)} \right) = 1 - \frac{\hat{u}_c^{\min}}{\hat{u}_c^b} \tag{13}$$

In the above relationship, the subscript min indicate the cost minimizing industries which have the lowest technical inefficiency $(\hat{u}_c)$ that is considered as the basis for comparing and then the difference of inefficiency of other industries $(\hat{u}_b)$ compared to based bank $(\hat{u}_c^{\min})$ will be measured. Overall, the total welfare cost (W_{ax}) due to the noncompetitive performance (sum of allocative inefficiency and x-inefficiency) will be equal to:

$$W_{total} = W_{ax} + W_X$$
(14)

$$= \frac{1}{2} q p_m \eta \left[\frac{(p_m - c_m) + \left(1 - \frac{\hat{u}_c^{\min}}{\hat{u}_c^b}\right)}{p_m} \right]^2 + \left[q_0 \times \left(1 - \frac{\hat{u}_c^{\min}}{\hat{u}_c^b}\right) \right] \tag{15}$$

In the above relationship, p, q, η, $\left(1 - \frac{\hat{u}_c^{\min}}{\hat{u}_c^b}\right)$ and $\left(\frac{p - mc}{p}\right)$ indicate the price, amount of sale, elasticity, inefficient term and price disturbance term, respectively. For calculating the above index, it is required first to calculate the amount of inefficiency of every concentrated firm in industry. Also one has to calculate the price elasticity of demand based on scientific criteria and finally calculate the amount of disturbance term considering various points of view.

In other words, for determining the welfare costs in this approach,

the average difference of cost of monopoly units relative to a cost minimizing unit, can be calculated using their technical efficiency ratio.

5. Evaluation of the social cost

The central purpose of the discussion is to check how much welfare cost has been imposed on the consumers in society due to the concentrated structure of Iran's industrial sectors. Thus, according to the mentioned information and using the Leibenstein index we calculate the W_L in Iran's concentrated industries.

Table 2: Social cost in Iranian Industry (Leibenstein approach)

ISIC	Industry	social cost to Sale
3599	manufacturing of other transport equipment not been classified elsewhere	38.77367348
2101	Manufacture of pulp, paper and paperboard	28.32691984
1912	Luggage, handbags, etc.; saddlery& harness	22.14936304
2891	Gas and oil appliances and heating and cooking apparatus	21.5444862
3691	Manufacture of structural clay products	16.9986723
3520	Manufacture of paints, varnishes and lacquers	15.56799152
3220	Manufacture of wearing apparel, except footwear	14.78884165
3693	Manufacture of structural clay products	12.26481809
2926	News agency activities	10.09333474
1553	Malt liquors and malt	9.041179829
3140	Tobacco manufactures	9.018710433
3511	Manufacture of basic industrial chemicals except fertilizers	8.580324031
2921	Publishing of books, brochures and other publications	7.892640331
1551	Distilling, rectifying & blending of spirits	7.387755216
3330	Manufacture of furniture and fixtures, except primarily of metal	5.592381633
2721	Manufacture of basic precious and non-ferrous metals	3.970055683
1518	Dairy products	3.528122277
1723	Cordage, rope, twine and netting	2.868502948
2412	Manufacture of plastics in primary forms and of synthetic rubber	2.752304685
2722	Manufacture of basic precious and non-ferrous metals	2.318738148
2430	Manufacture of coke oven products	2.247464457
2732	Forging, pressing, stamping and roll-forming of metal; powder metallurgy	2.201693191
1600	Tobacco products	1.896643268
1547	Tea-making	1.593794192

ISIC	Industry	social cost to Sale
2221	Manufacture of basic chemicals, except fertilizers and nitrogen compounds	1.561644106
2310	Manufacture of other chemical products n.e.c.	1.55578664
3592	Manufacture of rubber products not classified elsewhere	1.394147974
3720	Non-ferrous metal basic industries	1.36948831
2911	Radio and television activities	1.305588775
2010	Manufacture of wooden containers	1.257538633
3420	Printing, publishing and allied industries	1.239270972
3410	Manufacture of pulp, paper and paperboard	1.232773933
2924	Other publishing	0.801405194
3190	manufacturing of other electrical equipment not been classified elsewhere	0.67407246

The highest welfare cost ratio is related to the code (3599) that is "manufacturing of other transport equipment not been classified elsewhere". Also the lowest welfare cost ratio is related to the code (3190) that is "manufacturing of other electrical equipment not been classified elsewhere".

6. SCP Approach

Now, we investigate the role of structural components and their effects on the size of the welfare cost in Iran's industry sector using theoretical discussions of industrial economics and based on the SCP theory or "Structure-Conduct-Performance" paradigm. Thus, the SCP paradigm has been considered as follows:

$$W_L = f(CDR, HHI, MES, Sngov, VAR) \quad (16)$$

Where, W_L indicates the welfare cost, CDR stands for cost disadvantage ratio (as a proxy of entry barrio intensity), HHI is the Herfindahl-Hirschman concentration index, MES is the index for optimal point of production, $Sngov$ is the size of government in the industrial activities and VAR is the firm size in the industry. In this study, in order to quantify the above model, the panel model with the following structure is used:

$$WL_{it} = \beta_i + \beta_1 CDR_{it} + \beta_2 HHI_{it} + \beta_3 MES_{it} + \beta_4 Sngov_{it} + \beta_5 VAR_{it} + \nu_{it} \quad (17)$$

Where, $Cov(X_{it}, \nu_{it}) = 0$ and $\nu_{it} \approx N(0, \delta^2)$.

Also, according to the industrial economics theories, it is expected that

the relationship between structural variables and the welfare cost be as follow:

$$
\begin{aligned}
&i) \quad Cov(HHI_{it}, WL_{it}) \succ 0 \\
&ii) \quad Cov(CDR_{it}, WL_{it}) \succ 0 \\
&iii) \quad Cov(MES_{it}, WL_{it}) \begin{matrix}\succ \\ \prec\end{matrix} 0 \\
&iv) \quad Cov(Sngov_{it}, WL_{it}) \begin{matrix}\succ \\ \prec\end{matrix} 0 \\
&v) \quad Cov(VAR_{it}, WL_{it}) \begin{matrix}\succ \\ \prec\end{matrix} 0
\end{aligned}
\tag{18}
$$

We will continue with the manner of measuring each index in Iran's industry sector.

6.1 Entry barriers

Entry barriers variable is the one of the other market structural variables assessing the relationship between actual sellers and potential sellers. It is expected that the more entry barriers, the more market power of the actual sellers and leads to the market will be propelled to the monopoly. Barriers to entry can have different reasons. For example, the law, huge fixed costs, lack of access to superior technology, the internal requirements of the market, the strategic behavior of competing firms, etc. can all be considered as the barriers to entry of a potential firm in an industry. Also, in commercial markets, tariffs, restrictions of product standard, high commodity prices etc. can be considered as a barrier to entry of a commodity in the realm of a foreign market. In academic studies, it is believed that we should be able to assess quantitatively all discussions and views. In the case of the entry barrier that is known as a market structural variable, we should be able to provide some measures for quantitatively measuring the entry barriers. It is notable that among the discussions of the industrial economics, the lowest development is made in the entry barrier field, that is, so far we haven't been able to achieve a measure that has strong theoretical foundations. This index was used, for the first time, by Khalilzade Shirazi (1974) for British industries and then Khodadad Kashi (2007) used it in the case of Iran's industries.

CDR is introduced as follows:

$$CDR = \frac{(n-\nabla)\sum_{i=1}^{\nabla-1}(v_i / l_i)}{(\nabla-1)\sum_{i=\nabla}^{n}(v_i / l_i)} \qquad (19)$$

Where the numerator of fraction represents the average value added per person, v_i / l_i, for small firms which have generated 50 percent of industry value added while the denominator is the average value added per person for large firms that have generated 50 percent of industry value added. Additionally, Subscribe ∇ is number of firms at the median level. The findings show that value of CDR in all 4-digit Iran's industries is less than one.

This index is a tool that can be used for assessing the disadvantage of some firms compared to others. If the CDR ratio is smaller than one, it means that the small-scale production is not economical. In fact, this index assesses the entry barriers from the aspect of economies of scale. However, the other causes of "entry barriers" that are qualitative aspects--such as the various licenses, rents and having preferential facilities--are also implicitly included in the Index.

6.2 Market Concentration

Economists who are interested in the study of the causes of competitive and non-competitive behavior require a practical method for measuring the amount and the size of competition and monopoly in the individual markets or in the whole economy. The concentration is responding to such a requirement. The researchers using the concept of concentration will be able to a large extent to measure the level of competition and monopoly in the markets.

Concentration of sellers and purchasers is the most salient aspect of the organizational characteristics of the market. The concentration degree of sellers is known as one of the market's structural variables. To assess the degree of concentration of sellers or producers in market, it must be specified how many producers or sellers there are in the market and how the market is between distributed among them; in other words, whether the market share of the firms is distributed fairly or not.

If we show the number of firms with n and the manner of market

distribution between the active firms of industry with I, the measure of the concentration degree of sale is defined as follow:

$$C = f(I, n), \quad \frac{\partial C}{\partial I} > 0, \frac{\partial C}{\partial n} < 0$$

In this relationship, if the number of firms (n) is small and the manner of market distribution (I) among them is more diffuse, it is said that the market structure in aspect of the degree of competition, is more imperfect or in other words, it is more concentrated. Table (3) shows the manner of measuring the Herfindahl-Hirschman concentration index:

Table 3: Herfindahl-Hirschman concentration index

index	Computational relationship	Variables introducing	application	Advantages and disadvantages
Herfindahl-Hirschman index	$HH = \sum_{i=1}^{K} S_i^2$ $S_i = \frac{X_i}{\sum X_i} \quad i = 1,\ldots,K$	s_i: market share of the ith firm K: the number of firms in industry	Measuring the degree of monopoly and market power	1.Consistent with the Axiomatic principles 2. Having a strong theoretical base 3. Ease to calculate and analyze 4. independence from market size 5. Using information of all n firms in the industry

Source: Shahiki

6.3 Economies of Scale

Economies of Scale are a concept that can be explained using the long-run marginal cost curve. This curve is also called "scale curve" and all of its points guarantee the efficiency, meaning that every points on it refers to a level of production which to produce them, the resources are optimally employed. On all of the points of "scale curve" (the long-run average cost), price of the production factors is fixed and it is assumed that the supply of factors is quite elastic and with change of production level, their price does not change. Also, the firm considering the fixed prices of factors for every level of production does employ a combination of factors that incur the lowest cost (Khodadad Kashi, 2009).

The "classical" economies of scale theory imply that by increasing the production on the scale curve, the average cost does decline. From microeconomic theory we know that by increasing the production level,

the average cost does decrease to a specific level of production which is known as the optimal scale or optimal level of production or the "minimum efficient scale" (MES). In this level, the average cost of production is at its lowest amount. With more production relative to the optimal production level, the average cost does increase. The MES production level is not same for all industries so that it is very large for some industries and is very small for others. Before the MES, the more the slope of average cost curve, the greater the benefits of cost obtained by increasing the production level. Also, if the average cost curve at the production level of upper than MES is higher, the cost disadvantages, or, in other words. the diseconomies of scale will be more. By increasing the production, the average cost is declined to a certain level which is known as optimal scale of production. Identification and estimation of this level of production is of great importance in empirical studies.

Economically speaking, achieving economies of scale and optimal point of production (MES) has great importance in reducing production costs. In other words, a firm will reach to efficiency conditions if it is able to operate at MES or in optimal scale of production. Now, the question is what the methods of determination of the optimal point of production (MES) are. Table 4 provides the manner of calculating the MES.

Table 4: The method of Estimating MES

Relationship	Description	
Statistical method	The results of Flurence's study in some of the manufacturing industries indicate that the central indexes (such as the median and mean of production of the industry's large firms) can be used to measure the optimal point of production.	$\Phi = \{X_1, X_2, X_3, \ldots X_n\}$ Having the information related to the vector of the size of industrial firms (Φ) and considering the numerical average of the size of the large industrial firms, we can calculate the MES as follow: $MES = \frac{2\sum_{i=\frac{n}{2}}^{n} X_i}{n}$

6.4 The share of state ownership

In order to determine the ownership structure of firms in each industry, the manner of ownership distribution between the firms is considered in

this research. To determine the type of the ownership the following relationship is used:

$$Sngov = \frac{ngov}{n}$$

Where, ngov is the number of state-owned firms in each industry and n is the total number of firms in the industry.

6.5 The size of industry

Increase in firm size can lead to savings in factors of the maintenance section and saving in the reserve labor force and machinery. In the factories where many numbers of machineries are used, the number of damages of equipment and machinery can be predicted using the law of large numbers. So there is no need to increase the number of reserve factors and the forces of maintenance section proportional to increasing machinery. The same issue is true in the case of reserve machinery. The factory which makes use of only one machine in the production process will have to store a machine to deal with emergency situations so that if the first machine is damaged, the production process does not stop. By increasing the number of the firm's machinery, there is no need to have one reserve machine for each machine, because due to the large size of the firm, one can predict the number of damages using the law of the large numbers and proportionately keep some machinery. Therefore, by increasing the size of the factory, the number of forces of the maintenance section as well as the number of reserve machinery will be saved. This saving is so-called saving in the supporter factors or saving in the reserve forces (Khodadad Kashi, 2009).

In total, for assessing the economies of scale in every market, two factors must be considered: the capital equipment required for establishing the optimal organization and the size of the market. The more the capital needed to establish the optimal structure and the higher the percent of optimal scale in the market, the more important is economies of scale. In this study the ratio of value added to sale is used to measure the size of the firm. That is:

$$VAR_{it} = \frac{VAL_{it}}{R_{it}}$$

Where, VAR_{it} is the size of the ith industry in period t, VAL is the value added of the ith industry in period t and R_{it} is the sale of the ith industry

in period t.

7. Model Estimation

In this study the panel data model has been used in order to estimate the SCP model of welfare cost. Panel data model is chosen because this approach has the following advantages:

1. The number of observations increases leading to an increase in the degrees of freedom as well as a decrease the co-linearity.
2. Allows the researcher to assess the important economic issues that could not be answered by the cross-sectional and time series models.
3. The panel data model, in addition to allowing for more complex behavioral models to be created from the cross-sectional data or time series data, also provides a solution for decreasing the econometric key problems occurring in the empirical studies. For example, the appearance or absence of specific effects due to omitted variables (or incorrect measuring) is of the mentioned problems (Ashraf-zadeh and Mehregan, 2008).
4. Use of panel data reduces the estimation bias to a large extent.
5. The number of data and observation in panel data model is generally large and this causes the estimates to be more reliable.
6. A panel data set allows the researchers to explain the more advanced models and perform a test included the less constraining hypothesis.

In the following, the F-limer test will be checked to choose between pooling and panel data. Then the Hausman test will be calculated and finally the estimated model will be explained.

8. F-Limer Test

Various tests are used in order to determine the type of panel data model. The most general test is the F-Limer test for using the fixed effects model against the estimated model of pooled data. Consider the following model:

$$Y_{it} = \alpha_i + \beta 1 X_{it} + \mu_i ... + v_{it} \qquad (20)$$

The disturbance term, v_{it}, has a normal distribution and all i's and t's are independent from X_{it} and are not correlated with it (Johnston and Dinardo, 1997). So, it must be checked first to see whether there are heterogeneity or individual differences. If there is heterogeneity, the

panel data approach will be used; otherwise the ordinary least squares (OLS) models are used to estimate the model. The μ_i's represents the individual effects or heterogeneity in the cross-sections and appear in the form of random effects or fixed effects. Comparison of the panel data method with the ordinary least squares method is evaluated in framework of following hypothesis:

$$H_0 = \mu_1 = \mu_2 = \mu_3 = ... = \mu_N = 0$$

H_a= At least one of the u_i's is nonzero.

In order to test the above hypothesis, the F-limer statistic is used as follows (Baltagi, 2005):

$$F=((RSS_R\text{-}RSS_{UR})/N\text{-}1)/(RRS_{UR}/(NT\text{-}N\text{-}K))\sim F_{(N-1),(NT-N-K)} \qquad (21)$$

Where RSS_R is the restricted Residual Sum of Squares (pooling data), RSS_{UR} is the unrestricted Residual Sum of Squares (panel data), N is the total number of industries, T is the number of time series and K is the number of estimated parameters. In this test, the null hypothesis is based on restricted values and the alternative hypothesis is based on unrestricted values. This test is of the Chow-type tests.

If the calculated value of F is greater than calculated values in Table (5), with the degrees of freedom N-1and NT-N-K, the null will be rejected; it will be accepted otherwise. The critical region for testing the hypothesis is the following expression:

$$CI = \left\{F > F_{(N-1),(NT-N-K)}; \alpha_0\right\} \qquad (22)$$

Where, α is the probability of the critical region (2001, Keshavarz Hadad,).

Table5: F-limer test

Effect Test	Statistic	d.f	prob
Cross-section *F*	11.247990	(128,1406)	0.0000
Cross-section Chi-square	1085.815956	128	0.0000

Table 5 provides the calculated statistical value for the F-limer test. According to this Table we find out that considering the obtained value for F-limer test (11.247990) we can use the panel data method to estimate the model.

9. Hausman Test

Hausman Test (1978) is used for choosing between the fixed effects model and random effect model. The statistic of this test (H) has a chi-squared distribution with k (the number of explanatory variables) degrees of freedom. Given that an important assumption about the disturbance components of regression model is that, $E(u_{it} \mid X_{it})$, that is the same assumption of the independence of disturbance components from the explanatory variables, Hausman suggests that the both effects be compared under the null $H_0 : E(u_{it} \mid X_{it}) = 0$. The random effect estimator is consistent and asymptotically efficient just if the null hypothesis does not rejected, while the fixed effects estimator is consistent whether the null be rejected or not (Keshavarz Hadad, 2012). The Hausman test statistic is as follows:

$$W = (bs - \beta s)' (M_1 - M_0)^{-1} (bs - \beta s) \qquad (23)$$

Where w has a chi-squared distribution with k degrees of freedom where k is the number of independent variables in the model. M_0 and M_1stand for a variance-covariance matrix for coefficients of the random effects model (βs) and the fixed effects model (bs), respectively. If M_0 and M_1 are correlated βs and bs can be significantly different and it is expected that this be reflected in the test. If the null hypothesis is not rejected using this test, the random effects model will be appropriated.

Table 6: Hausman test

Test summary	Chi-Statistic	Chi-Sq.d.f.	Prob
Cross-Section Random	7.085104	5	0.2144

As Table 6 shows, based on the calculated probability value (0.2144) for the Hausman test, we find out that the random effects model must be used to estimate the model, because the p-value is greater than 0.05.

10. Estimated model

According to the two last tests we found out that first, according to the results of the F¬limer test, the panel data method can be used to estimate the model and second, according to the results of the Hausman test, we conclude that the random effects model must be used. Thus we will estimate the model. According to the following algebraic model, we

investigate the effect of each parameter on the welfare costs.

$$W_L = f(CDR, HHI, MES, Sngov, VAR) \quad (24)$$

According to the calculated coefficients, the degree of importance of each variable on the welfare costs can be determined. These coefficients are shown in Table 7 for each variable.

Table7: Model estimation

Variables		Coefficient		t-Statistic		Prob.	
		FE	**RE**	**FE**	**RE**	**FE**	**RE**
Intercept	*C*	-0.13660	-0.12186	-4.04190	-4.48677	0.0001	0.0000
Entry barriers	*CDR1*	0.00616	0.00652	2.04652	2.00727	0.0409	0.0449
Concentration	*HHI*	0.30399	0.24331	3.35867	2.78697	0.0008	0.0054
Economies of Scale	*MES*	0.88199	0.92604	4.80363	3.65407	0.0000	0.0003
The share of state ownership	*SNGOV*	0.30486	0.28190	4.78018	4.52494	0.0000	0.0000
The size of industry	*VAR*	0.18472	0.17841	3.23691	3.58185	0.0012	0.0004
Effect Specification							
		FE			**RE**		
R^2_w		0.655501			0.163289		
R^2_{uw}		-			0.284850		
DW_w		1.685735			1.525930		
F		20.11496			59.87398		
Effect Specification							
		S.D.			Rho		
Idiosyncratic random		0.167473			0.4611		
Idiosyncratic random		0.181050			0.5398		

According to the Table 7 the following results can be extracted:

1. The results of this research indicate that there is a positive relationship between the intensity of entry barrier and the ratio of welfare cost to sales in Iran's industries. In other words, if the intensity of entry barrier increases by one percent, it is expected that, if the other factors are constant, the welfare cost to sales ratio will increase by 0.0065 CDR percent in average. This indicates that the more the entry barriers, the more is the welfare cost.

2. According to Table 7, it can be seen that there is a positive relationship between the concentration and the welfare cost to sales ratio in Iran's industries; in other words, if the concentration increases by one percent, it is expected that, if the other factors are constant, the welfare cost to sales ratio will increase by 0.243 HHI percent in average. It means that the monopoly industries have a significant role in the increase of the intensity of the welfare cost in Iran's economy.

3. According to the Table 7 we find that there is a direct relationship between the economies of scale and the welfare cost to sales ratio in Iran's industries, so that if the economies of scale increase by one percent, it is expected that, if the other factors are constant, the welfare cost to sales ratio will increase by 0.926 MES percent.

4. According to the results of Table 7, there is a positive relationship between the state ownership share and the welfare cost to sales ratio. This means that if the state ownership share increases by one percent, it is expected that, if the other factors are constant, the welfare cost to sales ratio will increase by 0.281 Sngov percent. This indicates that the more the entry barriers, the more is the welfare cost to sales ratio.

5. The latest parameter is the size of industry; this also has a direct relationship with the welfare cost to sales ratio. In other words, if the size of industry increases by one percent, it is expected that, if the other factors are constant, the welfare cost to sales ratio will increase by 0.178 VAR percent.

11. Conclusion

1. The results of this research indicate that there is a positive relationship between the intensity of entry barrier and the ratio of welfare cost to sales in Iran's industries. It is recommended that the various dimensions of entry barriers (like the government regulations, assigning the permissions, high fixed costs, strategic noncompetitive behaviors etc.) which make the markets to be monopolistic and increase the welfare cost be controlled.

2. The concentrated industries impose welfare cost to the society. Hence, it is recommended to follow competition increasing policies in intensively concentrated industries. For example, the intensity of concentration can be reduced by supporting small scale and medium scale firms (SME_S) via financial and monetary policies, controlling the non-competitive behaviors of concentrated industries, monitoring the

changes of market share of this industries and controlling the market share of the dominant firm in this markets.

3. The research findings show that the state-owned industries have a high welfare cost. Hence, efficient privatization policy which creates real competition, can have a great role in reducing the welfare costs.

4. The results show that there is a direct relationship between the firm size and the welfare cost to sales ratio. In other words, the larger industries that have a greater ratio of the value added to sales have proportionally imposed a more welfare cost on the society. Hence, the identification of non-competitive behaviors and the structure dominant on the large industries and controlling the price and quantity noncompetitive evidence in these industries will help to reduce the welfare cost.

5. Given that the high entry barriers in Iran's industries are mainly arises from the government support, hence the increase of the participation of the private sector and eliminating the government tenure and attracting the foreign investment will be effective in reducing the entry barriers and increasing the welfare.

6. The government policy is the most important factor affecting the welfare loss. The supporting of the competing industries and the proper pricing policy can play a significant role in reducing the welfare cost.

7. In order to increase the consumer welfare, the government can create a competitive environment by reducing the entry barriers. Because the entry barriers lead to the creation of market power for the old firms and hence can reduce the welfare.

8. As we know, the concentration is also a branch of monopoly and in order to reduce the concentration, the government must not only use the liberalization policies, but must also support the small firms (for example by tax rebate) to be able to increase the competition and the welfare.

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