

## The Impact of Privatization on Performance and Productivity of Iranian Aluminum Company (IRALCO)

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### ABSTRACT

The present research aims at measuring privatization objectives achievement degree of a big recently privatized firm including performance improvement and productivity promotion as well as finding its failure causes and providing appropriate approaches. The studied firm is Iranian Aluminum Company (IRALCO) in which the privatization effect on performance and productivity measures was examined during 2005-2010 period. This period has been divided into three subsets i.e. governmental ownership, semi-private ownership and private ownership in which 52 performances (economic and financial) and productivity (efficiency and effectiveness) measures have been examined and analyzed. The research ranks and analyzes the Corporation's position through descriptive statistic using financial statements and the firm performance reports according to Analytic Hierarchy Process (AHP) with respect to each of the performance and productivity criteria during governmental, semi-private and private ownership regimes.

**KEYWORDS:** Privatization; governmental ownership; Semi-private ownership; Private ownership; Performance; Productivity; Analytic Hierarchy Process(AHP).

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### INTRODUCTION

Privatization is among various economic policies that during the recent decades have attracted more attention of policy makers in different countries. The fact is not limited to the former East Bloc (socialistic economies) but it includes a vast spectrum of capitalism countries. Privatization issues especially ownership transfer from public to private sector is one of the most important topics in Iran. The basic idea behind the privatization is that competitive arena and market system have forced firms and private units to show more efficient performance. Based on the idea, various theories and definitions have been proposed which include different privatization aspects and objectives. Beesley and Littlechild [1] argue that if 50% of the firm's stock is transferred to private sector, privatization may be a way to improve economic activities performance through market forces enforcement. Veljanovski [17] defines privatization as doing economic activities through private sector or by transfer of asset ownership to the private sector. Schwartz [16] believes that privatization definition in countries with centralized economy is beyond the ownership transfer and regulatory modifications but it means a new system implementation based on market place which eventually results in changing of various economic aspects. Bos [5] maintains that privatization is an indicator of capitalism philosophy excellence and trust to the market efficiency opposed to public sector efficiency. The privatization is a common and diverse term referring the transfer of operational/financial control of government ownership to private sector or in another word the privatization is exclusion of any prevention and control from demand and supply establishment process. Although it has the most important impacts on decision making networks, ownership is one of the obsolete issues and specifically it is worth mentioning that its side effects will be revealed on innovation and evolution or invention and creation in a long term period and also its performance positive/negative evaluation is affected by value system and cultural believes. Boubakri et al [3] believe that the aim of global privatization approach is minimizing government roles and maximizing private sector participation in various economic activities; privatization tries changing the firm's ownership, improving its performance, increasing its profitability and reinforcing its productivity. According to above mentioned facts, the present research's main objective is the examination of privatization impacts on performance and productivity of one of the big privatized public companies in Iran. In order to study the privatization impacts on performance and productivity in the studied company, the following questions are proposed and examined accordingly: (1) Are privatization process results in Iranian Aluminum Company (IRALCO) concord with the pre-determined objectives? (2) Has privatization been able to improve Iranian Aluminum Company (IRALCO) performance and

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productivity levels? The questions are examined using input from 52 performance (financial and economic) and productivity (efficiency and effectiveness) measures.

### **Theoretical background and hypotheses**

Numerous academic researchers have been undertaken to extract the privatization impacts on the firm performance. A huge part of these studies have dealt with comparison of pre- and post-privatization performances. The researches results indicate that in general, privatization results in outstanding increase of profitability, and efficiency as well as output and share dividend. Boycko *et al* [6] have examined performance changes among 452 Russian privatized firms and found that changes in ownership and management style would result in value maximization. One of the largest researches in the field of privatization was implemented by Boubakri *et al* [2]. In the research, 79 firms from 23 developing countries were selected and their financial and operational performance during three years before and three years after privatization from 1980 to 1992 were examined. The sample firms have been selected among countries with low economic return (Bangladesh, India and Pakistan) as well as ones with medium economic return (Argentina, Brazil, Greece, Korea, Malaysia, Mexico, Portugal, Singapore, Taiwan, Trinidad, Tobago and Venezuela). The sample includes various industries with different sizes. The mentioned study aimed at finding an answer for the question that whether privatization policies in developing countries have resulted in desirable consequences such as performance improvement specifically profitability. For the reason, the study has used profitability and operational indexes to delineate performance changes. The research findings indicate that privatization is associated with firm profitability increase. Another research about privatization which undoubtedly has been carried out by the most skillful experts as one of the most complete and all-encompassing researches is the World Bank's expert group research authored by Maginson *et al* [12]. The research examined its sample firms' financial performance and efficiency three years before and three years after privatization. The financial and operational performances of 62 firms in 18 countries (six developing and twelve industrial countries) and in 32 privatized industries were evaluated. In the research, the financial instrument used in performance analysis was wilkinson signaled ranking test. Its findings indicated an exceptional increase of profitability, efficiency and investment as well as decrease of financial pressures. In another study, Earle [8] evaluated the impact of ownership structure on production performance of Russian industrial firms and observed a positive impact of private ownership compared to public ownership on workers production rate. He found that most of such positive changes are due to managerial positive impacts and employee ownership. Bortoliti *et al.* [4] tried to examine the financial and operational performance of 31 firms active in the communication and telecommunication industry in 25 developed and developing countries during seven year periods in addition to a period from 1981 to 1988. The study criteria included profitability, operational efficiency and investment indexes in three years before and three years after privatization. Similar to the previous researches, the research findings indicate the improvement of all mentioned indexes in privatized companies. In the research, one of the important findings is that profitability improvement is more due to considerable cost reduction than price increase and also the efficiency enhancement is resulted from employee motivation and productivity. In a study on 118 firms from 29 countries (developing and developed countries), Ramamurti [15] examined the firms' financial and operational (efficiency) performance. The study examined profitability indexes (ratio of operational return to sell, selling return, output, asset returns and investment return), efficiency indexes (real selling rate for individual selling staff) and capital indexes (investment expenditure to sell and capital to total asset) in three years before and three years after privatization. The research findings reveal a meaningful increase in all indexes among the considered countries. Kocenda and Svejnar [11] studied the impact of ownership on the firms' performance according to Check Republic privatization plan. They examined the impacts of various ownership structures and ownership centralization degree in the post-privatization period. Their evaluation includes some variables as operational gain, selling return, labor cost and debt to shareholders' equity. Their research results indicate that in the post-privatization period, the private ownership achieves higher performance in compared to public ownership. In other words, the private ownership shows a better or equal performance in compared to governmental centralized ownership. In another research, Omran [14] studied the privatization and ownership structure impact on privatized firms' performance to determine which type of ownership structure has positive impact on performance in post- privatization period. He analyzed and examined the financial information in two years before and two years after privatization. The studied variables included profitability ratios (profit before tax and interest deduction, ROS, ROA and ROE), operational efficiency, cost, capital, output, employment ratio, leverage ratio, dividend and risk. The

study results indicated an outstanding increase of profitability, operational efficiency and share dividend as well as great reduction of employment rate, liability and risk. It has also been observed that the firms which were transferred to employees and other special bodies had better performance than firms transferred through stock exchange market. In other research, Narayana [13] has focused on the impact of privatization on financial indexes, price and service quality, exchange equality and service provideability and examined the positive impact of privatization on financial indexes (capital market), price and service provideability. In their study on 63 developing countries in a period from 1997 to 1988, Cook et al. [7] have also emphasized on privatization axial role in the countries' economic growth. They believe that there is a significant and positive correlation between the privatization and countries' economic growth. However, privatization is a long term process and requires revision of regulations and adjustment of competitive rules. Privatization will result in desirable economic consequences if it is practical to implement structural corrections in such countries. Guohua et al [9] have examined the impact of privatization on the privatized firms' profitability in China. In addition to evaluation of profitability changes among the privatized firms, they also focused on public firms profitability changes. For the purpose, they evaluated the profitability of 149 privatized firms during 1999 to 2003 emphasizing on return of selling (ROS) variable as a measure of profitability. The research findings indicate the improvement of privatized firms' profitability in compared to their counterparts in public sector. Following the examination of financial and operational performance changes among 127 Chinese privatized companies, Huang and Wang [10] explain that complete and/or full privatization is effective on improvement of firm's financial and operational performance; and complete control transfer from public sector to private sector in the privatized firms is an effective factor on the studied firms' performance improvement.

Following hypotheses are examined to find some explanation for the research questions.

### **Research hypotheses**

*H1: Privatization causes financial performance indexes improvement in IRALCO.*

*H2: Privatization causes economical performance indexes improvement in IRALCO.*

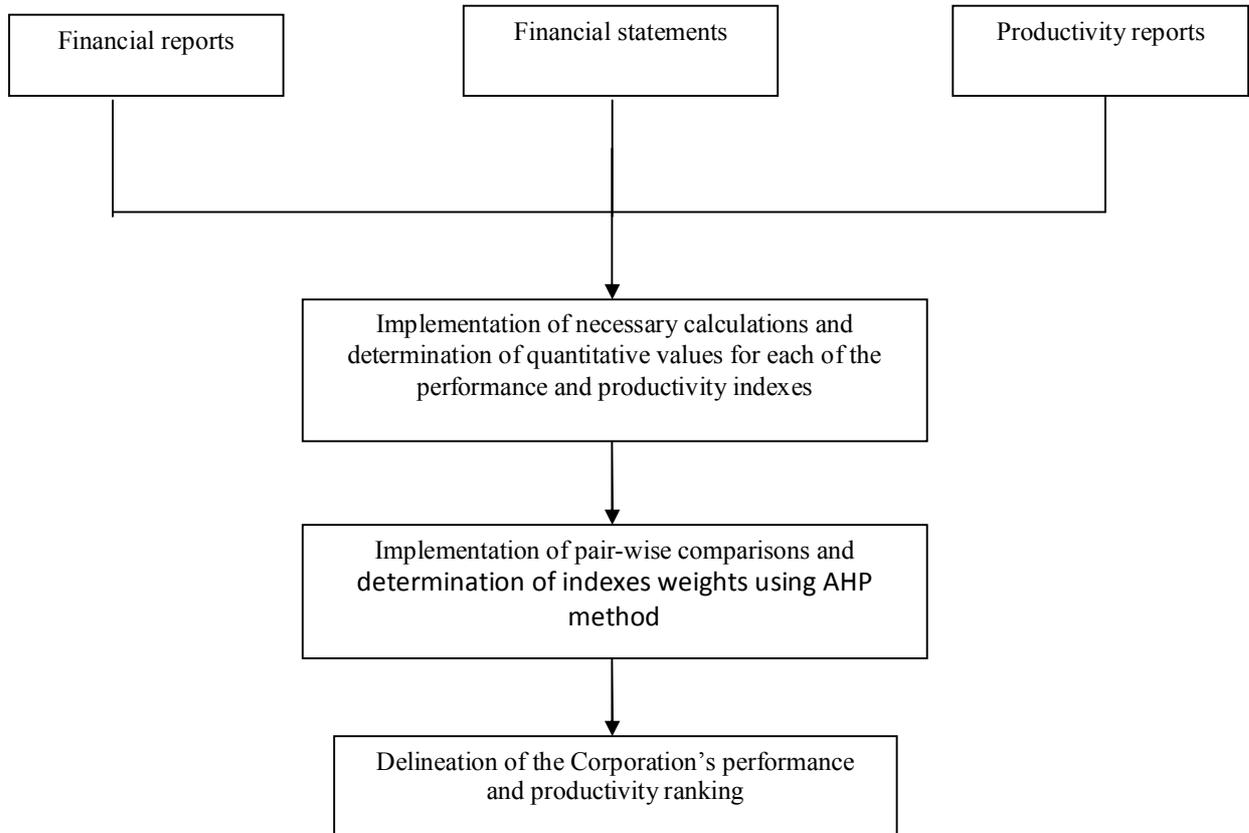
*H3: Privatization causes efficiency indexes improvement in IRALCO.*

*H4: Privatization causes effectiveness indexes improvement in IRALCO.*

### **METHODOLOGY**

With regard to the under study topic in which the collected data is related to the past events and also depended variables are measured previously, during and after the independent variable input, the most appropriate method in such a research is a post-event research methodology known as casual-comparative method. According to purpose, the present research is classified as an applied research. Based on methodology and nature, it also is presented as a descriptive research. Experimental data along with library method have been employed in the research for data collection and theory formulation. Data collection instruments are audited financial statements and notes to the financial statements, financial reports as well as performance and productivity reports of Iranian Aluminum Company (IRALCO). After data collection, following measures have been carried out for hypotheses testing and analysis. At first, the firm's averages of performance and productivity indexes in two year periods during governmental ownership, semi-private ownership and private ownership have been calculated and integrated. Then the final weights of performance and productivity indexes have been determined through pair-wise comparison using experts' opinions according to AHP method. Finally, The Corporation ranking in the considered periods has been identified and the obtained results have been analyzed.

**Research methodology algorithm**



Information and numbers of performance and productivity index measure with different units. It is necessary to integrate by mean of analysis data. Figures normalization related to indexes accomplished Euclidean's norm method that it is as follows:

$$1) a_i = \frac{S_i}{\sum_{i=1}^n S_i} \quad i=1, 2, \dots, n$$

That  $S_i$  in it is an index in every period of ownership and  $a_i$  is congenial quantities of every index, after above process it is necessary to calculate the ranking of company for every period (for every index and every ownership period).

Ownership periods	$A_1$	$A_2$	.....	$A_n$	rank
governmental	$a_{11}$	$a_{12}$	.....	$a_{1n}$	$W_1$
Semi private	$a_{21}$	$a_{22}$	.....	$a_{2n}$	$W_2$
private	$a_{31}$	$a_{32}$	.....	$a_{3n}$	$W_3$

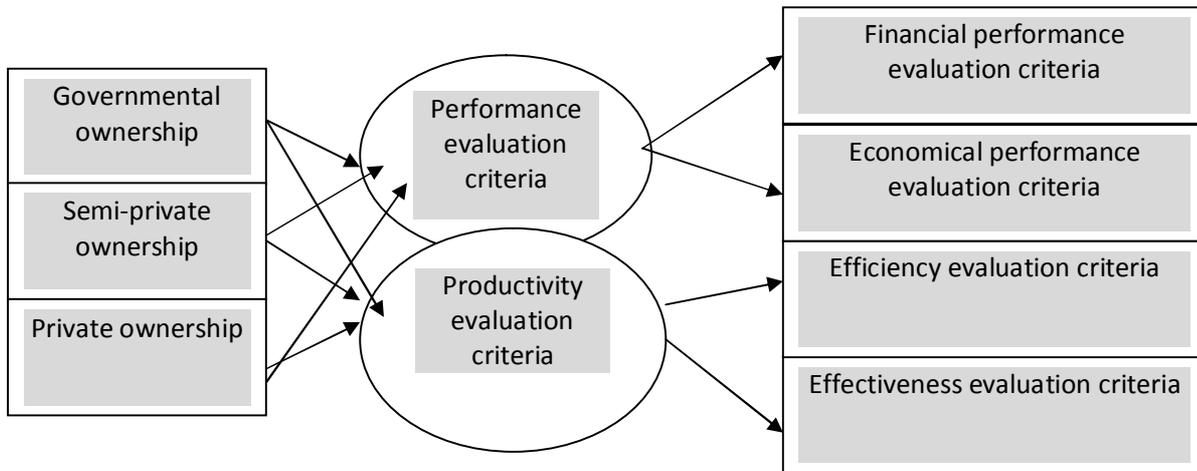
In this matrix  $A_1$  to  $A_n$  be achieved weights of AHP method  $a_{11}$  to  $a_{3n}$  are congenial quantity for every index in different period of ownership,  $W_1, W_2, W_3$  are ranking of company in under study indexes and during different period of governmental ownership, semi private and private that come from multiplicity of every weight in congenial quantity and come in the following order:

$$W_1 = (A_1 * a_{11}) + (A_2 * a_{12}) + \dots + (A_n * a_{1n}) \tag{2}$$

$$W_2 = (A_1 * a_{21}) + (A_2 * a_{22}) + \dots + (A_n * a_{2n}) \tag{3}$$

$$W_3 = (A_1 * a_{31}) + (A_2 * a_{32}) + \dots + (A_n * a_{3n}) \tag{4}$$

**Research conceptual model**



Based on the research conceptual model, the only independent variable that its impact on dependent variable is measured is the Corporation ownership during 2005 to 2010 period in which the complete privatization process has been occurred in the studied Corporation. The public ownership includes a period from 2005 to 2006 during which the firm’s management and ownership was under the governmental control. The semi-private ownership span was considered from 2007 to 2008 during which the firm’s management was under the control of public sector but some percent of the Corporation shares were transferred to the private sector. The private ownership period began from 2009 to 2010 during which the managerial tasks and more than 70 percent of the Corporation shares were transferred to the private sector. The research dependant variables are analyzed during the mentioned periods and include performance measurement indexes (financial and economic) .

**Variable measurement**

Calculation and measurement of the research dependant variables are carried out according to below table formula.

**Financial performance evaluation criteria:**

**Liquidity ratios:**

$$\text{Current ratio} = \frac{\text{current assets}}{\text{current debts}} \tag{5}$$

$$\frac{\text{current assets} - (\text{inventory} + \text{prepayment})}{\text{current debts}} \text{Quick ratio} = \tag{6}$$

$$\text{Cash ratio} = \frac{\text{Cash}}{\text{current debts}} \tag{7}$$

**Activity ratios:**

$$\text{Fixed assets turnover} = \frac{\text{income}}{\text{net of fixed assets}} \tag{8}$$

$$\text{Total assets turnover} = \frac{\text{income}}{\text{total assets}} \tag{9}$$

$$\text{Inventory turnover} = \frac{\text{cost}}{\text{inventory}} \tag{10}$$

$$\text{Inventory to working capital} = \frac{\text{inventory}}{\text{working capital}} \tag{11}$$

$$\text{Current capital turnover} = \frac{\text{income net}}{\text{working capital}} \tag{12}$$

**Leverage ratios:**

$$\text{Debt ratio} = \frac{\text{total debts}}{\text{total assets}} \quad (13)$$

$$\text{Long term debt to equity} = \frac{\text{long term debt}}{\text{equity}} \quad (14)$$

$$\text{Current debt to equity} = \frac{\text{current debt}}{\text{equity}} \quad (15)$$

$$\text{Total debt to equity} = \frac{\text{total debt}}{\text{equity}} \quad (16)$$

$$\text{Current debt to inventory} = \frac{\text{current debt}}{\text{inventory}} \quad (17)$$

$$\text{Long term debt to working capital} = \frac{\text{long term debt}}{\text{working capital}} \quad (18)$$

$$\text{Interest payment ability ratio} = \frac{\text{current assetse}}{\text{current liabilitise}} \quad (19)$$

$$\text{Debt coverage ratio} = \frac{\text{fixed assets}}{\text{long term debts}} \quad (20)$$

$$\text{Proprietary ratio} = \frac{\text{net worth}}{\text{total assets}} \quad (21)$$

**Profitability ratios:**

$$\text{Gross profit ratio} = \frac{\text{gross profit}}{\text{net sale}} \quad (22)$$

$$\text{Net profit ratio} = \frac{\text{net profit}}{\text{net sale}} \quad (23)$$

$$\text{EPS} = \frac{\text{net profit}}{\text{number of shares}} \quad (24)$$

$$\text{DPS} = \frac{\text{dividend}}{\text{number of shares}} \quad (25)$$

$$\text{DPS \%} = \frac{\text{EPS}}{\text{DPS}} \quad (26)$$

$$\text{Growth of EPS} = \frac{\text{EPS2} - \text{EPS1}}{\text{EPS1}} \quad (27)$$

$$\text{P/E} = \frac{\text{price per share}}{\text{earning per share}} \quad (28)$$

$$\text{Return on shares} = \frac{\text{current assetse}}{\text{current liabilitise}} \quad (29)$$

$$\text{ROS} = \frac{\text{NOPAT}}{\text{net income}} \quad (30)$$

$$\text{Q - TOBIN} = \frac{\text{market value of shares}}{\text{assets} - \text{debts}} \quad (31)$$

$$\text{Return on working capital} = \frac{\text{NOPAT}}{\text{working capital}} \quad (32)$$

$$\text{ROI} = \frac{\text{NOPAT}}{\text{IC}} \quad (33)$$

$$\text{ROE} = \frac{\text{net profit}}{\text{equity}} \quad (34)$$

**Economical performance evaluation criteria:**

$$\text{EVA} = (r - c) * \text{capital} \quad (35)$$

$$\text{REVA} = (r - c) * M \text{ capital} \quad (36)$$

$$\text{MVA} = \text{market value of shares} - \text{IC} \quad (37)$$

**Efficiency evaluation criteria:**

$$\text{Ratio consumption of materials in reduction cells} = \frac{\text{consumption of materials (ton)}}{\text{production (ton)}} \quad (38)$$

$$\text{Ratio consumption of materials in carbon plant} = \frac{\text{consumption of materials(ton)}}{\text{production(ton)}} \quad (39)$$

$$\text{Capita production in reduction cells} = \frac{\text{production (ton)}}{\text{number of employees}} \quad (40)$$

$$\text{Capita production in carbon plant} = \frac{\text{production (ton)}}{\text{number of employees}} \quad (41)$$

$$\text{Capita production in cast house} = \frac{\text{production (ton)}}{\text{number of employees}} \quad (42)$$

$$\text{Electricity consumption} = \frac{\text{production of reduction cells}}{\text{electricity consumption}} \quad (43)$$

$$\text{Direct material share of production cost} = \frac{\text{direct material expenses}}{\text{production cost}} \quad (44)$$

$$\text{Direct wage share of production cost} = \frac{\text{direct wage expenses}}{\text{production cost}} \quad (45)$$

$$\text{Overhead share of production cost} = \frac{\text{overhead expenses}}{\text{production cost}} \quad (46)$$

**Effectiveness evaluation criteria:**

$$\text{Capita sale} = \frac{\text{sales (ton)}}{\text{number of employees}} \quad (47)$$

$$\text{Capita gross profit} = \frac{\text{gross profit}}{\text{number of employees}} \quad (48)$$

$$\text{Capita net profit} = \frac{\text{net profit}}{\text{number of employees}} \quad (49)$$

$$\text{Cost to income} = \frac{\text{cost}}{\text{income}} \quad (50)$$

$$\text{General expense to income} = \frac{\text{general exp ense}}{\text{income}} \quad (51)$$

$$\text{Finance l expense to income} = \frac{\text{financial exp ense}}{\text{income}} \quad (52)$$

$$\text{Rate of financing expense} = \frac{\text{financial exp enses}}{\text{int erest bearing liabilities}} \quad (53)$$

$$\text{Share of internal market} = \frac{\text{int ernal sales (ton)}}{\text{total consumption of AL in country (ton)}} \quad (54)$$

$$\text{Internal sales \%} = \frac{\text{int ernal sales (ton)}}{\text{total sales (ton)}} \quad (55)$$

$$\text{Growth sales \%} = \frac{\text{current sales - sales of last year}}{\text{sales of last year}} \quad (56)$$

**RESULTS**

As it has been mentioned, the research hypotheses testing needs the calculation of the considered dependant variables, integration of related values, pair-wise comparisons, determination of individual variables' weights based on AHP method and ultimately ranking of the studied Corporation during various ownership regimes. The results obtained for each hypothesis are explained in the following section.

**Analysis of the first hypothesis (H1)**

The first hypothesis deals with privatization impacts on the Corporation financial performance. The financial performance evaluation is based on liquidity ratios, activity ratios, leverage ratios and profitability ratios. The results of integration and weighting of each of the above mentioned ratios and consequently, the Corporation

ranking with respect to the ratios and finally the total rank of the Corporation financial performance during various ownership periods are calculated according to the above mentioned formula and are reported in Table 1. As it can be seen from the table, the liquidity ratios rankings during governmental ownership, semi-private ownership and private ownership are 0.440, 0.336 and 0.229, respectively. The Corporation rankings for activity ratios during the governmental, semi-private and private ownerships are respectively obtained as 0.287, 0.078 and 0.311. The Corporation leverage ratios rankings for governmental, semi-private and private ownerships are 0.730, 0.375 and 0.115, respectively. And ultimately, the profitability ratios rankings during the above various ownership regimes are 0.478, 0.205 and 0.043, respectively. The total ranking of the financial performance obtained for Iranian Aluminum Company as the sum of its ranking in each of the above mentioned ratios during the governmental, semi-private and private ownership regimes are 0.507, 0.235 and 0.105, respectively. Figure 1 shows the impact of privatization on the Corporation financial performance indexes during various ownership regimes.

#### **Analysis of the second hypothesis (H2)**

The second hypothesis is related to privatization impacts on the Corporation economic performance. The economic performance evaluation is carried on using EVA, REVA and MVA. The integration and weighting results for each of the mentioned variables and the Corporation economic performance rankings during various ownership periods are calculated according to the above mentioned formula and are reported in Table 2. As it can be observed from the table, the Corporation economic performance rankings during governmental ownership, semi-private ownership and private ownership are 0.003, -0.440 and -0.379, respectively. Figure 2 shows the impact of privatization on the Corporation economic performance measures during various ownership regimes.

#### **Analysis of the third hypothesis (H3)**

The third hypothesis focuses on privatization impacts on the Corporation efficiency. The results of integration and weighting for each of the efficiency measures and the Corporation efficiency rankings during various ownership regimes are calculated using the previous mentioned formula and are reported in Table 3. Based on the table, the Corporation efficiency rankings during governmental, semi-private and private ownership regimes are 0.587, 0.589 and 0.587, respectively. Figure 3 shows the impact of privatization on the Corporation efficiency measures during various ownership regimes.

#### **Analysis of the fourth hypothesis (H4)**

The fourth hypothesis focuses on privatization impacts on the Corporation effectiveness. The results of integration and weighting for each of the effectiveness measures and the Corporation effectiveness ranking during various ownership regimes are calculated using the previous mentioned formula and are reported in Table 4. As it can be seen from the table, the Corporation effectiveness rankings during governmental, semi-private and private ownership regimes are 0.518, 0.424 and 0.422, respectively. Figure 4 shows the impact of privatization on the Corporation effectiveness measures during various ownership regimes.

#### **Conclusion**

Based on the results reported in Figure 1, all financial ratios rankings (liquidity ratios, leverage ratios and profitability ratios) except activity ratios have been decreased during the ownership and management transfer process from governmental sector to private sector, so there is no support for H1 and it is rejected. In another word, until now privatization has not been resulted in improvement of Iran Aluminum Corporation's financial performance. As it can be observed from Figure 2, the Corporation economic performance has not been decreased during the privatization process. In other words, privatization has not enhanced Iran Aluminum Corporation's economic performance and so H2 is not supported. Figure 3 reveals that there are no significant changes in the Corporation efficiency ranking during the privatization process. The efficiency ranking shows a small improvement during the semi-private ownership regime compared to governmental ownership although the ranking falls again in the private ownership period. The fact indicates that privatization has no impact on efficiency improvement in Iranian Aluminum Company and so H3 is rejected. Based on the Figure 4, the Corporation effectiveness ranking has declined during the ownership transfer process from governmental to private sector. In other words, privatization has not resulted in enhancement of the Corporation effectiveness and thus H4 is rejected too.

With regard to hypotheses analysis, the research questions are answered partly. As it was mentioned, the research questions are as follows: (1) Are privatization process results in Iranian Aluminum Company (IRALCO) concord with the pre-determined objectives? (2) Has privatization been able to

improve Iranian Aluminum Company (IRALCO) performance and productivity levels? Regarding the hypotheses analysis, it is obvious that the implementation of privatization process in IRALCO is not in agreement with the predetermined objectives. It means that privatization has not been able to improve each of the performance (financial and economic) and productivity (efficiency and effectiveness) indexes in IRALCO due to improper situation of capital structure and shareholders' equity and also lack of deserved attention to identification, measurement and control of performance indexes. For managers and responsible bodies in IRALCO it is recommended to solve present challenges, to plan appropriate capital structure, to correct and adjust shareholders' equity and to provide necessary training for important fields such as productivity, to identify the effective indexes on performance and productivity as well as measurement and control of the mentioned indexes along with implementation of Target based costing system. It is worth mentioning that the present research was limited to a short period of time due to novelty of privatization regulations in Iran as a whole and its implementation in the studied Corporation. So it was not possible for the present researcher to consider a longer term perspective and also to identify and measure the global economic crisis impacts on each of the Corporation's performance and productivity indexes.

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## TABLES

Table 1: Evaluation criteria of financial performance, calculated weighs by AHP method, integration values and final rank in different ownership periods

Evaluation criteria of financial performance		Calculated weigh by AHP method	Integrate values on different ownership periods			final ranking of different period of ownership		
			Governmental	Semi private	private	Governmental	Semi private	private
liquidity ratios	Current ratio	0.571	0.40	0.34	0.26	0.228	0.194	0.148
	Quick ratio	0.286	0.48	0.30	0.21	0.137	0.086	0.060
	Cash ratio	0.143	0.52	0.35	0.14	0.074	0.050	0.020
	liquidity ratios rank	0.072	-	-	-	0.440	0.330	0.229
Activity ratios	Fixed assets turnover	0.250	0.32	0.28	0.40	0.080	0.070	0.100
	Total assets turnover	0.438	0.34	0.29	0.37	0.149	0.127	0.162
	Inventory turnover	0.149	0.39	0.28	0.33	0.058	0.042	0.049
	Inventory to working capital	0.081	0.00102	-0.99000	-0.00414	0.00008	-0.080	-0.00031
	current capital turnover	0.081	0.00200	-0.99000	-0.00388	0.00016	-0.080	-0.00031
	activity ratios rank	0.123	-	-	-	0.287	0.078	0.311
Leverage ratios	Debt ratio	0.177	0.71	0.67	0.62	0.126	0.119	0.109
	Long term liability to shares holders equity	0.058	0.95	0.86	-0.09	0.055	0.050	-0.005
	Current liability to shares holders equity	0.058	0.98	0.89	-0.08	0.057	0.051	-0.005
	Total debt to shares holders equity	0.082	0.97	0.88	-0.09	0.079	0.072	-0.007
	Current liability to inventory	0.047	0.68	0.70	0.63	0.032	0.033	0.029
	Long term liability to working capital	0.047	0.99	-1.99	-1.11	0.047	-0.094	-0.047
	Interest payment ability ratio	0.177	0.64	0.23	0.13	0.113	0.040	0.023
	Debt- coverage ratio	0.177	0.64	0.23	0.14	0.113	0.040	0.024
	Proprietary ratio	0.177	0.61	0.36	-0.03	0.108	0.063	-0.006
	Leverage ratios rank	0.218	-	-	-	0.730	0.375	0.115
Profitability ratios	Gross profit ratio	0.033	0.54	0.31	0.15	0.018	0.010	0.005
	net profit ratio	0.062	0.65	-0.16	-0.19	0.040	-0.010	0.012
	EPS	0.062	0.60	-0.17	-0.23	0.037	-0.010	-0.014
	DPS	0.062	0.63	0.37	0	0.039	0.023	0
	DPS %	0.062	0.73	0.27	0	0.045	0.017	0
	Growth of EOS	0.111	0.68	-0.18	0.14	0.076	-0.020	0.015
	P/E	0.137	0.72	0.99	0.28	0.099	0.136	0.039
	Return on shares	0.174	0.19	0.36	-0.45	0.033	0.062	-0.079
	ROS	0.021	0.31	0.53	0.15	0.007	0.011	0.003
	Q - TOBIN	0.129	0.07	0.17	0.76	0.009	0.022	0.098
	Return on working capital	0.021	0.01	0.99	-0.00062	0.00014	0.021	-0.00001
	ROI	0.062	0.69	-0.05	0.27	0.043	-0.003	0.017
	ROE	0.062	0.52	0.02	-0.46	0.032	-0.001	-0.029
	Profitability ratios rank	0.587	-	-	-	0.478	0.205	0.043
Financial performance rank on different ownership periods						0.507	0.235	0.105

Table2: Evaluation criteria of economical performance, calculated weigh by AHP method, integration values and final rank in different ownership periods

Evaluation criteria of economical performance		Calculated weigh by AHP method	Integrate values on different ownership periods			final ranking of different period of ownership		
			Governmental	semiprivate	private	Governmental	Semi private	private
criteria of economical performance	EVA	0.103	0.32	-0.51	-0.18	0.032	-0.052	-0.018
	REVA	0.216	0.28	-0.56	-0.16	0.060	-0.121	-0.035
	MVA	0.682	-0.13	-0.39	-0.48	-0.089	-0.266	-0.326
Economical performance rank						0.003	-0.440	-0.379

Table 3: Evaluation criteria of efficiency, calculated weigh by AHP method, integration values and final rank in different ownership periods

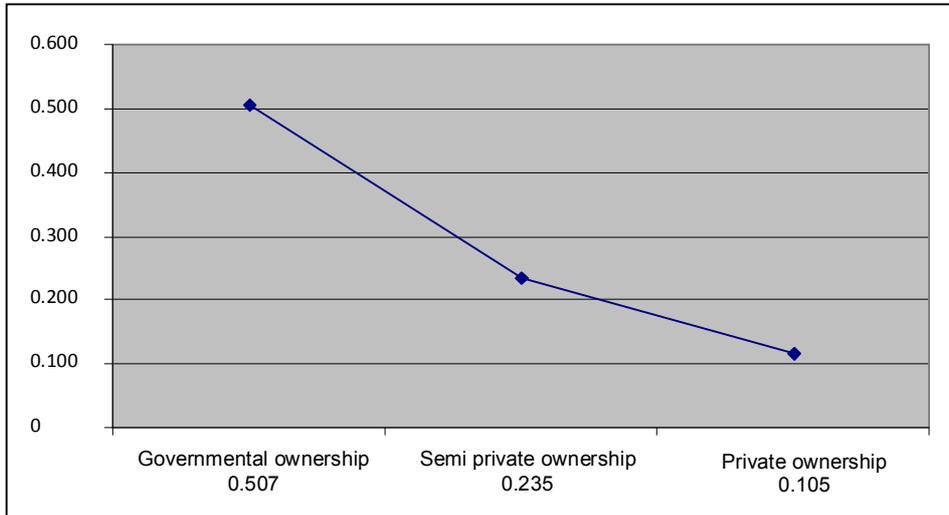
Evaluation criteria of efficiency		Calculate d weigh by AHP method	Integrate values on different ownership periods			final ranking of different period of ownership		
			Governmental	Semi private	private	Governmental	Semi private	private
criteria of efficiency	Ratio consumption of materials in reduction cells	0.092	0.68	0.67	0.65	0.062	0.062	0.060
	Ratio consumption of materials in carbon plant	0.092	0.66	0.68	0.66	0.061	0.063	0.061
	Capita production in reduction cells	0.092	0.27	0.30	0.43	0.025	0.028	0.040
	Capita production in carbon plant	0.092	0.39	0.33	0.27	0.036	0.031	0.025
	Capita production in cast house	0.051	0.25	0.33	0.42	0.013	0.017	0.021
	Electricity consumption	0.178	0.68	0.68	0.64	0.121	0.121	0.114
	Direct material share of production cost	0.178	0.66	0.66	0.69	0.117	0.117	0.122
	Direct wage share of production cost	0.046	0.68	0.71	0.61	0.031	0.033	0.028
	Overhead share of production cost	0.178	0.68	0.67	0.65	0.121	0.119	0.116
efficiency rank						0.587	0.589	0.587

Table 4: Evaluation criteria of effectiveness, calculated weigh by AHP method, integration values and final rank in different ownership periods

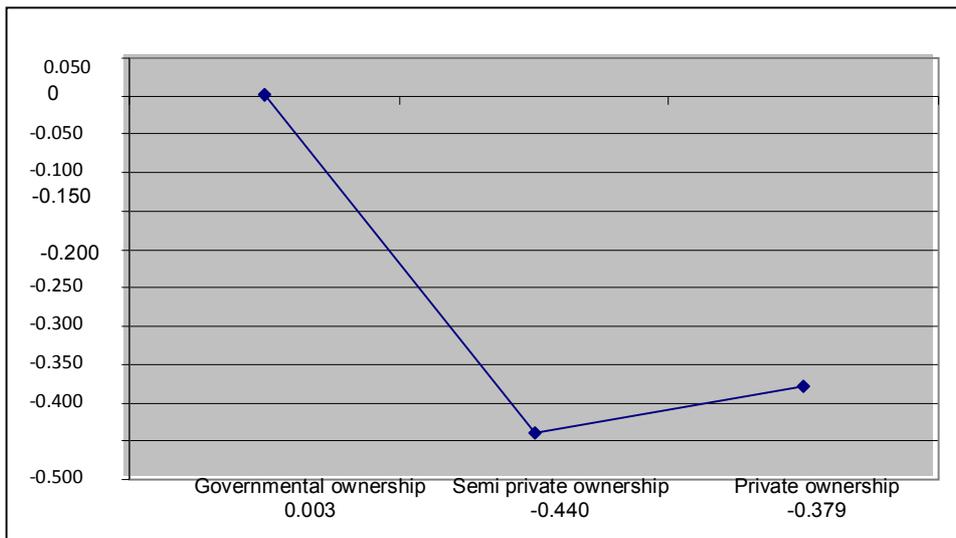
Evaluation criteria of effectiveness		Calculated weigh by AHP method	Integrate values on different ownership periods			final ranking of different period of ownership		
			Governmental	Semi private	private	Governmental	Semi private	private
criteria of effectiveness	Capita sale	0.178	0.27	0.28	0.45	0.048	0.050	0.079
	Capita gross profit	0.109	0.46	0.29	0.24	0.051	0.032	0.026
	Capita net profit	0.162	0.61	-0.17	-0.22	0.098	-0.028	-0.036
	Cost to income	0.109	0.68	0.67	0.65	0.074	0.073	0.071
	General expense to income	0.098	0.61	0.66	0.73	0.060	0.065	0.071
	Financial expense to income	0.098	0.76	0.73	0.51	0.074	0.071	0.050
	Rate of financing expense	0.098	0.73	0.73	0.52	0.072	0.071	0.051
	Share of internal market	0.098	0.39	0.27	0.34	0.038	0.027	0.033
	Internal sales %	0.098	0.37	0.31	0.32	0.036	0.031	0.031
Growth sales %	0.109	-0.30	0.29	0.41	-0.033	0.032	0.045	
effectiveness rank						0.518	0.424	0.422

Figures (diagrams)

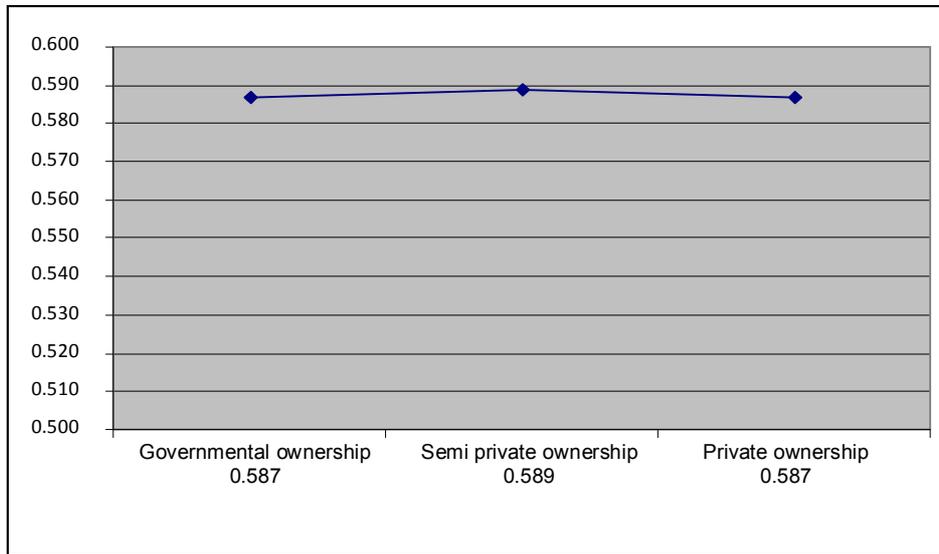
**Figure1: Financial performance rank in different period of ownership**



**Figure 2: Economical performance rank in different period of ownership**



**Figure 3: Efficiency rank in different period of ownership**



**Figure 4: Effectiveness rank in different period of ownership**

