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Performance of Major Franchised Takeout-Tea Brands in Taiwan

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Abstract:

With the growing takeout-tea market in Taiwan, consumers have more diverse selections of products, and takeout-tea shops in return have launched a variety of products and promotions to meet the demand. However, in recent years, the takeout-tea market in Taiwan has saturated, the analysis of operating efficiency for all brands have become the important topic of business management. Therefore, this study selected main 12 franchised takeout-tea brands in Taiwan for the scale efficiency analysis. Moreover, this study deploys the data envelopment analysis (DEA) method for the efficiency analysis. Results of this study show that, for the franchised takeout-tea brands, pursuing either the high quality or simply low-cost can get the good scale efficiencies; in contrary, the unclear brand image or middle-class brand positioning may lead to relatively low scale efficiencies. Furthermore, the analytic structure of this paper can apply to practical studies on other chain franchised business.

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1. Introduction

For the people in Taiwan, during the summer days, it is a great satisfaction to find a refreshing drink in the takeout-tea shops. In Taiwan along, the handmade takeout-tea beverages have the business opportunities for billions US dollars per year. Meanwhile, consumers are increasingly diversifying their choice of products; the industry therefore introduces a variety of products and promotions to increase sales. Therefore, many takeout-tea shops have opened up different tastes for consumers to make market segmentation to attract new consumers. However, with the booming development in recent years, Taiwan's takeout-tea beverage market has approached saturation, and how to strengthen the brand, deepen product depth, and make market segmentation has become more and more important. Therefore, analyzing the operational efficiency of each brand to understand the advantages and disadvantages and to improve them has become an important issue in management. For those reasons, this study selects the 12 main franchised chain takeout-tea brands in Taiwan for efficiency analysis. The study will first describe the current status of the main chain takeout-tea brands in Taiwan, then apply the data envelopment analysis method to analyze the quantitative efficiency of each takeout-tea brand, to know the current operation efficiencies of each brand, and explore possible ways to improve the abilities of competition. This study collects the most recent 2017 full year data for analysis, to know the relative operating efficiency and possible improvement direction of these main chain takeout-tea brands. The raw data is mainly obtained through the private job bank database and the official websites of every brand in Taiwan. This study can not only calculate the quantitative efficiency for each takeout-tea brand, but also simultaneously display the relatively inefficient operators for their future efforts and improvement.

2. Literature Review

The data envelopment analysis (DEA) method has been widely applied to many studies, including the manufacturing, construction, service, farming, and financial industries. This study reviewed some important studies as follows. For the manufacturing and construction industries, Liu and Yu (2004) used data envelopment analysis to assess the efficiency of plant maintenance to see how improvements in factories with poor maintenance efficiency can reach. El-Mashaleh et al. (2010) used data envelopment analysis to assess the safety performance of construction contractors to find contractors with poor safety performance and to give proper recommendations for improvement. Guo et al. (2018) aimed to assess the efficiency of transit oriented development (TOD) by applying the data envelopment analysis method. The ridership of public transportation is the direct output characteristic of TOD efficiency, and nine indicators of ridership as inputs on the basis of the core concepts of TOD. For the financial industries, Shahooth et al. (2006) assessed the efficiency of 24 Islamic financial institutions by data envelopment analysis. The study shows that most of the Islamic financial institutions in the survey are efficient, and only a few are inefficient. In addition, Rpdrlgez-Perez et al. (2011) also attempted to assess the efficiency of 85 Spanish insurance institutions by data envelopment analysis. The results of the study show that although most of the analytical agencies are not efficient, only a few are more resilient to new challenges and changes. Minh et al. (2012) attempted to improve the super-efficiency evaluation method of data envelopment analysis, and used the data of 145 agricultural bank branches in Vietnam as a case study, and found that the analysis results were more efficient than traditional calculation methods. For the service and farming industries, Donthu and Yoo (1988) used data envelopment analysis to assess a chain of retail stores to understand the efficiency of each retail store. Houshyar et al. (2010) used data envelopment analysis to assess wheat production efficiency in Fars Province, Iran. The results show that most farms can increase efficiency by adding proper staff. Azadi and Saen (2011) used data envelopment analysis to assess the efficiency of third-party logistics operators (3PLs) to learn about specific operational improvements. Kelly et al. (2012) evaluated the efficiency of Irish dairy farms by data envelopment analysis and found that the average technical efficiency of 0.785, and the average technical efficiency of 0.833.

Furthermore, for the theoretical studies about data envelopment analysis, Banker (1993) established the basis of the statistical theory of data envelopment analysis methods, so that this analysis method not only occupies an important place in practical applications, but also has a theoretical framework. Despotis and Smirlis (2002) attempted to improve the processing of inaccurate data met in data envelopment analysis and to transform the nonlinear data envelopment analysis mode into a linear data envelopment analysis mode to simplify the analysis. Wang et al. (2005) also attempted to blur the input and output variables of data envelopment analysis to further increase the data envelopment analysis applicability. Po et al. (2009) developed a data clustering model based on data envelopment analysis, but this model can only be used with the basic model of data envelopment analysis. Applicability of other data envelopment analysis models still needs to overcome. Kengil et al. (2010) and Liu et al. (2013) collated the application and development history of data envelopment analysis for further application and development of next application studies. Yilmaz and Yurdusev (2011) tried to combine data envelopment analysis with Multiple Criteria Decision Making (MCDM). Shokouhi et al. (2010) added data envelopment analysis to the uncertainty factor and named the method Robust DEA (RDEA). The improved model proposed by this study has expanded the data envelopment analysis. El-Demerdash et al. (2013) also discussed data envelopment analysis applications for the case of random input variables to improve the data envelopment analysis model. Mehdiloozad et al. (2018) proposed method can deal with negative data, and is also computationally more efficient than the existing approaches. Finally, Zhou et al. (2018) tried to give a detailed illustration about DEA application for different industry sectors, shows that Figure 1. It clearly showed the DEA method can deploy in many research fields.

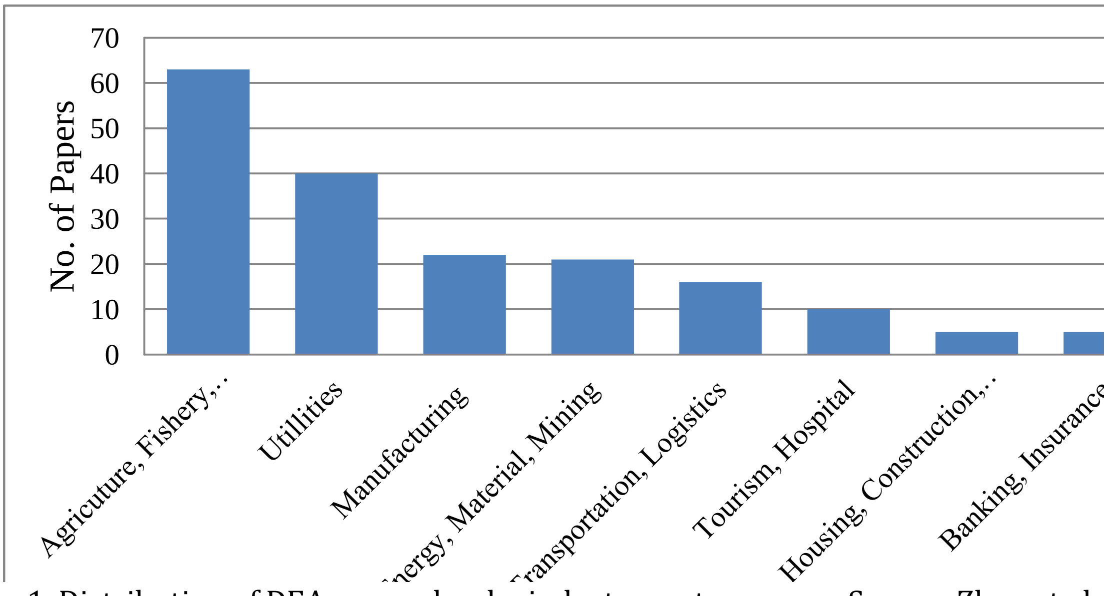

Fig. 1. Distribution of DEA researches by industry sector. Source: Zhou et al., 2018.

3. Methodology

Charnes, Cooper, and Rhodes proposed the data envelopment analysis method in 1978. It is from the concept of productivity that Farrell proposed in 1957. It is a method of assessing the efficiency of decision-making units (DMUs) by means of mathematical planning. The idea is to replace the traditional production function of the "envelopment curve" technology, which is a non-parametric measure of the efficiency, using the "production frontier" as the basis of measuring efficiency and finding the production boundary. There is no need to preset the production function mode, and the target input and output data is through the mathematical model to find the production boundary. However, Farrell's efficiency evaluation model only applies to single input and single output. In reality, the manufacturer has many outputs and inputs; therefore, Charnes, Cooper and Rhodes based on Farrell's theory and expand it into a model of multiple inputs and multiple outputs, and propose a production boundary calculated using linear programming in the case of fixed-scale return, and finally measure the relative efficiency of each decision-making unit. It is the CCR model of data envelopment analysis. Moreover, the basic assumptions of the CCR model are fixed-scale return; in fact, some decision-making units cannot produce at the optimal scale because of the case of increasing or decreasing scale returns. Therefore, Banker, Charnes and Cooper went on to propose the BCC model in 1984, lifting the fixed-scale returns assumption, and meanwhile considering measuring the relative efficiency values of different scale returns. The BCC model divides technical efficiency into pure technical efficiency (PTE) and scale efficiency (SE). Therefore, the reason for the inefficiency of technology is not only the improper allocation of input and output, but also the scale factor of the decision-making unit. In other words, if we want to eliminate the inefficiency of the manufacturer, as well as to adjusting the input and output factors, we can also start by adjusting the scale factor. The main assumptions are that the most efficient units form a production front, and the relatively inefficient units are below the leading edge. In addition, Farrell divides overall efficiency (OE) into two types, one is technical efficiency (TE) and the other is allocative efficiency (AE), also known as price efficiency (PE). The former are the ability to get great output under the given input, or to minimize the input under the established output; the latter is to find the input and output combination under the established input and output prices.

When applying the data envelopment analysis method of relative efficiency evaluation, it is first necessary to decide the evaluating object, that is, to select those decision-making units as a comparison of relative efficiency. Therefore, when selecting a decision-making unit, factors such as the homogeneity of the decision-making units must consider. When deciding on the size of the unit under evaluation, the general rule suggests that the decision-making units are at least twice the sum of the input and output items. The CCR model measures the efficiency value of a decision-making unit under the constant return to scale (CRS), so it is also called the CRS model. The BCC model is also called the VRS model because it measures the pure technical efficiency value of the variable return to scale (VRS). In the data envelopment analysis mode, the CRS mode evaluates the overall efficiency, and the VRS evaluates the technical efficiency. In other words, the fixed-scale compensation model is an efficiency assessment that compares all decision-making units together, while the variable-scale compensation model asset only the evaluated units. Further, the data envelopment analysis model divided into input-oriented and output-oriented; the input-oriented model is to control the input amount, that is, to fix the existing output value to calculate the part of the input factor that can reduce. If the output controlled, the output-oriented style can adopt, and the existing input thus fixed to calculate expansion of the output factor. Finally, the theoretical framework of the data envelopment analysis, such as, assumes a data envelopment analysis with five decision units (A, B, C, D, E), while the input variable has two items of X1 and X2, and the output variable is only Y item. In Figure 2, A, C and D are all on the efficiency frontier line, so these three decision units are efficient units; in contrast, B and E are not on the efficiency frontier line, so they are relatively the unit of efficiency.

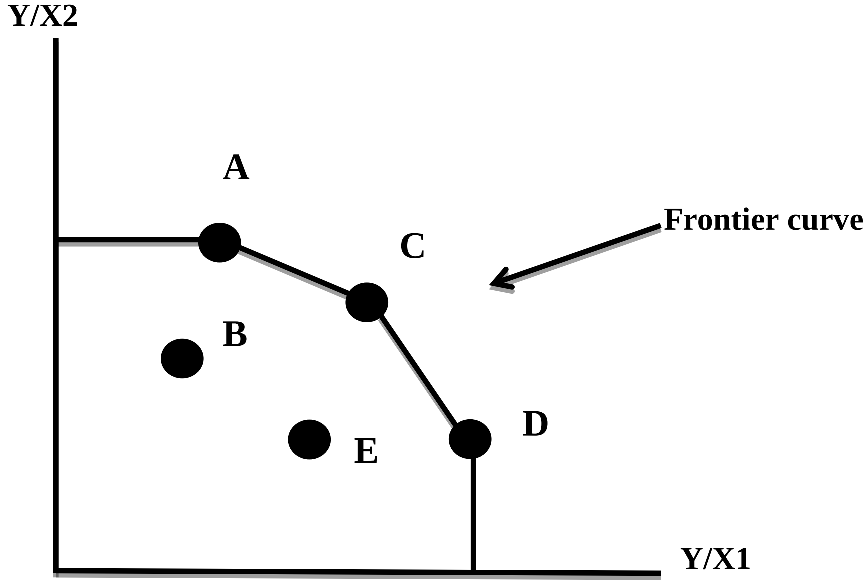

Fig. 2. Efficiency frontier curve. Source: Shahooth et al., 2006.

The structure of Fig. 2 above, if expressed in mathematical form, can expressed as follows (Shahooth et al., 2006):

$$\text{Technical efficiency} = \frac{\Sigma\text{weighted output}}{\Sigma\text{ weighted input}} \quad (1)$$

After further expression, the mathematical formula (1) expressed as follows:

$$E_k = \frac{\sum_{j=1}^{M} U_j\, O_{jk}}{\sum_{i=1}^{N} V_i\, I_{ik}} \quad (2)$$

among them,
E_k: value of technical efficiency, between 0~1.
k: number of decision units.
N: number of inputs variables.
M: number of output variables.
O_{jk}: value of the output variable j of the decision unit k.
I_{ik}: value of the input variable i of the decision unit k.
V_i: weight of the input i.
U_j: weight of output j.

Finally, to solve with linear programming as follows:

$$\text{Max. TE}$$
$$\text{s. t.}$$
$$Ek \leq 1 \qquad k = 1,2, \ldots K \quad (3)$$

The TE in the target formula may either the maximum output in the known input or the minimum input in the known output.

4. Case Study

In this study, the "amount of capital," the "number of shops" and the "number of employees" were defined as input variables, and the "amount of annual revenue" was used as the output variable. The study collected operating data of the 12 chain takeout-tea brands in 2017, shows that Table 1. All the data obtained from the websites of every brand or the website of the private job banks.

Table 1. Case data.

Brand	Capital (Thousand USD)	No. of Shops	No. of Employees	Annual revenue (Thousand USD)
Kingyo	1,307	259	1,813	30,878
Chingshin	73	1,079	8,632	173,660
Tp-tea	33	155	1550	49,893
Chatime	1,176	40	240	3,684
Orangetea	304	64	512	4,515
50-lan	817	411	2,466	56,349
Coco	3,266	1,200	10,000	228,639
Comebuy	2,613	197	500	32,663
Sharetea	980	80	480	9,799
Teaplus	359	82	492	11,731
Presotea	653	250	1,750	40,236
Okla-tea	7	460	920	109,681

Note:

1. Exchange rate of Central Bank (Taiwan), 1 August 2018, NTD/USD=30.616.
2. All the data including Taiwan and overseas.

In this study, the envelope analysis of the case data carried out with the "DEA Solver Online Edition" software. Firstly, the basic CCR model then used to analyze the fixed-scale return assumption, and the relative efficiency value results shown in Table 2. Among them, Okla-tea and Tp-tea are the most efficient (efficiency value is equal to 1) brands, while Orangetea is the least efficient one.

Table 2. Efficiency results by CCR model.

Brand	Efficiency value
Kingyo (DMU1)	0.410255
Chingshin (DMU2)	0.616780
Tp-tea (DMU3)	1
Chatime (DMU4)	0.328766
Orangetea (DMU5)	0.234368
50-lan (DMU6)	0.48936
Coco (DMU7)	0.625710
Comebuy (DMU8)	0.679369
Sharetea (DMU9)	0.437189
Teaplus (DMU10)	0.510637
Presotea (DMU11)	0.553847
Okla-tea (DMU12)	1

Moreover, the study carried out the analysis of the variable-scale return assumption based on the more advanced BCC model, and the relative efficiency value results shown in Table 3. Among them, Chingshin, Tp-tea, Chatime, Orangetea, Coco, Teaplus, Okla-tea have the highest relative efficiency (efficiency value is equal to 1), while Kingyo is the least efficient brand.

Table 3. Efficiency results by BCC model.

Brand	Efficiency value
Kingyo (DMU1)	0.461932
Chingshin (DMU2)	1
Tp-tea (DMU3)	1
Chatime (DMU4)	1
Orangetea (DMU5)	1
50-lan (DMU6)	0.498542
Coco (DMU7)	1
Comebuy (DMU8)	0.851808
Sharetea (DMU9)	0.820475
Teaplus (DMU10)	1
Presotea (DMU11)	0.593093
Okla-tea (DMU12)	1

Since the BCC model measures "pure technical efficiency", the CCR model measures the "technical efficiency," if the technical efficiency divided by the pure technical efficiency, the "scale efficiency" thus obtained. Therefore, based on the analysis results from CCR and BCC models, this study further calculates the scale efficiency values of 12 case brands shown in Table 4. Among them, "Tp-tea" and "Okla-tea" have the highest relative efficiency, while "Orangetea" has the lowest relative efficiency. This result represents that in the current chain takeout-tea brands, the investment and output of the two brands "Tp-tea" and "Okla-tea" are relatively efficient, while "Orangetea" has relatively low efficiency. Furthermore, since "Tp-tea" goes a refined and high quality way of operation, "Okla-tea" goes a simple low storefront cost way; while the "Orangetea" goes between these two ends. Therefore, the results might imply that in the chain takeout-tea industry, good scale efficiency obtained in both the high quality and simple low-cost business positioning. As for the vague brand image positioning between these two ends, the operation scale efficiency is poor.

Table 4. Results of scale efficiency

Brand	Scale efficiency value
Kingyo (DMU1)	0.888129
Chingshin (DMU2)	0.616780
Tp-tea (DMU3)	1
Chatime (DMU4)	0.328766
Orangetea (DMU5)	0.234368
50-lan (DMU6)	0.981522
Coco (DMU7)	0.625710
Comebuy (DMU8)	0.797561
Sharetea (DMU9)	0.532849
Teaplus (DMU10)	0.510637
Presotea (DMU11)	0.933828
Okla-tea (DMU12)	1

5. Conclusions

In recent years, the economic development in Taiwan has been sluggish, and to start a small business has become another choice for many people. As a result, the franchised takeout-tea shops have flourished in Taiwan for these years. However, with the booming development, Taiwan's takeout-tea market has approached saturation, and how to strengthen the brand influence, deepen the product depth, and make market segmentation has become more important than ever. This study selected main 12 chain takeout-tea brands in Taiwan for analysis. The "capital amount", "number of shops" and "number of employees" are defined as input variables, and "annual revenue" is used as the output variable. Results of this study show that in the chain takeout-tea market, good scale efficiency obtained in both high quality and low-cost business models. As for the brands which have middle class positioning policy or the brands with vague images, the scale of operational efficiencies are worse. Moreover, for the recommendations, the popular data envelopment analysis models of CCR and BCC deployed for efficiency evaluation in this study; however, this study suggested that the following studies can try other more advanced data envelopment analysis models to get more comprehensive analysis results. In addition, it is also recommended adding the inputs and outputs variables in further studies. The future direction of research is to enhance the soundness of variables definition and apply to other franchised business fields.

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