

Full Length Research Paper

Review of interactions between e-commerce, brand and packaging on value added of saffron: A structural equation modeling approach

Daneshvar Kakhki Mahmoud* and Farahmand Gelyan Kazem

Department of Agricultural Economics, College of Agronomy, Ferdowsi University of Mashhad,
P.O. Box 91775-1163, Mashhad, Iran.

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The structural equation modeling approach is widely used to analyze relationships and causation among manifestly observed and intrinsically latent variables, and control observation or measurement errors in economics, sociology, and psychology. The main objective of this study was to investigate the effects of three variables e-commerce, brand and packaging on the value added of saffron by using a structural equation model. Results showed that packaging parameter with regression weight of 0.91 has the greater correlation to the latent variable of “factor” and it shows that it has the share of high value added to two other scales. Also based on this result, it can be said that three scales together have more value added in the foreign market (0.35 coefficient) toward domestic market (0.26 coefficient).

Key words: Structural equation modeling (SEM), e-commerce, brand, packaging, saffron.

INTRODUCTION

Among agricultural products with comparative advantage, saffron as a valuable product is occupying unique position in the world. Iran is the largest producer of saffron in the world, with cultivation area about 42 thousand hectares and annual average production of about 120 to 130 tons (Daneshvar, 2007); and is also the largest exporter of saffron in the world with annual average exports 90 to 100 tons per year (Fehli et al., 2007). Saffron, as one of the agricultural products that is a non-oil export, has an important role in foreign exchange earnings from exports of agricultural products; hence it has a significant share in comparison with the rest. Growing exports of saffron and creation of income and employment for the country's rural areas has attracted greater attention to this product. Starting third millennium, production institutions, governments and economic poles in the world are more competing in business sectors, especially. Each of them attempted to

have more share of facilities and opportunities in business either inside or outside the country (Hashemi, 2008). There are three important factors in development of saffron market: packaging, brand and e-commerce of saffron. In recent years, packaging has developed well beyond its original function as merely a means of product protection; now it plays a key role in product success, particularly in the fast moving consumer goods industry (Simms and Trott, 2010). It can have a powerful effect on consumers at the point of sale (Grossman and Wisenblit, 1999; Wells et al., 2007).

Packaging and brand are complementary to each other; favorable packaging can be a means of continuously strengthening the brand's request. Although, packaging is most commonly regarded as a way to protect the product, an often overlooked element of packaging is the capability of better reflecting the sense of product attributes to consumers who might evaluate these attributes valuable. Using new and innovative packaging designs, increase perceived benefits to consumer's thus increasing value added can be achieved. Value is added when packages are designed for aesthetics and ability to deploy clear information to

*Corresponding author. E-mail: daneshvar_k@yahoo.com.
Tel/Fax: 0098511-8763653.

Table 1. Indicators and factors are defined for e-commerce variable.

Variable	Explanation
X1	Acquaintance to science and technology of the day
X2	Exchange the latest information and standards for supply of products
X3	Using chopped food distribution networks for better access to supermarkets and hypermarkets
X4	Selling saffron with Iranian brand through mail and having the capillary sale system
X5	Using web service companies for creating change in saffron of Iran electronic marketing system
X6	Having been allocating web for participating in the global internet network and to show various products produced in it
X7	Identify, absorb and communication with business partners and external vendors by internet
X8	Possibility communicating with the company through the website
X9	To order the product by customers and internet sale
X10	Possible question and answer on the website

Source: Iran's saffron exporters union and national council of Iranian saffron.

consumers, and at the same time conserve the product qualities through time and from the environment (Topoyan and Bulut, 2008). Packages carry out a major role in enhancing brand equity by fortifying brand awareness and building brand images via conveying practical, symbolic, and experiential benefits (Shimp, 2001). Consumers generally choose to buy from the image they perceive that the product has, and what they perceive is heavily influenced by the cues given on the products packaging, brand name, color and display (Sara, 1990). On the other hands, the appearance of electronic commerce over the past decade has radically changed the global economic view, the fast growth of the Internet and World Wide Web has provided a new channel for marketing and selling. An additional channel of trade is profitable for consumers if it reduces their transaction costs and provides the product at a lower price than the existing channel. This phenomenon applies exactly to e-commerce. Thus, it is often considered that e-commerce is welfare enhancing (Nakayama, 2009). Therefore, it is necessary to give special attention to these three factors, which are brand, packaging and e-commerce. Here, we try to assess their effect on the value added of saffron.

MATERIALS AND METHODS

This study was conducted based on structural equation modeling (SEM) approach. SEM has been extensively developed in social sciences (Jöreskog and Sörbom, 1982; Kaplan, 2000; Kline, 2005). However, after the late 1990s, SEM has been applied increasingly to natural sciences (Iriondo et al., 2003; Grace, 2006). Trend of SEM applications in aquatic sciences is also increasing (Stow and Borsuk, 2003; Reckhow et al., 2005).

Structural equation modeling (SEM) is an advanced multivariate statistical approach with which a researcher can set up theoretical concepts; test multivariate relationships within and between observed (variables that can be measured directly) and latent (variables that cannot be measured directly) variables; and corroborate proposed causal relationships based on two or more structural equations (Malaeb et al., 2000; Grace, 2006). Generally, structural equation models (SEM) is a combination of measurement

models and structural models. Based on measurement models, the researcher defines which on observed variables or indicators is dimension a ; which is a latent variables. Based on structural models, we will determine which independent variables have effect on which dependent variables, or what variables are correlated with each other. Thus these models can perform simultaneously assessment variables measurement quality and acceptability, direct and indirect effects, and also had defined interactions between variables (Ghasemi, 2010).

There are many problems in regression analysis that are overcome by using structural equation modeling. Titman and Wessels (1988) explain some problems in regression analysis associated with estimating parameters with proxies for unobservable theoretical attributes:

- 1) Absence single representation of the attributes: It may lead researchers to select variables based on statistical goodness-of-fit criteria, and therefore, slant economic explanation.
- 2) Absence single representation of agent variables for theoretical attributes means that an agent may be measuring the effects of several different attributes.
- 3) The imperfect representation of agent variables leads to the regression analysis introduces an errors-in-variables problem.

Therefore, SEM has two main advantages: (1) it allows for the estimation of a series, but independent, multiple regression equations simultaneously, and (2) it can merge latent variables into the analysis and accounts for measurement errors in the estimation process (Hair et al., 1995).

RESULTS AND DISCUSSION

In this study, brand, e-commerce, packaging, export and domestic supply are latent variables and therefore should be measured by the indicators or factors. Tables 1 to 3, respectively show the indicators and factors that defined for e-commerce, brand, and packaging variables. Table 4 presents three variables Y1, Y2 and Y3; these are exporting statistic of saffron during several months in 2010 that are gathered from large companies of saffron export in Iran. Table 5 defines three variables Y4, Y5, Y6; this is the average price of saffron at different packaging that is supplied in inside stores by the same large companies of saffron export. Questionnaires were

Table 2. Indicators and factors are defined for brand variable.

Variable	Explanation
X11	Medium advertising for increase reputation brand of saffron
X12	News conferences for increase reputation brand of saffron
X13	Using lecture tool for increase reputation brand of saffron
X14	Using events, celebrations and festivals of target countries for promoting credibility and place of brand marketing of saffron of Iran export
X15	Using public relations and marketing for promotion level of awareness
X16	To inform of the saffron brand in target markets
X17	Creation and transmission of visual identity for brand through design and publication logos in newspaper, advertising brochures, forms and business cards
X18	Using the latest scientific findings in order to create the famous brand of saffron
X19	Having identified and long term plan for fill vacuum presence company brand in saffron international markets
X20	Using capacity of embassies and consulate general of Iran to develop export houses trade in target countries
X21	Identify potential buyers in the international exhibition of food products and agricultural
X22	Recognition consumer tastes and ideas relative to quality of Iranian saffron in international exhibition of food products and agricultural
X23	Advertising and introduction saffron products with the brand in international exhibition
X24	Participate in Iran dedicated exhibitions for association inseparable communication of saffron and Iran
X25	Create and introduce Iranian saffron brands and to fortify it position in target markets
X26	Considering the properties of saffron (smell, taste, color, its high price) in selection advertising methods of Iranian saffron brand
X27	Using spices distribution networks in European and American markets for marketing of saffron with Iranian brand
X28	Cooperation with large stores in target markets for distribution of saffron products with Iranian brand

Source: Iran's saffron exporters union and national council of Iranian saffron.

Table 3. Indicators and factors are defined for packaging variable.

Variable	Explanation
X29	Match with environmental debates in target markets
X30	Match with requested rules each market
X31	Dynamic and flexible and trust information
X32	Create Iranian identity through good packaging
X33	Innovation features (pre-image creativity and analysis, innovative ideas)
X34	To standard packaging workshops under domestic and foreign criterions
X35	To mention a saffron type with rating in saffron packaging
X36	Having licensed no, expiry and product date

Source: Iran's saffron exporters union and national council of Iranian saffron.

designed for Tables 1, 2 and 3 that are given a grade for each of the variables X1 to X36 at a range of 1 to 7 in it. Questionnaires were distributed among the 23 largest exporter of saffron in Iran, the rate of return and valid

response was 65%.

LISREL, EQS, and AMOS are programs for structural equation modeling method and are distributed by Scientific Software International, Multivariate Software,

Table 4. Indicators and factors are defined for export variable.

Variable	Explanation
Y1	Value of saffron exports in packaging of less than 10 g
Y2	Value of saffron exports in packaging of between 10 to 30 g
Y3	Value of saffron exports in packaging of more than 30 g

Source: Customs of Iran.

Table 5. Indicators and factors are defined for inside supply variable.

Variable	Explanation
Y4	Average price of saffron supply in packaging of less than 10 g
Y5	Average price of saffron supply in packaging of between 10 to 30 g
Y6	Average price of saffron supply in packaging of more than 30 g

Source: Collected from the country stores.

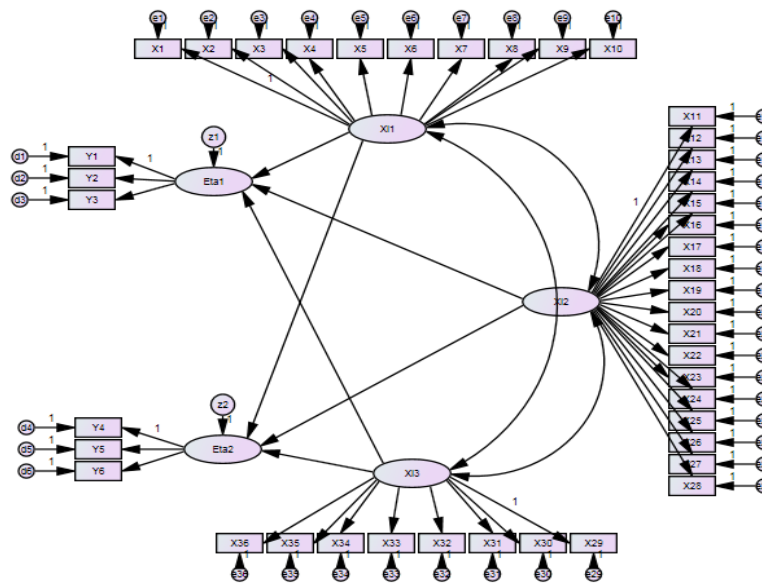


Figure 1. Structural equation model. Source: research findings.

and SPSS, respectively. In this study structural equation modeling was performed using the maximum likelihood methods of AMOS version 18.0.

Theoretical model of study is shown in Figure 1. In this figure, Xi1, Xi2 and Xi3, respectively present the latent variables of e-commerce, brand and packaging. Eta1 and Eta2 are dependent latent variables, respectively for export and supply. e1 to e36 are error variables in measurement models related to an independent latent variable. d1 to d6 are error variables in measurement models related to dependent latent variables. Z1 and Z2 are error variables in the structural model related to dependent latent variables.

There are five measurement models in this figure.

Measurement model is a component of structural equation models that to express measure method a latent variable using by two or more observed variables. Therefore, there is a measurement model for every latent variable. Also structural model is a component of structural equation models that to indicate how latent variables and sometimes observed variables affect each other. In the given model how communicate and effects five latent variables of Xi1, Xi2, Xi3, Eta1 and Eta2 and also effect of error variables of Z1 and Z2 on the two dependent latent variables to organize a structural model total. There was a restriction in structural equation modeling. It was very low sample size. Therefore, we were forced to design the path model. Path models are

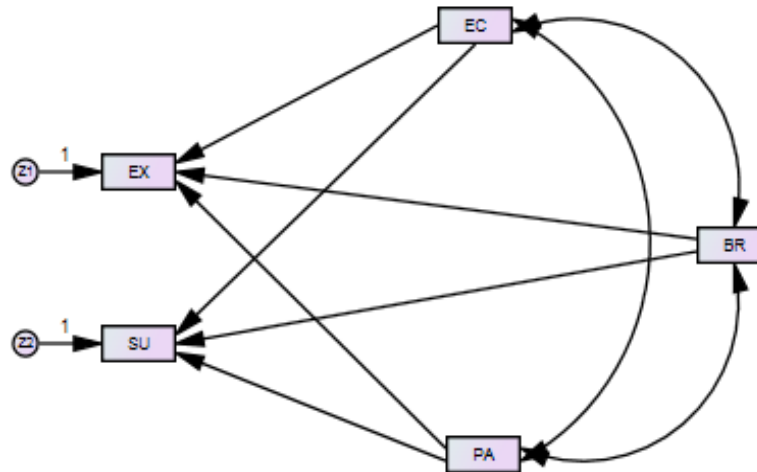


Figure 2. Path model. Source: research findings.

Table 6. Correlation between independent observer variables.

Variable	PA	BR	EC
PA	1	0.72**	0.62*
BR	0.72**	1	0.61*
EC	0.62*	0.61*	1

Source: Research findings: **Correlation is significant at the 0.01 level (2-tailed). *Correlation is significant at the 0.05 level (2-tailed).

one of the models that can explain and predict various phenomena. In terms of such particulars, those are usually one of the substructures of models in the discussion of structural equation modeling (Ghasemi, 2010). Some of the particulars include:

- 1) All the main variables (except error variables) in these models are of type observed variables, therefore, there is no measurement error.
- 2) In path models, there are often more of dependent variables (Ghasemi, 2010). Path model is shown in Figure 2. In this figure, the variables of packaging, brand, e-commerce, export and supply in local market are shown by PA, BR, EC, EX, SU respectively. Variables of EC, BR and PA are observed variables, X_{i1} , X_{i2} , X_{i3} respectively, that are given from weight average X_1 to X_2 related to it. Correlation between independent observed variables is shown in Table 6.

As you can see, there is a high correlation between these variables; and it shows that the entire studied sample for improvement of their performance in the global market has the same attention to all these variables. Therefore, all these three variables define a phenomenon. We used extraction method: principal

component analysis, as shown in Table 7. It also showed these three variables define a phenomenon that we named "factor". Thus, our model is shown in Figure 3.

Acceptable scientific criteria for confirming theoretical models using data collected is the main discussion in model fit indices. There are more than 30 model fit indices often reported in Amos software output thus we evaluate only the most important ones. The first model fit indicator is one of the most general indicators, relative Chi-square or normal Chi-square is division Chi-Square on the degree of freedom (DF). Acceptable values fall between 1 and 3; here, it is 0.82 (Table 8). We cannot base our decision on it alone; therefore, we review other indicators.

Tucker-Lewis Index (TLI) falls in the range of 0 and 1. Amount of 0.95 or more, reflects a good model, and if it becomes more of one value, its amount will be 1; in our model it is 1.128. Comparative Fit Index (CFI) is based on correlation between variables existing in the model, so high correlation coefficients between them lead to the high amount of CFI. In this model, it is one value that expresses a good model. Acceptable minimum value for parsimonious comparative fit Index (PCFI) is 0.5 or more; here, it is 0.5 thus it shows the model is good (Table 9).

Last review of the model fit index is root mean squared error of approximation (RMSEA). Acceptable models for this index have to be 0.05 or less. It is 0.00 in our models (Table 10).

Therefore we conclude that our model is well fit. The estimated parameters: 0.73, 0.83 and 0.86 are the kind of regression weight that actually represents the covariance or correlation coefficient between each observed variable with latent variable. Between these secondary scales, according to the estimated standard values, PA scale with coefficient 0.86 has the greater correlation to the latent variable of "factor". Thus, it has more weight for value added saffron. Also three scales

Table 7. Component matrix.

Variable	Component
	1
EC	0.843
BR	0.889
PA	0.893

Source: Research findings. Extraction method: principal component analysis. 1 component extracted.

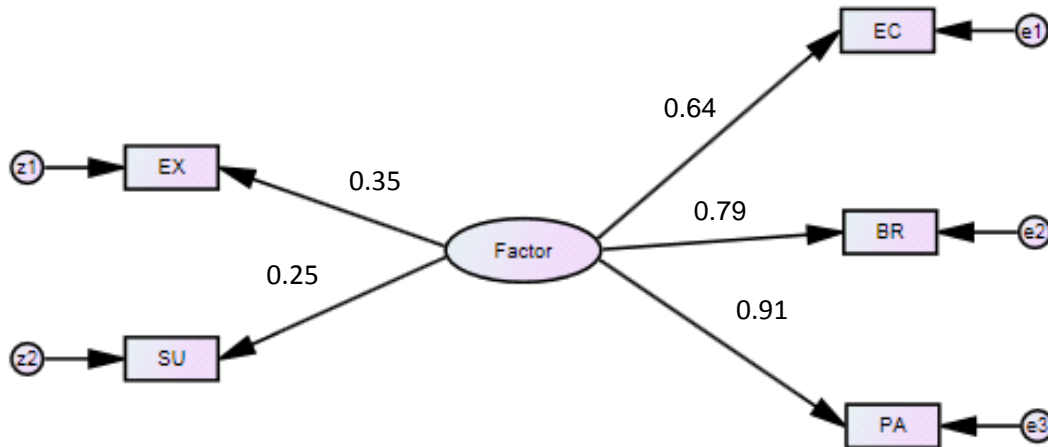


Figure 3. Final model. Source: Research findings.

Table 8. CMIN/DF indices.

Model	NPAR	CMIN	DF	P	CMIN/DF
Default model	10	4.128	5	0.531	0.826
Saturated model	15	0.00			
Independent model	5	23.640	10	0.009	

Source: Research findings.

Table 9. TLI, CFI and PCFI indices.

Model	TLI (rho2)	CFI	PCFI
Default model	1.128	1.000	0.500
Saturated model		1.000	0.00
Independent model	0.000	0.000	0.00

Source: Research findings.

Table 10. RMSEA indices.

Model	RMESA	LO 90	HI 90	PCLOSE
Default model	0.000	0.000	0.35	0.55
Independent model	0.324	0.155	0.495	0.011

Source: research findings.

together have more value added in the domestic market (comparison of 0.35 with 0.32), and it shows that exporter companies first strengthen presence in the domestic market to spread presence in international markets.

Conclusion

In this investigation, the effects of three variables of brand, packaging and e-commerce on value added of export and domestic supply of saffron were studied. In the first step, we designed structural equation model. Although, the sample size, in the next phase the path model was designed. In path model, there was high correlation between three variables of brand, packaging and e-commerce, so in principal component analysis, it

showed one component was extracted. In the final model, estimated parameters were 0.64, 0.79 and 0.91; thus PA scale with coefficient 0.91 has greater correlation than the latent variable of "factor" and it shows it has the share of high value added than the rest. Also based on this result, it can be said that three scales together have more value added in the domestic market than foreign market.

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