

Judgment on Retail Format Structure

Sun Lu

Management School, Harbin University of Commerce, Harbin, P.R.China, 150028
(E-mail: sunlu800@126.com)

Abstract The retail format structure is divided into broad sense and narrow sense, and this paper refers to the latter. General equilibrium theory and similarity coefficients of clustering analysis are used to analyze Chinese retail format. High correlation between equilibrium of retail format structure and average assets return ratios has been also demonstrated. The conclusions are beneficial to government and retailers.

Key word Average Gssets return ratios; Retail format; Retail format structure; Similarity coefficient

1 Introduction

It is very important for retailers' investment choice and governmental macro-management to know retail format structure. In the academic literature pertaining to retail format, studies have traditionally limited to study of retail format evolution (Brown, 1987), study of retail format space structure (A.Losch, 1933; Berry. B.J.L.and Parr,J.B.,1988), study of retail structure (J. D. Forbes, 1964; Hiroataka Takeuchi, Louis P. and Bucklin,1977; Ritu Lohtis,2000), and study of format saturation (Langston, et al,1997; E. M. Buys, 2004). The study of format saturation is research on selected capacity of format in certain some place. A ripe saturation measure method was also put forward by the above researchers. The application of saturation is close to retail format structure study, while it only can be applied in a single format for which ignores comparison in different formats. In fact, it is difficult to judge the whole retail format structure state. Perfect distribution of retail formats in a selected place is rarely studied in home and abroad. Amit Bhatnagar, Brian T. Ratchford (2004) developed a general model of consumers store-format choice for a consumer having utility structure. Their work mainly concerned consumers' demands without regards to governments' governmental intentions and retailers' speculation. At all, their theoretical fruits enlighten and our insight.

The essence of structure efficiency of retail formats is the issue of equilibrium that is put forward by us, and the assumption of the equilibrium retail format structure is perfectly validated. The evaluation criterion of the retail format structure according to the general equilibrium theory is set up in the following context. From the perspective of format investment and governmental macro-management, retail format structure is put forward. And similarity coefficient (SC) of cluster analysis method is introduced to describe retail format structure. Then the correlation between Chinese retail format structure and the average assets return ratios (AARR) is analyzed with statistical method. There has been an implicit assumption in this study that each format development quantity has saturation in some selected places. Finally, implications from the study are discussed from the perspectives of both governments and retailers, and possible limitations and direction for future research are discussed.

2 Theoretical Basis

2.1 Conceptual definition

It is very important to decide a subject before one study a certain problem. So we first define scientific retail format structure. The retail format structure is mainly used to describe the conditions of retail format under a specified circumstance, but there is no clear definition of it. We propose that its definition shall be categorized into narrow sense and broad sense, based on a large number of retail literatures home and abroad. The meaning of retail format structure in narrow sense pertains to the relationship in quantity and respective relationship in proportion among various retail format assets, sales and profit inclusive of format types, given a specified economic and social condition. The meaning of retail structure in broad sense pertains to the relationship in quantity and respective relationship in proportion among the factors including retail format types, stores, assets, sales, profits, and spatial structure, given a specified economic and societal condition. That is, its inner essence includes types and quantities and proportionate relationship and distribution, and its extension includes quantity structure, assets structure, sales structure, profit structure and spatial structure. The following will be mainly engaged in explication of evaluation criterion of the structure and its relationship with average assets return ratio, on the basis of retail format structure in narrow sense.

This paper pays attention to main retail formats which can be classified into four species as

supermarkets, department stores, exclusive shop/specialty shop, and others including convenience store, warehouse club, grocery store, on-store selling etc. Among the four, department stores have higher breadth of assortment, but higher price. In turn, supermarkets have lower breadth as compared to department stores and lower prices. An exclusive shop/specialty shop has lower prices as compared to a competitive supermarket, but similar breadth of assortment.

2.2 Application of general equilibrium theory

The general equilibrium theory has been successfully applied in some fields such as development aid (Rob Vos,1998), emergence of political business cycles(Jan Tuinstra, 2000), allocation of carbon permits within a country (T. Huw. Edwards, 2001), policy analysis (Shujie Yao, 2000), economic transition (Xiao-guang Zhang, 1998).The general equilibrium principle can be perfectly used to analyze the retail format structure issue.

According to equilibrium theory, structure assessment substantively is to assess retail format structure equilibrium.

At first, it is necessary for retail format structure situation to construct a evaluation criterion on assessing retail format structure. Equilibrium of format structure means efficient. The essence of structure assessment is to assess the degree of format structure equilibrium.

According to H.H Gossen No.II Law, a consumer' income is limited; consumers have to make utilities created by the last unit of currency spent on each commodity, in order to obtaining the most pleasures and utilities. The common marginal utility per dollar of all commodities in consumer equilibrium is called the marginal utility of income. It measures the additional utility that would be gained if the consumer could enjoy an extra dollar's worth of consumption.

This fundamental condition of consumer equilibrium can be written in terms of the marginal utilities ($M_{uA}, M_{uB}, M_{uC}, \dots$) and prices (P_A, P_B, P_C, \dots)of the different goods in the following compact way:

$$\frac{M_{uA}}{P_A} = \frac{M_{uB}}{P_B} = \frac{M_{uC}}{P_C} \quad (1)$$

The pursuit of the consumers' maximal utilities is equivalent to the pursuit of the states' maximal profits. Experienced applications of general equilibrium theory tell us the consumer subject can be substituted by states, and purchasing activities can be equal to states' investment activities to various formats. So, it is reasonable for us to think that gap among ratios of assets return of all kinds of retail formats decreases that implies retail development is efficient. An ideal format structure shall be one in which ratios of assets return of all formats are equal, only in this way government can acquire efficient retail format structure.

3 Methodology

System similarity and variable similarity are different. Study of similarity of retail asset structure and retail profit structure corresponds to the former. Moreover, detailed comparison of systematic methods has been done in my doctoral dissertation which demonstrated that similarity coefficient method is the best.

3.1 Establish retail format structural vector

Retail format structure equilibrium status can be described according to the structural vectors similarity degree.

At first, we design assets structural vectors and profit structural vectors based on retail format assets distribution and retail format profit distribution in selected places, *the index of structure vectors as follows:*

The meanings of symbols below are important. GM_i means format assets of type i , LY_i means format profit of type i , t means time.

$$\text{Asset structure vector } GM = \{GM_1, GM_2, GM_3, GM_4\} \quad (2)$$

$$\text{Profit structure vector } LY = \{LY_1, LY_2, LY_3, LY_4\} \quad (3)$$

$C(GL)_i = \cos(GM, LY)_i$, means the similarity coefficient (SC) between retail format asset structure and retail format profit structure.

3.2 Describe retail format structure using similarity coefficient

The approach of SC derives from clustering analysis, application of which demand classifying both samples and variables, thus the concept of SCs is frequently needed. The standard definition is as follows:

More formally, let V be a collection of variables, and c is the real function of from $V \times V$ to $[1 \times 1]$, if satisfied:

$$c_{xy} = \pm 1 \Leftrightarrow x = ay, a \neq 0, a \text{ is a constant} \tag{4}$$

$$\forall x, y \in V, |C_{xy}| \leq 1 \tag{5}$$

$$\forall x, y \in V, c_{xy} = c_{yx} \tag{6}$$

c_{xy} is the SC of variables x and y . As $|c_{xy}|$ is closer to 1, the closer connection between x and y is, the higher degree of similarity is. The most frequently used SC is cosine of two structural vectors' angle. We assume vector of n dimensions from n times of observation values of the index variables I_i and $I_j, i.e.$ respectively $x_i = (x_{i1}, x_{i2}, \dots, x_{in})^T$ and $x_j = (x_{j1}, x_{j2}, \dots, x_{jn})^T$. Then, SC between variables I_i and I_j can be given:

$$C_{ij}(I) = \cos(x_i, x_j) = \frac{(x_i, x_j)}{\|x_i\| \|x_j\|} = \frac{\sum_{k=1}^n x_{ki} x_{kj}}{\sqrt{\left(\sum_{k=1}^n x_{ki}^2\right) \left(\sum_{k=1}^n x_{kj}^2\right)}} \tag{7}$$

The C_{ij} is close to 1 that implies the degree of equilibrium of retail structure is high, in other words, it's more ideal one.

Selected retail data from 9 Chinese cities and national data in 1999 (data from: *China markets yearbook 2000*) have been used to explore it. After calculation of the data, structure of nine places retail format is described, and ratios of retail average assets return corresponding to those cities are calculated, at last, we got those correlation Acquired retail format structure SC.

4 Results and Discussion

Shanghai, Beijing, Chong- qing, Tianjin got higher AARR than that of other citys. SCs of format structure of those cities are close to 1. It is obvious that format asset return ratios of four formats are close in those cities. That is, retail format structure of those city reached equilibrium. AARR in Xinjiang and Shanxi etc. are lower, their SCs of those retail structures are far from 1, that is, retail format structure of those cities developed disequilibrium.

Correlation between the format structure and AARR can be analyzed. And the coefficient of correlation between format structure and AARR have been computed: $r=0.83214, t=4.24$, where the significance level is 0.01, $t_{\alpha/2}=3.3554, t > t_{\alpha/2}$. Therefore, we claim that r passes test of significance level, namely, there is a high linear correlation between the SC of format structure and AARR. It proves that essence of the retail format structure quality is the equilibrium issue. An equilibrium retail format structure can create a higher AARR than a disequilibrium format structure can do, and an equilibrium retail format structure is a perfect retail structure.

Following issues should be paid attention to:

1) In the long term, retail formats structure is often disequilibrium, and transient equilibrium of retail format structure sometime takes place. This is because format development is characterized dynamic behavior, and format types and number develop at random. It is difficult to reach equilibrium of retail format structure.

2) Retail format development is characterized by life cycle. When a new format comes into being, its asset return rate always is lower than AARR. So, retail format structure appears disequilibrium at the beginning, and AARR is decreasing. But, it does not imply the retail format is a blind alley. Other more practical indices need to be introduced in order to judge health of this format.

5 Conclusion

5.1 Managerial implication

These results we acquired is applicable both on a macro-(government) and micro-(retailers) level. That is to say, it is beneficial for retailers to adjust format investment and for government to position strategically managerial decisions, to optimize human resources, to upgrade competitive ability and to protect domestic industries.

The results of this research also are implications for retailers' to adjust format strategically. The replication of the study at different time and region will enable retailers to ascertain effectiveness of the retail development level. What has been highlighted is the different priorities that each retail format and retailer has different perceptions of their business operation and investment. An implication of our study is that retailers interested in exploring possible opportunities to create new retail formats should pay

special attention to the retail format structure development. Furthermore, the consequent replications are essential to analyze the individual retail format.

In light of the current and prospective retail formats, and related challenges to managerial decision-making in the future we can through computing a regional format structure SC to judge local retail development, hence government can further study any individual format and reasonably adjust kinds and number of a regional retail format in order to improve regional retail competing power.

5.2 Limitation and future research

The current research, just like any other research, is not without its limitations. One limitation is the use of a convenience sample due to cost and time constraints. Because government pay little attention to retail than other industries lack of statistical workers help, we can not computed the retail format structure with longitudinal data to demonstrate the correlation of retail format structure and AARR. But, to optimize the local retail format structure, we should study in-depth in order to find the cause which results in lower assets return ratios of that retail format and adjust it.

This research is only elementary intermediate document of research on retail format structure issue; and research theories and methods need further to be improved and completed. Future studies on retail format structure may consider other antecedents of retail format structure. For example, Future researchers can extend this study by withdrawing our assumptions about prices and consumption rates.

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