INVESTIGATING RESEARCH AND DEVELOPMENT COSTS ON THE PROFITABILITY OF INDUSTRIES

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ABSTRACT

The main objective of this paper is to investigate the effects of market share, R&D and advertising expenditures on Iranian industries profitability's over the period of 2016. For this purpose, the main model has been estimated by using of rank regression approach. The main findings of this paper reveal that all variables have positive and significant effects on the profitability of Iranian industries. Moreover the results indicate that the effect of market share on profitability of industries is more than of other explanatory variables. Hence the main implication policy of this study is that the policy makers should be encourages the investment plans for improving market share and other applicable researches in the industry sector for the enhance of industry profitability.

Key Words: *Market Share, R&D, Advertising expenditures, Rank Regression Approach.*

INTRODUCTION

Industrial economics and organization are one of the trends in economic science that investigates the causal relationships between the three elements of the structure, behavior, and performance of the markets. Profitability as a functional variable of the market and its relationship with other elements of the market has always been one of the major fields of studying industrial economics and organization. Among the factors affecting profitability, advertising and research and development costs as market behavior variables and market share as the market structure variables are among the most important factors affecting profitability. There is no consensus among economists on how to influence and the direction of causality. As, for example, some economists speak about profitable effects of advertising for advertiser firm, while other economists consider advertising as a waste of resources, which leads to the loss of the finances of the advertiser firm and the reduction of their profits. On the other hand, while many economists consider causation of elements of the market from structure to behavior and performance (structuralism school), in contrast, the Chicago School U.C.L.A considers market structure as a function of performance and behavior. There are many empirical studies in support of these views. Economists also disagree on how to influence R & D costs on the profitability of industries.

Therefore, given the ambiguity of the subject from the theoretical and empirical point of view, it is necessary that this issue be investigated in the Iranian economy. In this regard, the main purpose of this paper is to investigate the effect of advertising costs and research and development costs as market behavior variables and market share as a structural variable of

the market on the profitability of industries, as a functional variable of market in industries with four-digit code (ISIC) (International Standard of Industrial Classification) in Iran in 2016. The main hypothesis of this research is that advertising costs, market share, and research and development costs have a direct effect on the profitability of industries. For this purpose, in this study, using the statistics and information about the industrial workshops of ten employees and above, this issue is explained. The econometric technique used in this study is ranking regression technique and the econometric model has been estimated and calculated using Excel 2016 and Eviews software.

The paper is organized as follows:

In the second part of the paper, the theoretical framework of factors affecting profitability is investigated and in the third part, empirical studies in the form of domestic and foreign studies are reviewed. In the fourth part, the model and method of estimation are introduced, and in the fifth part, the results of model estimation and analysis of the results are presented. The sixth and final part of the paper is devoted to the conclusion and presentation of research policy recommendations.

Theoretical Framework of Factors Affecting Profitability

In explaining the relationship between advertising and sales, Schmalensee raises demand function as follows:

Suppose that firm can buy any unit of advertising at a price t and enter the function of the firm's demand generally.

$$q = q\,(a, p) \qquad \frac{\partial q}{\partial p} <;\; \frac{\partial q}{\partial a} >. \qquad (1)$$

As q and p are respectively price and value, and a is cost of advertising, then the profit function of the firm π, is written as follows

$$\Pi = pq\,(a, p) - c[q(a, p)] - at \qquad (2)$$

By the differentiation of this function relative to a zero, the conditions for optimizing the rate of purchase of advertising messages are obtained:

$$\frac{\partial \pi}{\partial a} = \left(p - \frac{\partial c}{\partial q}\right)\frac{\partial q}{\partial a} - t = 0 \qquad (3)$$

So:

$$\frac{a_1}{pq} = \left[\frac{p - \left(\frac{\partial c}{\partial q}\right)}{p}\right]\frac{a}{q}\frac{\partial q}{\partial a} \qquad (4)$$

In the above equation $\frac{P - (\partial C/\partial q)}{p}$, 1 the margin is price -cost. If the firm performs pricing in a way to maximize its profit, the margin of price-cost equals $\frac{1}{E}$, 2 and E is the price elasticity of the demand. On the other hand, in Equation (4), the term $\frac{\partial q}{\partial a}\frac{a}{q}$ is the advertising elasticity, which we represent with a.

Therefore, equation (4) can be written with the following considerations:

$$\frac{a_t}{pq} = \frac{\partial}{E} \qquad (5)$$

I.e., the proportion of advertising to sales is determined by the ratio of advertising elasticity and the price elasticity of demand.

The above equation shows that there is a direct relationship between advertising elasticity and the intensity of advertising if the value of sales (PQ) and firm price elasticity are fixed. I.e., the more advertising intensity increases, the price elasticity of advertisements increases and vice versa. Also, by the assumption of the advertising elasticity and the number of sales, there is an inverse relationship between the price elasticity of demand and the intensity of advertising. This means that the more the advertising intensity increases, the price sensitivity of demand decreases and vice versa.

The study of the relationship between research and development costs and the profitability of firms has been the focus of many of the industrial economy debates over the past decade. In addition, the first study that examines the theoretical relationship between these two variables is the study of Dugout and Meyers (1998), which use Schumpeter's standard pattern to explain the relationship between these variables. On the other hand, Greenan (1999) by presenting the econometric model tests empirically profitability and research and development costs. In other studies, Rosenberg (1982), using innovative strategies, examines the effect of research and development costs on the profitability of the French manufacturing industries. Ballot et al. (2001) study in another study the effect of human capital and the research and development costs on the profitability of firms in France and Sweden. They concluded in their study that human capital and research and development costs in the French industries had a positive and significant effect on the profitability of firms, while this effect was not significant in the Swedish industries.

Lev & Sougiannis (1996), using information related to US manufacturing firms, examine the effect of research and development costs on the profitability of these firms over the years 1977-1990. They conclude in this study that research and development costs with a gap have a positive and significant effect on the profitability of the manufacturing industries.

Rogers (2002) investigated the relationship between profitability, research, and development costs, and intellectual property in the Australian manufacturing industries over the years 1995-1998. In this study, the market value of firms is considered as an alternative to profitability. The findings of the research indicate that the research and development costs have a positive and significant effect on the profitability of these industries.

Legros and Galia (2004) in their study, using the asymptotic least squares method, investigated the relationship between research and development costs, innovation, training quality and profitability in 2165 French manufacturing industries. The findings of this study show that the profitability of industries has a positive correlation with quality and research and development costs have a positive and significant effect on the profitability of firms.

Johansen and Loof (2008) in a study investigated the relationship between research and development costs, firms' profitability and labor productivity for 1767 Swedish manufacturing firms. In their study, the dynamic ordinary least square method is used to estimate the model.

The results of this study show that firms that continually carry out research and development costs are more profitable than other firms that perform this kind of cost randomly.

The effect of research and development costs on profitability is shown in Chart (1). Based on the chart (1), firms according to the profitability rate, the market concentration index in which they operate, the public finance that they have, the analysis of consumer needs and the risk of projects organize their research and development activities. Research and development costs increase the profitability of firms by innovation, training, and raising the level of quality. The point to consider in this chart is that, on the one hand, research and development costs increase profitability, and, on the other hand, increasing profitability also allows for more research and development costs for the firm. Additionally, market size, membership in strategic groups, segmental effects, the use of specialized labor and the intensity of capital use are factors that affect the profitability of the firm.

An Overview of Empirical Studies

In the field of investigating the relationship between profitability and advertising costs, several studies have been carried out abroad that the first and most important study in this field is the study of Comanor and Wilson (1967). They conclude in this study that advertising costs have had a positive and significant effect on the profitability of firms. Rosenberg (1982) using innovative strategies examine the effect of research and development costs on the profitability of the French manufacturing industries. Pitelis (1991) using panel data approach examines the effect of advertising costs on the profitability of the UK manufacturing industries. The results of this study show that investment in advertising has a positive and significant effect on the profitability of these industries and is considered one of the effective variables on the profitability of the industries.

Gisser (1991) examines the relationship between advertising costs, concentration, and profitability in the US manufacturing industries. In this study, he concludes that advertising costs have a significant and significant effect on the profitability of industries, and the extent of this effect is higher in industries producing homogeneous goods. In addition, the findings of this study indicate that advertising costs do not act as a barrier to entry in these industries.

Santos (1995) using the vector self-regression model studies the market structure, advertising, and profitability in the US manufacturing industries. In this study, he concludes that there is a weak relationship between the variables of market structure, advertising and firms' profitability.

McDonald and Ted (1999), in their study using the Dynamic Panel Data Approach, examine the determinants of profitability in Australian factories in 1984. In this study, they conclude that the interrupted profitability, as well as the concentration of firms, are considered as factors determining the profitability of these industries and have a positive and significant effect on the profit margin of firms.

Feeny (2000) examines the determinants of profitability in 180738 Australian firms during 1997-1994. The results of this study indicate that there is a u-form relationship between market share and corporate profitability, and concentration has also had a positive and significant effect on the profitability of industries, and in particular 4-digit codes.

Greuner et al. (2000) in a study investigates the effects of advertising costs on the automotive industry of US in 1994-1994. In this study, the effect of sales variables, market share, gasoline price and advertising costs on the profitability of General Motors, Ford and Chrysler industries

has been studied. The main findings of this study show that the mentioned industries cannot increase their profits through the advertising costs more than the normal level. Therefore, the results of this study are consistent with the view that advertising costs cannot create barriers to entry for other firms.

Ballot et al. (2001) states that there is a direct relationship between human capital, research, and development costs, and the profitability of firms in France and Sweden. Neokosmidi et al. (2005), using panel data approach, examines the effect of advertising cost variables, market share on the profitability of the Greek food industries. For this purpose, 36 firms have been selected that the influence the costs of advertising and market share on the profitability of selected industries in 2002 has been investigated. The main results of this study indicate that the market share has a positive and significant effect on the profitability of these firms and the effect of this variable is higher than the advertising intensity variable (the ratio of advertising costs to sales).

Goddard et al. (2006) in a study using Dynamic Panel Data Approach, examined the determinants of profitability in the factory and service industries during the years 1993-2001. In this study, they conclude that there is a positive and significant relationship between market share and profitability of industries, and this relationship is more in the factory industries than service industries. In addition, the findings of this study indicate that the level of liquidity of industries has a positive and significant effect on their profitability.

Kundu (2007) in his study examined the effect of advertising costs on the profitability and value of 172 Indian firms. In this study, the profit after deduction of firms as an alternative variable for profitability and the Tobin Q index is used to consider the value of firms. The main findings of this study indicate that advertising costs have a positive and significant effect on the profitability and value of the firms under study.

Johansen and Loof (2008) examined the relationship between research and development costs, firms' profitability, and labor productivity for the Swedish manufacturing industries, and conclude a direct relationship between value-added and research and development costs and productivity of labor.

Gupta (2008) examines the effect of advertising costs on the performance of industries in the three automotive, textile, and food industries in India during 1997 -2006. In this study, he concluded that the intensity of advertising on the sale of all three industries had a positive and significant effect, while the effect of advertising on the profitability of food and textile industries was negative and significant.

Lee (2009) in his study, using the dynamic panel data approach, examined the effect of firm size on the profitability of 7,000 firms during 1987-2006. The results of this study show that there is a positive and significant nonlinear relationship between firm size and corporate profitability.

In the field of domestic studies conducted, it can also be said that in limited studies and separately, the effect of structural and behavioral factors affecting profitability have been investigated, that the most important ones are referred in the below.

Molaiy (2004) evaluates the factors affecting the profitability and performance of small industries in Iran. In this study, he concludes that Iran's small industries do not have a comparative advantage over large industries in many economic indicators.

Dehghani et al. (2005) have examined the effect of advertising on the profitability of Iran's food industries. In this study, they have tested the hypothesis that "advertising has had a positive and significant effect on the profitability of Iran's food industries". In their study, data of 22 codes of Iran's food four-digit industry for 1999-2000 is used. Based on the results of model estimation, there is a positive and significant relationship between advertising intensity and profitability of Iranian food industries during the mentioned years. In addition, the findings of this study indicate that there is an optimum level of advertising intensity in which the profitability of Iran's food industries is maximized. In another study, Dehghani et al. (2007) examined the effectiveness of research and development costs on the profitability of production cooperatives in Khorasan Razavi province during the years 1995-2002. They conclude in this study that research and development costs have had a positive and significant effect on the profitability of these industries.

Introduction of Rank Regression Approach

One of the most important nonparametric regression methods is rank regression method. In this regression method, unlike the rank parametric regression methods, explanatory and dependent variables in the regression coefficients estimates are used. The main advantage of this method in comparison with the parametric methods, and in particular the least squares method, is that in this method mid-term statistics are used to measure the partial coefficients of the regression model. Therefore, the rank of explanatory and dependent variables is determined based on the mid-observation. For example, if we want to calculate the slope of the regression line based on the ordinary least squares method, we should use the weighted median of independent and dependent variables that we will have in this situation:

$$\hat{\beta}_{LS} = \sum w_{ij} b_{ij}$$

In the above equation $w_{ij} = \frac{(x_i - x_j)^2}{\Sigma (x_i - x_j)^2}$, and $1 \le i < j \le n$. In the rank regression method, the weighted median is used to estimate the slope of the regression line. The weighted median of a set of xi observations with wi weights is computed in this way that observations of the variable x is sorted in descending order to ascending order in the form of $x_1 \le x_2 \le \cdots \le x_n$. It is worth noting that the weights of each of the observations of the variable x must be non-negative and their sum equal to one. After sorting the observations of variable x in the next step, we need to determine an index such as k in a way that the following equations to be established:

$$w_1 + w_2 + ... + w_{k-1} < 0.5$$
$$w_1 + w_2 + ... + w_{k-1} + w_k > 0.5$$

In other words, xk is a weighted median and $w_1 + w_2 + \cdots + w_{\kappa-1} = 0.5$. In this situation, the $\frac{(x_{\kappa-1} + x_{\kappa})}{2}$ value will be weight median of the variable x. After estimating the slope of the regression line ($\hat{\beta}$), we can estimate intercept of regression ($\hat{a}$) as $y_i - \hat{\beta} x_i$. It should be noted that the estimate $\hat{\beta}$ and $\hat{\alpha}$ should be done in conditions that the estimated distortion sentences $\hat{e}_i = y_i - (\hat{a} + \hat{\beta} x_i)$ to be as small as possible. For this purpose, in the rank regression method,

based on the median rank of the disturbance sentences, which the smallest value is ranked to the highest value, estimate should be chosen so that the amount $\Sigma \left[rank\ (\hat{e}_i) - \frac{n+1}{2} \right] \hat{e}_i$ is minimized.

After estimating the partial coefficients of the regression and intercept, it is necessary to test the significance of the partial coefficients. In this method, like the ordinary least squares approach, the t test statistic is used to test the significance of the coefficients. The noteworthy point in calculating the t test statistic in this method is that instead of the standard deviation of the estimator in the denominator, the term SD (U) is used. The reason for using SD (U) instead of $(\hat{\beta})$ SD is that the regression coefficient estimated by the rank regression method cannot provide a reasonable estimate of the standard deviation $\hat{\beta}$. Therefore, it is necessary to do the significance of the partial coefficients based on U as defined $U = \Sigma \left[rank\ (y_i) - \frac{n+1}{2} \right] x_i$. Therefore, the t test statistic will be as:

$$|t| = \frac{|U|}{SD(U)}$$

To perform the t test, it is necessary to calculate the standard deviation of U, in which case we will have:

$$SD(U) = \sqrt{\frac{n(n+)\Sigma(x_i - \bar{x})^2}{12}}$$

After calculating the test statistic, it is necessary to compare the value of the test statistic with the critical value in order to investigate the significance of the partial coefficients of the regression. If the test statistic is larger than the critical value, the hypothesis of the significance of regression coefficient is accepted.

It should be noted that one of the important advantages of the rank regression method is its appropriateness for cross-section data and the use of the rank of observations related to explanatory and dependent variables. In addition, in this method, mid-observation is used to estimate the model parameters; this issue is the important advantage of this method than other parametric methods and in particular the least squares method.

INTRODUCTION OF THE RESEARCH MODEL AND MODEL ESTIMATION

In this study, for the purpose of explaining the factors affecting the rate of profit, 140 four-digit codes of Iran's industries, data of industrial workshops employees for 2010 have been used. The model used in this study is based on the theoretical foundations and empirical study of Greuner et al. (2000) as follows:

$$Pr = f(RMS, RADV, RRD) \qquad\qquad (6)$$

In which, Pr is the industry's profit rate calculated as the ratio of value added to sales[1]. MS is industrial market share, ADV is advertising costs and RD, research and development costs. Therefore, the model stipulated in this study is as follows

$$L\,Pr_i = \alpha_i + \beta_1 LMS_i + \beta_2 LADV_i + \beta_3 LRD_i + \varepsilon_i \qquad (7)$$

Rank regression approach has been used to estimate the model. It is worth noting that since most econometric software is not able to estimate the regression method, therefore, in this study, Excel 2016 software is used to estimate model by rank regression method. In the Macro software section, the programing required to estimate the partial coefficients of the regression and intercept is done, and step by step, the t-student's test and the coefficients of determination, the adjusted coefficient of determination, and other criteria of goodness of fit of the model is calculated. The results of model estimation (2) are reported by the rank regression method in the following table:

Table 1: The Results of Model Estimation Based on Regression Method (Dependent Variable, Logarithm of Profit Rate)

Variable	Coefficient	t-student static value
C	4.79	4.7
LADV	0.36	5.90
LRD	0.25	4.90
LMS	0.39	6.04

References: Research calculations

In the next step, using the computational formula of the coefficient to determination, the coefficient of determination and the adjusted coefficient of determination are estimated. The formula $R^2 = 1 - \frac{SWRR_M}{SWRR_{M0}}$ has been used to calculate the coefficient of determination. In this formula, SWRRM is the sum of the weight of the disordered sentences ranked by considering all the explanatory variables and the amount of SWRRM0 is the sum of the weight of the distorted sentences ranked without considering explanatory variables (Birkes and Dodge, 1993).

In the next step, to evaluate the error of prediction of the rank regression model and estimation of the amount of adjusted coefficient of determination and the coefficient of determination and the amount of test static of AIC, their computational formulas are used. The results are presented in the following table:

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[1] It is worth noting that one of the most commonly used methods in empirical studies is to use the value-added ratio index to calculate the profitability rate. In addition, other indicators such as profit-to-sales ratio, profit after deduction of taxes and sales taxes, etc. are also used. Value added is also calculated as the difference between the Rial value of output and industrial activity data.

Table 2: Results of Computing Goodness of Fit and Predictive Error using Rank Regression Approach

Name of test static	Computational formula	Result of calculating rank regression
Coefficient of determination	$R^2 = 1 - \dfrac{SWRR_M}{SWRR_{M0}}$	0.52
Adjusted coefficient of determination	$R^{\bar{2}} = 1 - (1 - R^2)\dfrac{n-1}{n-k}$	0.507
AIC test static	$AIC = -2l/T + 2K/T$	-0.154
Mean percentage error	$MPE' = \dfrac{\sum\limits_{t=1}^{T}(y_i - \hat{y}_i)/T}{\sum\limits_{i=1}^{T} y_i/T}$	0.0076
mean absolute percentage error	$MAPE' = \dfrac{\sum\limits_{i=1}^{T}\left|y_i - \hat{y}_i\right|}{\sum\limits_{i=1}^{T} y_i}$	4.59
mean absolute error	$MAE = \dfrac{1}{T}\sum\limits_{i=1}^{T}\left|y_i - \hat{y}_i\right|$	0.609
Root mean square error	$RMSE = \sqrt{\dfrac{1}{T}\sum\limits_{i=1}^{T}(y_i - \hat{y}_i)^2}$	0.812
Theil's inequality coefficient	$Theil = \dfrac{\sqrt{\dfrac{1}{T}\sum\limits_{i=1}^{T}(y_i - \hat{y}_i)^2}}{\sqrt{\dfrac{1}{T}\sum\limits_{i=1}^{T}y_i^2}}$	0.03

References: Research calculations

Based on the results of Table (2), the calculated coefficient of determination is equal to 0.52, which indicates that about 52 percent of the variation of the dependent variable (profit logarithm of industries) is due to changes in the variables included in the model, i.e. variables of research and development costs, market share and advertising costs, and the fitting power of the model is relatively high. The adjusted coefficient of determination $\bar{R}^2$ for rank regression is equal to 0.507, which expresses the goodness of model's relatively high fit.[2]

In the following, another criteria of goodness of fit model i.e. (Akaike Information Criterion) AIC test statistic, is estimated using the computational formula $AIC = -2l/T + 2K/T$. In this equation, T is the sample size (statistical observations), K is the number of estimated parameters, and l is the logarithm of the maximum likelihood function. The value of the AIC

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[2] It should be noted that in cross-sectional studies, the coefficient of determination and the adjusted coefficient of determination are low and 50% above is considered a high figure.

test statistic for the regression method is equal to -0.154, which means that the more this test statistic is smaller, it means that the effect of reducing the total square of the distorted sentences is overcome by the increase in the number of estimated parameters, which leads to the goodness of better fit of model. In the following, various criteria for gaining insight about the properties of the rank regression model are used. Among the most important, we can refer to criteria such as mean prediction error, Average Absolute Percentage Error, Mean Absolute Error, Root Mean Square Error and Theil's Inequality Coefficients. Based on these criteria, it can be compared the rank regression model with other regression models such as ordinary least squares as one of the most commonly used parametric methods. The various criteria investigated in this section are selective and their advantages or disadvantages are independent from their use, and are used only to help gain insight about the properties of the model. One of these criteria is the mean percentage error, that the mean percentage error for the rank regression estimated is equal to 0.0076, which indicates that the mean percentage error for the estimated regression model is very low. In addition, calculating the mean absolute percentage error for the regression model indicates that the value of this statistic is equal to 4.59, which indicates the mean absolute percentage error of estimated regression is low. In addition to the above two criteria, the mean absolute error criterion can also be used to investigate the predictive error of the model. The value of the mean absolute error for rank regression is equal to 0.609. Another criterion for determining goodness of fit of the model is the use of the root mean square error, which is also widely used in empirical studies, and this increases the mean error if there are large deviations between the observations. Based on this test statistic, the root mean square error for the estimated regression is equal to 0.79, indicating a relatively low error in the estimated regression model. The last criterion for estimating the prediction error in the regression model is the Theil's inequality coefficient, which is also widely used in econometric literature for predictive error estimation. Theil's coefficient for rank regression estimated is equal to 0.03, which indicates a low predictive error of the regression model. In the next section of this study, in order to compare estimate results of the rank regression with parametric regression, the model is logarithmically estimated using ordinary least squares regression. The estimated results are as follows:

Table 3: Model Estimation Results Based on Ordinary Least Squares Method (Dependent Variable, Logarithm of Profit Rate)

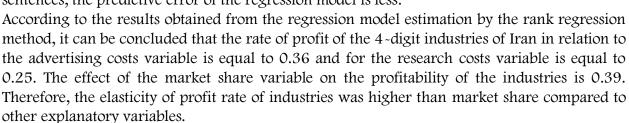| Variable	Coefficient	t-student static value
C	4.58	8.43
LRD	0.34	4.53
LADV	0.48	6.66
LMS	0.31	6.92
$R^2 = 0.78 \ \overline{R}^2 = 0.77 \ AIC = 2.44 \ F = 136.97$		

References: Research calculations

Based on the results of Table (2), the elasticity of profitability rate of industries in relation to advertising expenditures is equal to 0.48, while the profit elasticity to research and development costs is equal to 0.34. Therefore, it can be argued that advertising costs in increasing the profitability four-digit industries has more share than research costs. In

addition, the profitability elasticity versus market share is about 0.31, which shows that by 1% increase in the market share of these industries, their profitability will increase by 0.31%

The coefficient of determination of the regression model is equal to 0.78 and the adjusted coefficient of determination is 0.77, which shows that about 78% of firms' profit changes are due to changes in the explanatory variables entered in the model and above the adjusted coefficient of determination also indicates the relatively high fit of regression model. In another section of this study, we calculated mean percentage error, Average Absolute Percentage Error, Root Mean Square Error and Theil's Inequality Coefficients. The results of calculating the criteria of predictive error of model indicate that the mean absolute error for the estimated regression is equal to 0.618 which indicates that the mean absolute error for the estimated regression model is relatively low. The mean absolute error value for the estimated least squares is calculated equal to 4.68, which indicates that mean absolute error of the ordinary least squares regression error is higher than the rank regression. In addition, the root mean square error for OLS regression is 0.79, which is lower than rank regression. Theile inequality coefficient for ordinary least squares is 0.029, which is less than rank regression. By comparing the criteria of predictive error of the rank regression method with the least squares method, it is considered that in some of the criteria, rank regression model has a lower predictive error than ordinary least squares regression, while for some other criteria such as the Thiel's inequality coefficient and root mean square error, ordinary least squares method has less predictive error. In general, based on the results of the comparison of the predictive error of rank regression and the ordinary least squares, it can be stated that if using the absolute value of the distorted sentences instead of the squares of the distorted sentences, the predictive error of the rank regression approach compared to ordinary least squares method is one of the less parametric regression methods. In other words, since the sum of squares of distorted sentences in the OLS regression method is minimized, it is therefore expected that in the criteria that prediction error is calculated based on the sum of the squares of distorted sentences, the predictive error of the regression model is less.

According to the results obtained from the regression model estimation by the rank regression method, it can be concluded that the rate of profit of the 4-digit industries of Iran in relation to the advertising costs variable is equal to 0.36 and for the research costs variable is equal to 0.25. The effect of the market share variable on the profitability of the industries is 0.39. Therefore, the elasticity of profit rate of industries was higher than market share compared to other explanatory variables.

CONCLUSION AND PRESENTATION OF RESEARCH POLICY RECOMMENDATIONS

This study is conducted to investigate the effect of market share, research and development costs, and advertising costs on the profitability of industries with 4-digit code of Iran in 2010. For this purpose, the rank regression technique and data related to the industrial workshops of ten employees above mentioned year have been used. In the review of theoretical literature, the relationship between the variables of research and development costs and the advertising costs with profitability within the framework of the theoretical models of Durfman-Stiner and Lerner is introduced. Then, previous empirical studies in Iran and abroad have been investigated. In most of them, the direct relationship between the above variables and profitability has been concluded. Then, while introducing the econometric model and

explanations of the technique used, the model is estimated and the results are presented. The results of the estimation indicate the direct effect of market share, research and development costs, and advertising costs on the profitability of the four-digit industries in Iran. According to the results, the following cases are presented as policy recommendations of this study to the government, industries' managers and policy makers' market regulators:

Since market share has a positive effect on the profitability of the industries, so effort to increase market share and take a larger share of the market by firms active in these industries in Iran will increase their profitability. Therefore, it is considered that in order to increase profitability, firms active in the industries are motivated to increase investment, market share and, consequently, market power. On the other hand, the government can provide the field of investment, and increasing market share in the Iranian industry by incentive policies. Including these incentive policies can be referred to low-interest loan, tax exemptions of industrial production, customs exemptions for the purchase of equipment and machinery required by the industry sector, and so on.

The results of this study indicate the direct effect of research and development costs on the profitability of the industries surveyed. Therefore, it can be stated that research and development costs can increase future profitability of the industries under study. Therefore, the encouragement of the manufacturing firms of the industries studied to the research and development can lead, in addition to increase the profitability of these industries to improve the quality and innovation in these industries. Therefore, implementing policies to encourage these firms to invest in research and development by the government seems necessary. Among these policies, it can be referred to the customs exemptions and discounts for imports of laboratory and research equipment needed by the industry sector, encouraging applied research of industrial sector to industrial firms and researchers in applied studies of the industrial sector, tax exemptions of incomes of the activists of the research and development departments, and appropriate scholarship grant for the purpose of orienting the theses of MA students and doctoral students of the country to the applied and strategic studies of the industry sector by the government

According to the results of this study, advertising costs have had a positive and significant effect on the interest rate of industries with 4-digit code of Iran. Therefore, it is recommended to managers of these industries in order to improve the performance and increase the profitability of active enterprises in these industries in Iran to use advertising tools and new ways of domestic and foreign marketing to promote sales and gain more share of internal market, especially the global market. Among these policies, it can be referred to the participation in domestic and foreign exhibitions, brochure publishing and the introduction of products through advertisements and the use of various media, such as newspapers, magazines, Internet cyberspace, and billboards and so on, because the use of these policies can have a positive effect on the profitability of the advertiser's firm.

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