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EMPIRICAL STUDY ON THE RELATIONSHIP BETWEEN MARKET SHARE, ADVERTISING DENSITY AND RATIO OF SALES

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ABSTRACT

The causal relationship between market share, advertising density and ratio of sales has been widely discussed in academic circles. This paper examined the extent of reaction and the reverse causal relationship between advertising, concentration, and performance. Secondary data on the enterprises' operating income, total profits and advertising costs of the mid-range and high-end liquor enterprises, covering the period 2003-2011, were sourced from the financial statements. The simultaneous-equations model was employed to examine the mutual relationship of advertising, concentration and performance. The results of the simultaneous-equations model show that increased advertising density did not contribute to acquiring a higher market share for the mid-range and high-end liquor enterprises. We also found that a higher ratio of sales stimulated the enterprises to invest more in advertising costs; however, it did not promote the increase of market share.

Keywords: Liquor enterprises, SCP paradigm, Simultaneous equations model, Market share, Advertising density, Ratio of sales.

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Contribution/ Originality

This study uses new estimation methodology that is the simultaneous-equations model to examine the degree of interaction and reverse causality relationship between market share, advertising density and ratio of sales in liquor industry. It also explores the three variables' operation mechanism, which is certainly innovative.

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1. INTRODUCTION

Harvard School established the "Structure-Conduct-Performance" (SCP) of industrial organization theory which is an analysis paradigm of one-way causal relationship. Later, the Chicago School amended and pointed out that SCP was not only a simple unidirectional relationship S→C→P, but also the reverse relationship denoted as P→S→C (Su, 2009). Regarding the SCP paradigm of industrial organization, mainly empirical research has been conducted according to the statistical data of cross industry, with little application in a single industry. Thus based on the SCP theory, this paper selected China's mid-range and high-end liquor enterprises as the object by using the simultaneous-equations model to examine the degree of interaction and reverse causality relationship between market share, advertising density and ratio of sales in liquor industry. It also explores the three variables' operation mechanism, which is certainly innovative.

2. THEORY AND HYPOTHESIS

The scholars conducted more thorough research regarding the causality between market share, advertisement density and ratio of sales in different industries. This paper reviewed their previous achievements from the following perspectives and generated three hypotheses.

2.1. Relationship between Market Share and Advertising Density

If the enterprises want to obtain more market share, in addition to improving the product differentiation and quality, increasing investment in advertisement is also an effective way. Generally, advertising is able to promote an increase in product sales, and enables enterprises to produce long-term benefits. Allyn Strickland and Leonard (1976) found that advertising density was positively related to concentration, while the degree of concentration and the square of the advertisement density were negatively correlated, which was referred to as inversed "U" pattern (Allyn Strickland and Leonard, 1976). Yet, Liu and Sh (2003) has also conducted thorough research regarding the "inverted U", and he believes that with the concentration from low to high, advertising expenditure elasticity increases initially and then declines (Liu and Sh, 2003). Subsequently, Wang (2004) and Chen (2007) found that there was a positive correlation and mutual causality relationship between advertising and concentration in the car industry (Wang, 2004; Chen, 2007).

According to the above research conclusions, we can infer that if China's mid-range and high-end liquor enterprises want to gain more market share, they need to invest more in advertising. However, for the fast-growing liquor industry, investing much more in advertising expenditure does not necessarily bring a higher market share, because demand expansion rate of the industry may exceed sales growth of enterprises. Therefore, this reasoning leads to the following related hypothesis:

Hypothesis 1: Advertising density has significant positive influence on market share.

2.2. Relationship between Advertising Density and Ratio of Sales

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To determine the optimal advertising investment to maximize the enterprises' profit is a very important decision in advertising management mechanism. By employing co-integration analysis based on the time series data of advertising expenditure and sales of Lydia Pinkham, Zanias (1994) confirmed the existence of long-term equilibrium relationship between the enterprises' advertising investment and profit (Zanias, 1994). Elliott (2001) verified the applicability of that conclusion in the food industry and considers that there was an equilibrium relationship between advertising expenditure and sales before the market reached a saturation point (Elliott, 2001).

Moreover, based on the panel data of some industries' listed company, Xue (2007) found that for most industries, advertising spending had a significant positive effect on ratio of sales (Xue, 2007). Putting money into advertising is what makes profit, at the same time the increased ratio of sales can also influence the investment decisions of advertising. Du and Fan (2009) proved that the ratio of sales has a positive relation to the advertising expenses (Du and Fan, 2009). Without considering the lag response of advertising decision on the changes in ratio of sales, we state the following hypothesis:

Hypothesis 2: Prior-period ratio of sales has significant positive influence on advertising density.

2.3. Relationship between Market Share and Ratio of Sales

For enterprises, the market share and ratio of sales are both very important business indexes, and they will reflect the operating effect to some extent. The scholars studied the relationship between the market share and ratio of sales of different industries. Through empirical research on the car industry, Wang (2004) and Chen (2005) found that enterprises can acquire more market share to improve ratio of sales (Wang, 2004; Chen, 2005). Wang and Zhang (2007) reached the same conclusion that the bank card business's market share has a positive impact on the performance (Wang and Zhang, 2007). Thus, a certain market share is guaranteed to attain a higher ratio of sales, while some enterprises cannot afford to have both. The increase of market share is related to the nature of product, strategies of marketing activities, profit rate, all the activities related to strict cost control in the whole value chain enterprise, and the management efficiency of enterprises. Table-1 presents the results for the growth rate of operation income between the mid-range and high-end liquor enterprises and liquor industry; we can infer that the growth rate of liquor industry's total sales revenue is higher than China's mid-range and high-end liquor enterprises. This logic leads to the following hypothesis:

Hypothesis 3: Ratio of sales has a significant negative impact on market share.

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Table-1. Comparing the growth rate of operation income between the mid-range and high-end liquor enterprises and liquor industry

Year	2003	2004	2005	2006	2007	2008	2009	2010	2011
A:Mid-range and high-end liquor enterprises(%)	-	-0.70	30.03	-75.94	19.98	9.75	26.98	28.28	39.17
B:Liquor industry(%)	-	-2.81	36.35	34.37	28.61	26.10	31.42	17.01	54.69
A/B	-	0.249	0.826	-2.210	0.698	0.374	0.859	1.663	0.716

Source: Financial statements.

3. METHODS AND MATERIALS

3.1. Model Selection

The single-equation econometric model applies to unit economic phenomenon and explains its unidirectional causation. However, the relationship between market share, advertising density and ratio of sales of the mid-range and high-end liquor enterprises is interdependent and these factors interact as both cause and effect, which cannot be interpreted by a single-equation econometric model, thus a simultaneous-equations model is required. Furthermore, due to the endogeneity between the three kinds of variables, the results of single-equation regression are invalid and biased (Li and Pan, 2011). Therefore, it is reasonable to choose the simultaneous-equations model to judge the extent of reaction between market share, advertising density and ratio of sales of the mid-range and high-end liquor enterprises.

3.2. Sources and Scope of Data

The data analyzed were obtained from secondary sources. Secondary data on the enterprises operating income, total profits and advertising costs of the mid-range and high-end liquor enterprises, covering the period 2003-2011, were sourced from the financial statements of Mao-tai, Wuliangye, Luzhoulaojiao, Tuopaishede, Shanxifenjiu, Shuijingfang, Hengshuilaobaigan. The data of the liquor industry sales income were obtained from various publications of China Light Industry Yearbook, China Rum Yearbook and Website. In order to ensure the consistency and coherence of the data, we screened the liquor listings according to the following standards: firstly, remove the enterprises which are ST, PT and have any missing data; secondly, the supplementary schedule of cash flow statement must include advertising and publicity expenses; thirdly, the main business in the period 2003-2011 must be listed as liquor.

4. EMPIRICAL ANALYSIS

4.1. Specification of Model

Based on the analysis of the correlative researches, this paper tries to construct the simultaneous-equations model which includes three equations of market share, advertising density and ratio of sales according to the industrial organization theory. This involves running regressions of the form:

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$$\begin{cases} MS_i = \alpha_0 + \alpha_1 * PRO_i + \alpha_2 * AD_i + \mu_{i1} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1) \\ AD_i = \beta_0 + \beta_1 * MS_i + \beta_2 * LagPRO_i + \beta_3 * AD_{i-1} + \mu_{i2} \ldots\ldots\ldots\ldots\ldots\ldots (2) \\ PRO_i = \varepsilon_0 + \varepsilon_1 * MS_i + \varepsilon_2 * LagAD_i + \varepsilon_3 * TO_i + \mu_{i3} \ldots\ldots\ldots\ldots\ldots\ldots (3) \end{cases}$$

Where α_0, β_0, ε_0 are constant terms, μ_{i1}, μ_{i2}, μ_{i3} are error terms, and the subscript i denotes the year.

In the simultaneous-equations model, equation(1) is used to describe the impact of ratio of sales (PRO) and advertising density (AD) on the market share(MS) of mid-range and high-end liquor enterprises. We selected the ratio of sales (PRO) and advertising density (AD) as independent variables, and market share (MS) as the dependent variable.

Equation (2) is used to characterize the effect of prior-period ratio of sales (LagPRO) and market share (MS) on the advertising density (AD). Firstly, in this equation we use LagPRO (LagPRO=PRO (-1)). For most enterprises, advertising is affected by the previous performance rather than the current period. On the other hand, adding the lagged variable can enhance the significant regression. Thus we added the prior-period ratio of sales (LagPRO) into this equation to determine the degree of its influence on advertisement density (AD). Secondly, in the preliminary processing of the data, we found that the D.W of advertising density equation is less than the 5% significance level. Thus, we added AD (-1) to eliminate serial correlation.

Equation (3) aims to explain the influence of the market share (MS), prior-period advertisement density (LagAD) and turnover of total capital (TO) on the ratio of sales (PRO). We used the lagging value of advertising density, LagAD (LagAD=AD (-1)), to take into consideration the period of time in which the enterprises' advertisement information is sent to the consumers and then the consumers make their purchasing decisions. Thus, the influence on ratio of sales cannot be explained fully by only taking into account the current advertising density. In equation(3), we also added the turnover of total capital (TO) (Du, 2012) because it is an important index to examine the enterprises' operation efficiency of assets and it can also enhance the effect of regression to some extent. The result in Table-2 shows the variable symbols and its measures.

Table-2. Variable symbols and its measures

Variables		**Variable symbol**	**Measures**
Endogenous variable	Advertising density	AD	Advertising costs/operation income
	Ratio of sales	PRO	Total profit/operation income
	Market share	MS	Operation income/industry sales income
Predetermined variable	Turnover of total capital	TO	Sales income/total assets
	Prior-period advertising density	LagAD	LagAD=AD(-1)
	Prior period ratio of sales	LagPRO	LagPRO=PRO(-1)

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4.2. The Identification Problem and Estimation Methods

4.2.1. The Identification Problem

Perform the identification of structural conditions using the simultaneous-equations model, where g is the number of endogenous variables and k is the number of predetermined variables, g_i is the number of endogenous variables in equation (i) and k_i is the number of predetermined variables(including constant terms) in equation (i). $B_0\Gamma_0$ is the matrix in which the variables' (not considered in equation (i)) coefficient of correspondence is in the other g－1 equations. The structural parameters matrix is as follows:

$$B\Gamma=\begin{pmatrix} 1 & -\alpha_2 & -\alpha_1 & -\alpha_0 & 0 & 0 & 0 \\ -\beta_1 & 1 & 0 & -\beta_0 & -\beta_2 & 0 & 0 \\ -\varepsilon_1 & 0 & 1 & -\varepsilon_0 & 0 & -\varepsilon_2 & -\varepsilon_3 \end{pmatrix}$$

We can obtain $B_0\Gamma_0=\begin{pmatrix} -\beta_2 & -\beta_0 & 0 \\ 0 & -\varepsilon_2 & -\varepsilon_3 \end{pmatrix}$ from equation (1), and $R(B_0\Gamma_0)=g-1=2$, so equation (1) is identified. Moreover, $k-k_1=3>g_1-1=2$, so according to the judging conditions, equation (1) is a structural equation which is over identification.

$B_0\Gamma_0=\begin{pmatrix} -\alpha_1 & 0 \\ 1 & -\varepsilon_3 \end{pmatrix}$ can be obtained from equation (2), and $R(B_0\Gamma_0)=g-1=2$, so equation (2) is identified. In addition, $k-k_2=g_2-1=1$, so equation (2) is a structural equation which is just identification.

We can obtain $B_0\Gamma_0=\begin{pmatrix} -\alpha_2 & 0 \\ 1 & -\beta_2 \end{pmatrix}$ from equation (3), and $R(B_0\Gamma_0)=g-1=2$, so equation (3) is identified. Besides $k-k_3=g_3-1=1$, so equation (3) is structural equation which is just identification. Above all, the simultaneous-equations model we constructed in this paper is identification.

4.2.2. Estimation Method

The system methods of estimation of simultaneous-equations model are Three Stages Least Squares (3SLS) and Full Information Maximum Likelihood (FIML). By using path of Three Stages Least Squares (3SLS), the situation of random shock cross equations can be taken into account, this the choice of estimation method is reasonable (Li and Pan, 2011).

4.3. Empirical Examination

4.3.1. The Descriptive Statistics of Variables

Table-3 provides the descriptive statistics of variables for the seven mid-range and high-end liquor enterprises, covering the period between 2003-2011.The samples' mean of advertising density is 4.88% and maximum is 25.93%, while minimum is 0.04%. The results show there are large differences between the advertising strategies of the samples and this may present as a barrier to approach the Liquor industry to some extent. The mean of ratio of sales is 26.19% and maximum is 67.03%, while minimum is -17.61%. The maximum differs from the minimum by

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about 84%. This phenomenon indicates that the mid-range and high-end liquor enterprises have a strong attraction; while on the other hand, it shows that their development is not balanced. The market concentration degree in the mid-range and high-end liquor enterprises is low; the maximum of market share is 11.88%, while the minimum is 0.35%. The mean of turnover of total capital is 0.6223, and the maximum is 1.0727.

Table-3. The descriptive statistics of variables

Variables	Mean	Max	Min	Std
AD	0.0488	0.2593	0.0004	0.0245
PRO	0.2619	0.6703	-0.1761	0.0989
MS	0.0263	0.1188	0.0035	0.0052
TO	0.6223	1.0727	0.2583	0.0732

Source: Computed from financial statements.

4.3.2. Results and Discussion

According to the regression results shown in Table-4, the market share, advertising density and ratio of sales in the simultaneous-equations model demonstrate reciprocal causation and mutual influence.

The goodness of fit of equation (1) is 0.9150, adjusted goodness of fit is 0.8809, and thus, the fitting effect is good. The coefficient of advertisement density is -0.7501, and is statistically significant at the 0.1 level, which shows that advertising density does not have a significant positive influence on market share. This is contrary to Hypothesis 1. The main reasons are as follows: First of all, the samples are from the group of mid-range and high-end liquor enterprises and the market demand growth rate of this group is lower than the industry; therefore, its market share does not increase obviously. Secondly, from the view of coefficient, when the advertising density increases by 1 unit, the market share will reduce by 0.7501 units, and the degree of influence is not very obvious. It can be inferred that the mid-range and high-end liquor enterprises have a certain market share in the industry and their customers are relatively stable. Therefore, if the enterprises want to increase their market share, large-scale advertising is not their optimal choice.

The coefficient of ratio of sales is -0.3262, which is statistically significant at the 0.01 level. It shows that when the ratio of sales is reduced by 1 unit, the market share will increase by 0.3262 units. So the increased ratio of sales of samples does not play a promoting role on increase in market share, and thus, we accept Hypothesis 3. We can see from this conclusion that the ratio of sales has to be sacrificed to acquire a higher market share in China's mid-range and high-end liquor enterprises. Thus, there exist some deviations from the developmental conception.

The goodness of fit of equation (2) is 0.9364, adjusted goodness of fit is 0.8888, and the fitting effect is good. The coefficient of market share is 0.7409, and statistically significant at the 0.1 level. It indicates that a higher market share will stimulate the enterprises to invest more advertising costs. This is consistent with the research of Liu and Sh (2003) and (Liu and Sh, 2003; Wang, 2004).

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The coefficient of prior-period ratio of sales is 0.2435, which is statistically significant at the 0.01 level. It means that a higher ratio of sales in prior period will encourage the enterprises to spend more on advertising costs in current period to create a higher performance. Therefore, the empirical result proves that Hypothesis 2 is reasonable, indicating that there is a reverse effect between advertising density and ratio of sales, which respectively represent market behavior and market performance of China's mid-range and high-end liquor enterprises.

The goodness of fit of equation (3) is 0.9494, adjusted goodness of fit is 0.9114, and the fitting effect is good. When the market share is increased by 1 unit, the ratio of sales will reduce by 2.5018 units, and it is statistically significant at the 0.01 level. The results show that the market share has a significant negative impact on the ratio of sales. Based on the conclusion that ratio of sales have to be sacrificed to get a higher market share, this result provides further evidence that the ratio of sales and market share of China's mid-range and high-end liquor enterprises are in opposite directions.

The coefficient of turnover of total capital is 0.24634, and is statistically significant at the 0.01 level. It shows that the turnover of total capital has a positive effect on ratio of sales, and it conforms to the concept that a higher turnover of total capital signifies stronger profitability of enterprises.

Since the consumers have a period of acceptance for the information of advertising, the prior-period advertising investment will reflect the effect on ratio of sales in the current period. According to the results in Table-4, the coefficient of prior-period advertising density is -1.9822, which is statistically significant at the 0.01 level. From this, we can know that the previous advertising density has a significant negative effect on the period ratio of sales in the current period. It also shows that at the present stage, investing more in advertising is not the best choice for China's mid-range and high-end liquor enterprises.

Table-4. Table showing simultaneous equations model result

Variables	MS regression equation(1)			AD regression equation(2)			PRO regression equation(3)		
	Coefficiet	t-Statistc	Prob.	Coefficiet	t-Statistic	Prob.	Coefficiet	t-Statistic	Prob.
Intercept	0.3195	23.3453	0.0000***	-0.2062	-2.6096	0.0216**	0.5545	5.2038	0.0002***
AD	-0.7501	-2.9294	0.0117**	–	–	–	–	–	–
PRO	-0.3262	-4.5232	0.0006***	–	–	–	–	–	–
MS	–	–	–	0.7409	2.6675	0.0194**	-2.5018	-8.9549	0.0000***
TO	–	–	–	–	–	–	0.4634	3.2687	0.0061***
LagAD	–	–	–	1.3696	5.2487	0.0002***	-1.9822	-3.4143	0.0046***
LagPRO	–	–	–	0.2435	3.2758	0.0060***	–	–	–
R^2	0.9150			0.9364			0.9494		
Adi.R^2	0.8809			0.8888			0.9114		

Note: *significant at 10%;**significant at 5%;***significant at 1%.

5. CONCLUSION

The empirical evidence revealed that increased advertising density does not contribute to acquiring a higher market share for the mid-range and high-end liquor enterprises. A higher ratio of sales stimulated the enterprises to invest more in advertising costs; however, it did not promote the market share. According to the findings, we provide the following recommendations.

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Change emphasis of advertising. The equation (1) shows that advertising density does not significant positive influence on market share. Therefore, if the enterprises want to increase market share, large-scale advertising has not be the optimal choice. The enterprises need to change the strategy on advertisement. In early growth phases of liquor enterprises, advertising costs are often aimed at obtaining a higher market share. While for the mid-range and high-end liquor enterprises, which are in the stage of rapid development, the gift-giving market share is higher than the market in which the consumers purchase and drink the liquor themselves. Consumers pay close attention to the brand and price, so the intention of advertising and emphasis should be changed. High quality products, standardized production and exquisite packaging are easily imitated by competitors, and only the cultural connotation of the brand is the core competitiveness of enterprises. The advertising of mid-range and high-end liquor enterprises needs a unique way to touch the hearts of consumers. By highlighting the enterprise culture and Chinese wine culture, the mid-range and high-end liquor enterprises should establish top brands and target consumers that are willing to buy them at a higher price, so as to attain the competitive advantage.

Ensure product quality and encourage product innovation. In the equation (2), we can find that both the higher market share and ratio of sales in prior period will stimulate the enterprises to invest more advertising costs. While the advertising density does not significant positive influence on market share. Therefore, the enterprises should try to search new way to get higher market share and ratio of sales rather than by improving advertising costs. The quality of the products should be the fundamental objective of the enterprises' business activities. If there is a product quality problem, it will make the consumers lose faith in the product, thus, they would opt to buy the other products. "The plasticizer" event is a very strong proof. Therefore, in order to achieve sustained competitiveness, the enterprises must avoid such incidents, or the enterprises may suffer irreversible failure. In the empirical analysis, we have found that advertising was not the the best means of increasing sales and profits, which requires enterprises to improve product differentiation in other aspects, and product innovation is one of the most effective ways. If the fundamental objective of quality of the enterprises' products has been achieved and maintained, then product innovation is the source of sustainable development for the enterprises. Therefore, both product quality and product innovation are indispensable.

Balance market share and ratio of sales. The equation (1) shows that the increased ratio of sales of samples does not play a promoting role on the market share's increasing and the results of equation (3) show that the market share has significant negative impact on ratio of sales. While the higher market share with lower ratio of sales is not significant and it deviates from the normal track of enterprise growth. Therefore, if the enterprises want to be the leader of liquor industry, they should increase ratio of sales with significant market share or enlarge market share supported by sustained high ratio of sales. This is a powerful success discipline for China's mid-range and high-end liquor enterprises.

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