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ESTIMATION OF AVERAGE PRODUCTION COST FUNCTION FOR IRAN CARPET COMPANY'S WORKSHOPS

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ABSTRACT

In the contemporary world, the economic efficiency is a result of optimal allocation of resources and producing a competitive advantage in production and service. This issue is not limited only to one specific area or section of economic activities, rather this should cover all aspects of economic life in the national economies and geographical regions. Thus, with regard to necessity of producing a competitive advantage in the production through reduced marginal cost and optimal allocation of resources in the country in line with globalization of economy, it is necessary to examine the conditions governing the production. The handmade carpet has been one of the most important handicrafts in Iran in recent decades which, due to the changes in the world market, has undergone some undesirable developments. In this research, therefore, considering the costs of carpet workshops, the average costs function of all these workshops was estimated through Translog function and the results were analyzed, the needed data was gathered based on documentary and survey methods, the statistical population of the study includes carpet production workshops of Iran Carpet Company throughout the country that the sample size was selected using screening method. Also, along with using financial statements of the said companies, a questionnaire was designed using the expert opinions and information was gathered through having interviews with producer. The results suggest that in some carpet production workshops, using the maximum savings from production scales, the production capacity was in optimal level.

1. INTRODUCTION

Carpet is a multidimensional subject. On the one hand, it is a heritage of Iranian culture and civilization, belonging to a great history in the past. On the other hand, it is a pure art and a symbol of both Iranian and Islamic arts in this territory. It is embedded in development, with attributes such as job creation and reliance on the local products and, on the other hand, it has found an economic nature, which is used as one of the non-oil export items playing a role in bringing currency to the country. This multidimensionality requires that it is also addressed from different aspects in research, where the necessity of considering the carpet as an interdisciplinary element is revealed.

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Psychology, sociology, economy, history, advertisement, communications, literature etc., each can be involved with handmade carpet industry-art from different perspectives, thus welcoming a set of sciences (Raters, 2004, P 244-8). Some countries in the world have been introduced with their own unique goods or industry, being handmade carpet in the case of Iran. The handmade carpet is a combination of Iranian art, culture, values and believes with more than one thousand years old. Despite the technological advancements in the present age and expansion of production and consumption of machine made carpets for their beauty, this Iranian handicraft stills remains popular and continues its life, with Iran still having the first place among competitors such as China, Pakistan and India in handmade carpet exports and production in spite of all problems in this field (5).

2. RESEARCH METHOD

This is a prospective research. In terms of data collection method, it is a descriptive and correlational method. Also this research is considered a quantitative method based on nature and data features used for hypothesis analysis. The statistical population of this study consists of all carpet production workshops operating under Iran Carpet Co., operating in 2014. At the end, of 45 workshops operating under Iran Carpet Co., 29 workshops were selected as the sample. After considering all criteria, 29 workshops were left as the screened population, all being selected as the research sample. In this research, the needed information regarding the literature and theoretical basics is extracted from library resources and scientific databases, and domestic and foreign papers. Also the financial statements of the selected companies were used to provide data for estimation of function. In addition, using the experiences of skilled experts and researchers, a questionnaire was provided and other managerial, manufacturing, income and cost information of these companieswere obtained by referring to the selected companies and face-to-face interview.

3. LITERATURE REVIEW

Brant and Kristine (1973) estimated the translog cost function for various factories in the USA using the time series from 1968 to 1929 with least square roots and calculated the optimal cost level for various production factors of relevant industries. In investigating the productivity and efficiency of resource allocation in milk production in Himachal Pradesh, India, by estimation of various production functions for different races of cows and in different seasons, Sharma and Sink (1993) have calculated the final productivity value and discussed the optimal allocation of resources.

Lolland and Ringsted (2001) calculated the costs of economies of scale in diary production by cost function estimations using the series data (1996-1972), concluding that there is an ascending returns to scale in the given years, totally leading to reduced costs.

Using the frontier production function method, Powel et al (2005) in a study titled “economies of scale and efficiency in the USA agriculture” concluded that the smaller farms are inefficient both technically and in terms of scale.

In a paper titled “Is the size important? The relation between size and profitability”, Bjarne Janson (2007) investigated 250 firms in a five-year period. In this research, he measured the size of firms by transaction volume, work flow, and also total assets. the profitability was also obtained

through ratio of assets (ROA), return on capital (ROC), and return on equity (ROA). He showed that despite a positive relation, the firm size has no significant effect on profitability.

Gravesite al (2009) investigated the cost function of three Canadian agricultural subsections (beef, grain and dairy products) by employing translog functional form. The results confirm the existence of ascending returns to scale in all of these three activates. In another study, Ceyhan and Hazenki (2010) assessed the economic efficiency of livestock breeding for beef using the data envelopment analysis and showed that the economic inefficiency of livestock breeding is counteracted with an 18 percent reduction. Among the cattle farms 24 percent had fixed returns to scale and 74 percent increasing relative returns to scale, with no sample farm having decreasing relative return to scale. Also it was shown that 95 percent of cattle farms had no allocated efficiency. The production cost in these farms was more than the farms having the minimum cost.

In his doctoral dissertation titled "market structure and performance: theory and its application in Iranian industry," Khodabakashi (1992), by investigating and using the information of 81 industries in four digit ISIC code, concluded that the leading firms' return rate has a positive correlation with all structural indices, whereas the industry return rate in many cases and the rate of small firms in all cases, indicate a negative correlation. The concentration ratio has a negative and significant effect on industry profitability rate and follower firms, while that of lead firms is positively and significantly affected by the industry concentration level.

In a study using translog cost function, Torkamani and Kalayi (2001) analyzed the influence of inputs in production of wheat and barley. The results show that the chemical fertilizers is considered as the complement to the used seed, and the work force, machinery and chemical fertilizers have also substitutional association.

Kiani and Akbari (2001) determined the productivity rate of traditional dairy cattle farms in Golapayegan city using the appropriate models. Results show that increased number of cattle leads to decreased maintenance cost and thus increased productivity index, so that in one- and two-head cattle farms, productivity rate has been smaller and the existence of these cattle farms has was not economical, while in the seven-head cattle farms, this index approximates to two and the productivity rate is higher.

Using the translog cost function form, Javanbakht and Salami (2003) investigated whether economies of scale exist in the agricultural bank units. Their results showed the returns to scale 1.25 times higher than other banks. Yazdan and Najafi (2005) estimated the optimal size of cattle farms producing milk in Fars province using two-stage pattern of Dowson and Hopard in Marvdasht and Sepidan cities with 37 and 88 heads of livestock, respectively.

Shirzad Kebriayi and Zibayi (2005) investigated the economic and scale efficiency of industrial cattle farms in Shiraz province using a systemic method, showing that 38.7 percent of units are facing the issue of unprofitability which is related to size inefficiency.

In a paper titled "the effective factors on profitability of companies listed in stock exchange" Sajadi and Dasgir (2006) studied the effect of factors including the industry type, size, life, ratio of assets, asset-debt ratio and advertisement costs on companies listed in stock exchange. They found

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that if two criteria of profitability (return on asset and modified return on asset) are defined, then the variables such as size, asset-capital ratio and asset-debt ratio would affect the profitability, but type of industry, life and advertisement costs have no significant effect.

Ansari and Salami (2007) studied the economies of scale in Iranian shrimp farming through estimation of translog cost function. The research findings suggest the presence of structural characteristics of ascending return to scale in this industry, meaning that with increased size of shrimp farms, the production costs decrease.

Using the data envelopment analysis in Khusestan province, Hemati et al (2009) calculated the efficiency of dairy cow breeding units. The results imply that the average technical efficiency of products in these units is 88% using the work force, fixed capital and working capital, and these units should save approximately 0.12 in its work force, working capital and fixed capital to become efficient. Malkan (2011) investigated the effects of concentration-economies of scales ratio on profitability in Iranian industry sector. The research findings show that the variables of economies of scale and concentration ratio totally have a significant effect on industry profitability, and the association between economies of scale and profitability was also negative.

In a study by Banaiyan (2012), the technical efficiency of a broad sample from the Iranian dairy livestock breeders was assessed by nonparametric method through data envelopment analysis. The net average technical efficiency of the data envelopment analysis model was calculated to be 79 percent, which had been normalized for all variables based on the number of livestock.

The inefficiency of firms scales under decreasing return to scale also was calculated to be 52 percent. As a result, the smaller firms should move towards the bigger firm with appropriate number of livestock.

In a research by Mollanazari et al (2012), they investigated the different effects of firm size and industry type on profitability. The main purpose of this research was to study the different firm size and industry type on profitability of companies listed in Tehran stock exchange between time period from 2006 and 2010. The results from hypothesis test are suggesting that in different industries in big companies there is no significant association between the higher fixed costs and profitability. Also in smaller companies active in industries with lower fixed cost there is significant positive association between the operational debt leverage and return on equity.

In a research by Hosseini et al (2013) titled production analysis structure and economies of scales in production of Iranian sugar industries analyzed the association between inputs and the economies of scale in sugar production using dual cost approach.

4. RESEARCH FINDINGS

A summary of descriptive statistics regarding the research variables after screening and removal of outliers, is shown in (Table 1).

Table 1:Descriptive analysis of research variables

Variable	observations	average	Standard deviation	min	max	skewness	kurtosis
C	29	0.5739	0.3718	0.0000	1.7537	-0.159	2.120
Y1	29	0.8878	0.2973	0.0000	51.920	7.108	68.076
Y2	29	0.1745	4.3772	0.0000	1.6519	2.108	7.460
P1	29	0.4982	0.5002	0	1	0.006	1.000
P2	29	0.1346	0.1358	-0.2983	0.7016	0.570	3.973
P3	29	0.0017	0.1345	-0.6433	0.9722	0.911	10.269

5. NORMALITY TEST OF DEPENDENT DISTRIBUTION

If the statistic is lower than 5% (Prob<.05), the hypothesis with regard to normality of the relevant dependent distribution is rejected. The statistical hypothesis related to this test is as follows:

H0: Data distribution is normal.

H1: Data distribution is not normal.

The results from above statistical test is presented in (Table 2).

Table 2: The test results for normality of dependent variable distribution in the research

Variable	Bra-Kharkov statistic	Significance level
Carpet (mah)	32.384	0.0000

Considering that the probability of Jarque-Bera statisticfor both variables is less than 5 percent (0.000), H0 is rejected and H1 is confirmed in 95 percent confidence level. In other words, the results from Bra-Kharkov test suggest that the dependent variables do not have a normal distribution. This variable, therefore, was normalized using the Janson transfer functionin (Table 3).

Table 3: the normality tests for distribution of dependent variables in research after normalization

Variable	Jarque-Bera statistic	Significance level
Carpet (mah)	3.890	0.142

The dependent variables of the research, therefore, have normal distribution after normalization process. Dependence test between the research variables, as shown in (Tables 4, 5, 6, 7).

Table 4:Pearson Correlation Coefficient matrix between the research variables

Correlation / Probability	C	Y1	Y2	P1	P2	P3
C	1					

Y1	0/008	1				
	0/8	-----				
Y2	-0/173	0/018	1			
	0/000	0/581	-----			
P1	0/305	-0/014	-0/082	1		
	0/000	0/671	0/015	-----		
P2	0/019	-0/019	-0/020	-0/523	1	
	0/570	0/569	0/546	0/000	-----	
P3	-0/350	-0/09	0/104	-0/299	-0/091	1
	0/000	0/007	0/002	0/000	0/006	-----

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6. RESEARCH HYPOTHESIS TESTING

Test function selection for research hypothesis

$$SE = \left(\sum_{i=1}^{n} \left(\frac{\partial LnC}{\partial LnYi} \right) \right)^{-1} = \left[\sum_{i=1}^{n} R_i \right]^{-1} \quad (1)$$

Research hypothesis: there are economies of scale obtained from scale in carpet production workshops in Iranian carpet company. This hypothesis was tested using the above formula, with results presented in table 5:

Table 5:The results of model estimation

Result	Index of economies of scale (SE)	Workshop/city
+	212.1	Tabriz
-+	002.1	Meshkin shahr
+	004.1	Heris
+	124.1	Nain
+	0065.1	Derakhsh
-	0092.1	Yazd
-	987.0	Ravar
-	998.0	Abadeh
-	758.0	Nourbad
-	1009.1	Kashan
-	869.0	Ghom
+	786.0	Farokhshahr
+	769.0	Chaleshtar
+	852.0	Shahreza
-	0213.1	Sarayan, Arak
-	679.0	Broujerd
-	587.0	Nahavand

7. CONCLUSION ABOUT REJECTION OR CONFIRMATION OF THE SECOND HYPOTHESIS IN THE RESEARCH

The result is given in Tables 6 and 7.

Table 6: One-sample statistic

Std. Error Mean	Std. Deviation	Mean	N	
0.16462	0.83942	2.7404	29	f3

Table 7: One-sample test

Test Value = 0.05							
95% Confidence Interval of the Difference		df	Sig(2-tailed)	df	T		
Upper	Lower						
3.0294	2.3513	2.69038	0.000	25	16.343	f3	

Considering the above results and also the results presented in (Table 5), if SE<1, then it means the hypothesis is rejected, otherwise it means it is not rejected. Therefore, the positive and negative sign in the above table means confirmation and rejection of the second hypothesis, respectively.

8. CONCLUSION

According to the results in (Table 5), economies of scales appears in a field of production in which with increase in firm size, the average cost decreases. Also in a production range in which the average cost is descending, the marginal cost curve is under the average curve. Accordingly, and based on the research model, we can introduce a model a follows, by which it is possible to detect whether there are economies of scale. This criterion can be defined as,

$$S = AC/MC \qquad (2).$$

In any level of production, if S>1, then we will enjoy the advantages from economies of scale along with increased production, whereas if S<1, the increased average production will involve increased average cost and no econimies of scale. Where S=1, then the constant return to scale is established. Accordingly, the active workshops in Tabriz, Meshkinshahr, Heris, Naeen, Derakhsh, Yazd, Kashan, and Sarayan in Arak benefit from economies of scale, and the active workshops in Ravar, Abadeh, Nourabad, Ghom, Farokhshahr, Chaleshtar, Shahreza, Broujerd and Nahavand do not have theadvantagesresultant form the economies of the scale.

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