An Empirical Study on the Business Performance of Freight Forwarding：A Case Study of an Ocean Freight Forwarder

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ABSTRACT

The purpose of this paper is to analyze the business performance of an ocean freight forwarder based on this company's practical data. The input and output variables related to the business operating of case company are first developed. By using Data Envelopment Analysis (DEA), the operating efficiency of each shipping line is calculated. As a result, the relationship among the relative efficiency, enterprise environmental factors and profitability is examined to understand the overall business performance and the relative efficiency differs significantly among the different operating region. The Mainland China region which nearby Taiwan have the highest relative efficiency, followed by short-sea region and deep-sea region respectively. In conclusion, the technical efficiency, all the relative efficiency values are affected by season. Both the pure technical efficiency and scale efficiency are more higher in the first season than the second. Besides, the relative efficiency have significantly positive vary with profitability. In other words, the higher technical efficiency, pure technical efficiency and scale efficiency all can lead to the higher operating revenue and profit margin.

Key words: Business Performance, Ocean Freight Forwarder, Case Study

1. INTRODUCTION

Freight forwarding industry is refined as to handle air and ocean shipments of cargo for clients. Most people in this industry started on themself business operating, accumulated long-term experiences and brought to the interpersonal relationships from air or ocean freight forwarder. It had legistated laws and exclusive authorities to supervise and manage the industry of all nations in the world. In this highly competitive environment, most freight forwarders will take business-oriented approach to provide co-load services with each others. However, some of them still endeavor to develop their own customers. They maintain long-term relationships with customers and provide high-quality services to achieve the goal of profitability and sustainabilit. Therefore, operating efficiency is more importance to business managers in this paeticular industry. Except for the publicly companies which had been supervised by the government authority, due to differences in organizational scale, business strategies and characteristic are as well as the efficiency evaluation method for ocean freight forwarding industry, most forwarder usurelly used their own methods to evaluate business performance.

The traditional concept of human resource focuses on the management of people as expense. Modern management of human resources views human resources as a enterprise asset and centers it on optimal planning and utilization of organization. The cost structure of ocean freight forwarder is just the opposite to the shipping carriers. Ocean freight forwarder usually do not have huge investments in transport facilities. Under the non-asset based, personnel cost takes a dominant portion (about 60~70%) of their operating costs. Therefore, human resource and human network are two key successful factors of ocean freight forwarder. Ocean freight forwarder also relied on heavily teamwork. Manpower is the most expensive costs that increased with the accumulated of experience on the specialized abilities [15] (Tseng et al., 2010). Due to this characteristic, the excellent staffs and salary are the major investment and operating cost of ocean freight forwarder. How to Improve every staff’s productivity of human resource that is the priority for this industry. For the management, it is important that how optimum human resources to be used to create the maximum profits of the company. In other words, they need to know how many staffs that they should hire to finish the target. The management get hold of the efficiency of each carrier option and the overall performance of the company before making any decision. Hence, performance evaluation is indeed a critical issue for th magement of ocean freight forwarders.

Performance evaluation (also call performance measurement) is a system of indicators that a company can use to assess the performance of its regular business activities. [13] Robbins, DeCenoz, and Moon (2008) described that Effectiveness and efficiency deal with what we are doing and how we are doing it. Efficiency means doing the task correctly and refers to the relationship between inputs and outputs. Therefore, management seeks to minimize resource costs. Performance evaluation applies indicators, which can be either quantitative measures or subjective judgments, to evaluate the progress of an activity or people involved in the activity. It can be used to evaluate many kinds of subjects, ranging from an activity, an individual, a group, a department to a company as a whole, depending on users’ understanding and use of performance evaluation. One of the approaches to improving the business efficiency of an ocean freight forwarder is to measure the execution efficiency of its business operations. Through efficiency evaluation, ocean freight forwarders can understand the actual use of resources and set up appropriate resource control measures. Moreover, they can analyze their own strengths and weaknesses, get hold of opportunities and threats from the external environment to design an effective allocation of their resources. With regard to efficiency evaluation, [11] Kassem and Moursi (1971) quoted the definition addressed by Reddin. In their opinion, organization performance is the degree that managers achive the organization's objection change to. In the past, there are many ways for measuring business performance. There were many different indicators that be used to research, such as return on investment, return on sale, return on assets, return on equity, cash flow from the operating activities, comparative market position, market share, sales and market share growth, sales growth, the stability of market share and productivity of employees, net income before tax, profitability, customer satisfaction, the change of interest expense on productivity, residual Income and economic value added ([18] Woo and Willard 1983, [5] Dess and Ramanujam 1984, Richardson et al. 1985, [17] Vickery 1991,[7] Green and Barclay 1995, [14] Srivastava 1996, [1] Busija et al. 1997, [10] Horngren et al. 2009). [16] Venkatraman and Ramanujam (1986) proposed a more structured framework for measuring business performance. They suggested that business performance consists of three domains, including financial performance, business performance and organizational performance, and special attention should be paid to conflicts between dimensions when using factors from multiple dimensions for performance evaluation. Based on the liturature review, this study uses profit performanceas as the indicators business performance.

The focus of extant literature of ocean freight forwarders concentrates on the supervision, legal status, responsiblities and business strategies aspects of ocean frieght forwarders. In the aspect of business performance evaluation, [3] Coelli, Rao, and Battese (1998) and [12] Oum, Waters Ⅱ, and Yu (1999) listed and defined four methods to measure the operational performance, such as the Index Number, the Least Squares, the Data Envelopment Analysis, and the Stochastic Frontier Analysis. [8] Gengui, Hokey, Chao and Zhenyu (2008) evaluated the performance of third-party logistics in China using DEA. They employed four input variables (for example, net fixed asset, salaries and wages, operating expense, and current liabilities) and one output variable (such as operating income) to evalaute the performance. The proposed DEA method can be easily modified and extended to similar settings in ocean freight forwarders. Based on financial and non-financial data of an ocean freight forwarder, this paper will apply DEA to calculate the relative efficiency of each shipping line and analyze the inputs and outputs of the case of ocean freight forwarder. Further, this paper will examine the relationship among the relative efficiency, enterprise environmental factors and profitability to understand the overall business performance of this industry.

This paper is organized as follows: Section 1, a brief introduction. Section 2, explanations of the research method, including research framework and hypotheses. Section 3, The illustrated case description, we descripted the illustrated case and definited the input and output variables. Section 4, presentation the empirical analysis and results. Section 5, conclusion.

2. RESEARCH METHOD

Data envelopment analysis (DEA) was originally a method for measuring production efficiency based on the concept of efficiency frontier introduced by [6] Farrell (1957). [4] Charnes, Cooper and Rhodes (1978) reformulated it into a mathematical programming model called CCR. Later, [2] Banker, Charnes and Cooper (1984) extended it into a model called BCC to assess business productivity. DEA is a non-parametric approach. By means of mathematical programming techniques, it uses ex-post data to evaluate the efficiency of each decision making unit (DMU). It compares the relative efficiency of each DMU to find the most efficient DMU given the available resources. It sets the most efficiency DMU as 100% to determine the efficiency percentage of each other DMU. Through comparison, DEA can not only obtain the efficiency of each DMU but also provide suggestion on optimal adjustment of inputs and outputs of inefficient DMU. For each DMU, it can advise an optimal weight for each input and input to increase their relative efficiency. DEA uses a piecewise linear efficiency frontier to measure efficiency, because the production possibility set in the BCC model is a strong efficiency subset, slacks may exist.

In the first, we applied the CCR and BCC model to calculate the relative efficiency of each DMU and analysis the efficiency for each DMU. Then we establish hypotheses and use statistical methods to test the effectiveness of resource allocation to understand the business performance.

(1). Research Framework

The business performance is reflected upon enterprise environmental factors, input factors and output factors. Enterprise environmental factors include operating region (e.g. Mainland China, short-sea and deep-sea) and season; input factors include working hours of sales staff, working hours of operating staff, operating cost and cost of working capital; output factors include amount of full container loads and amount of less-than container loads. The purpouse od this study is to analyze the input and output variables of the ocean freight forwarder and further understand the overall business performance through exanining how the relative efficiency that is related to enterprise environmental factors and profitability. Based on the purpose, the evaluating procedure consists of two steps. The first step, to calculate the technical efficiency, pure technical efficiency and scale efficiency of each shipping line using DEA and the second step, based on the three relative efficiency and integrated with enterprise environmental factors and profitability by using Wilcoxon Socres (Rank Sums), Kruskal-Wallis Test, Wilcoxon Two-Sample Test, and Chi-Square Distribution to test and understand all of their relationships. The research framework is shown as in Figure 1.

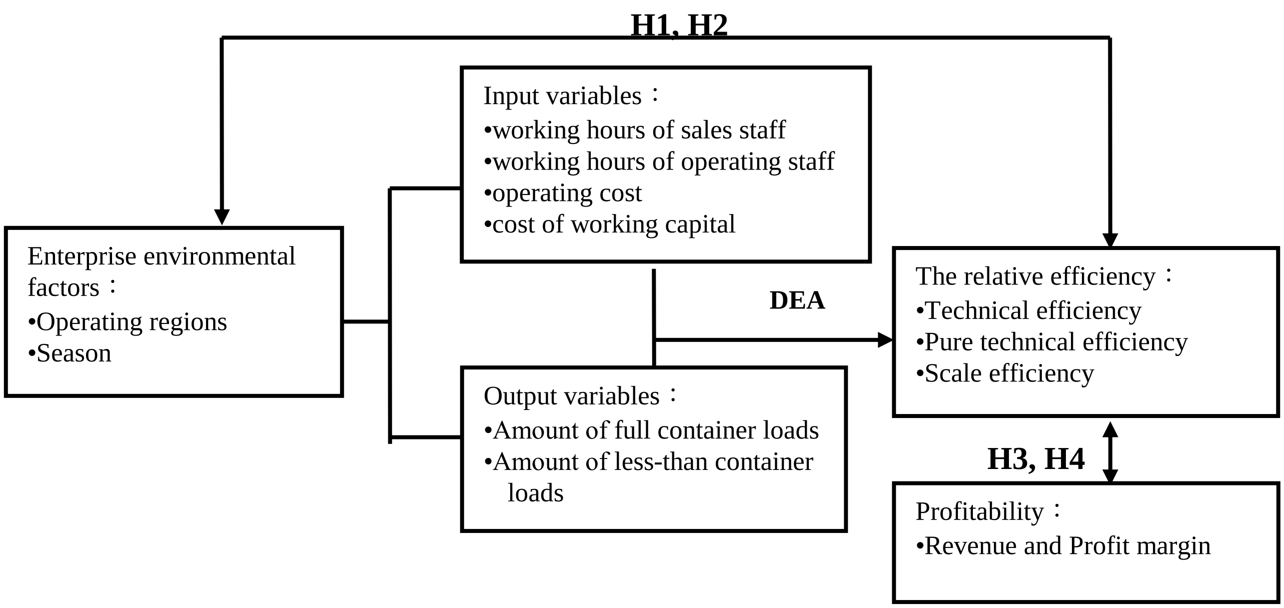

Figure 1 Research framework

(2) Research Hypotheses

To evaluate the overall business performance of ocean freight forwarder, this study developed the following hypotheses based on the research framework. These hypotheses were intended to test if the relative efficiency varies by shipping lines, season, operating and profit margin. An explanation for each hypothesis is provided as follows:

A. The Enterprise Environmental Factors and Relative Efficiency

An ocean freight forwarder consists of several departments, mainly including the business department, the shipping department, the documentation department, the export department, the management department, and the triangle trade department. The business department is in charge of providing customer services at the frontline. Its performance has direct effects on the entire company's performance. Generally, it uses four criteria, including shipping line, operating region and shipping cargo type or averaging, to attribute responsibilities. In this research, shipping line and operating region are both considered to average differences. The first hypothesis is as follows:

H1: The operating region and relative efficiency are not related.

There is a business cycle for every industry. For ocean freight forwarders, business and loads which vary by season affect their inputs and profitability. Generally, they have larger loads from June to August and from October to December and normal loads in other months. If there is a global economic slowdown or any financial storm, their loads will be seriously affected all year round. Therefore, this paper proposed:

H2: The season is not a significant with the relative efficiency.

B. The Profitability and Relative Efficiency

To achieve high performance, managers stress high efficiency and high effectiveness in business management. They endeavor to achieve high effectiveness even without high efficiency. Managers of ocean freight forwarding are no exception; they attempt to gain support of better business to increase their revenues while paying attention to cost management to enhance the profitability and value of the company. In terms of profitability, there is still a difference between regular shipping lines and special lines. For instance, ocean freight forwarders who have a contract with ship carriers to provide freight forwarding to the US or who can handle shipments to Africa (which fewer competitors can) will certainly have a competitive advantage. The profits they create will contribute greatly to their company's profitability. The profits from normal forwarding cases are limited. However, if forwarders can get a larger number of loads, they can create more profits and also get some intangible benefits. For instance, if they have a ship carrier willing to provide relatively cheaper shipping conditions, their clients will be very pleased to let them handle their cargo. Such favor will increase the business performance and the overall reputation of their company. Therefore, the third and fourth hypotheses are as follows:

H3: The revenue and relative efficiency are not related.

H4: The profit margin and relative efficiency are not related.

3. THE ILLUSTRAED CASE AND VARIABLE DESCRIPION

(1) The Illustrated Case Description

In this section, we simply described the case company that is an international company in Taiwan. Her head office is located in Taipei and has been in the business for more than sixteen years. There are more than 1,000 employees in the overall company. Over the past decade, the company has become an integrated service provider with over thirty-own offices in 7 countries plus a global agency network. She has the agencies in major seaports throughout the world to coordinate with several main shipping carriers, such as Evergreen Marine Corporation, Wan Hai Lines, Yang Ming Marine Transportation Corporation, CNC Line, Hyundai, KMTC AIR-SERVICE LTD., P&O Nedlloyd, and OOCL line, Hanjin, Maersk Sea Land and APL etc. For offering the international logistics service the network cover the major seaports in many country of the world. In addition, she provides domestic logistics services for the customer located in the primary cities within her country. She owned large-scale global operations and provided the high-quality service foe her customers. Based on her excellent operating service in the Asia, the company's target strategy will expand the share of oceanic market to provide more globally logistic services. Since opening up in late 1980s China has become a global source of all kind of products and thus cargo volume has been booming. In 1998, she first entered the market of Hong Kong and Mainland China. In 2004, the company had been approved as an eligible enterprise with the registration certification by the Chinese government newly regulated rule. Presently, there are more than thirty branches and representative offices in major seaports across the People's Republic of China. She also has been continuously expanding in overseas countries, starting the strategic alliance with her agent to provide the logistics service in Indonesia, Singapore, Dubai, and other foreign spots. Other than that, the company again established her branch offices in the United States and Vietnam in 2006. As a global enterprise, she provides the high-quality and high-competitive international logistics services across-the-board Taiwan, Hong Kong, Mainland China, Indonesia, Europe, American, and Vietnam in the world.

(2) Variables Selected and Defined

DEA calculates the relative efficiency of each DMU based on input and output data. The efficiency evaluation results are affected by the correctness and adequacy of the input and output variables collected. Performance standards can be based on external standards or internal standards. The external standards are set from the perspective of cusmoters, suppliers, creditors and community, while the internal standards are set from the perspective of owners, employees, union, company goal, organizational system, strategic factors and competitive value. Factors affecting effective and ineffective behaviors differ across industries, and so do variables of performance behaviors. Variables of performance standards should be selected based on industry characteristics. So far, few of publications have addressed this aspect of ocean freight forwarders. Therefore, this study selected input and output variables for the ocean freight forwarder through the following procedure:

Step 1: Inquire managers of the company, requesting them to explain their organizational goals and managerial goals.

Step 2: Visit supervisors of business and operating staff, requesting them to confirm the input and output items and provide working hours data of staff responsible for each route during the research period.

Step 3:Summarize the indices of input and output items and submit them to the management for confirmation.

Step 4: Request the company to provide other necessary data.

Step 5: Build a database after data collection.

The research data were collected from the business operating data of an ocean freight forwarder from during the first half year of 20xx after following the above five steps. The data encompassed twenty-one shipping lines. After the arranging, there are eighteen shipping lines were selected and classified into three groups, including Mainland China (MC) region (China and Hong Kong), short-sea (SS) region (Indonesia, Japan, Korea, Malaysia, Singapore, Thailand, Philippines, Vietnam and Middle East) and deep-sea (DS) region (American/Canada, Europe, New Zealand/Australia, Africa, Mediterranean, triangle trade and other). The data consisted of both financial and non-financial data. The data of each shipping line in each month were viewed an independent DMU and followed the homogenous, and the sample comprised of 108 (18 shipping lines × 6 months) DMU that were more than DMU amounts of the definitions of [9] Golany et al. (1989). The input and output variables were constant across all DMU. The required of DEA that outputs do not decrease with the increase of inputs. Hence, there are certain limitations on the number of input and output items. Basically, the number of DMU should be at least twice the number of input and output items. This study uses 108 DMU, so it is compliant with this requirement.

Based on the period business operating data, completely defined the relative input and output variables and their correlations were summarized in the Table 1.

Table 1 The summarized of input and output variables

Panel A Input and output variables

Variables	defination
Input variables	
1.Working hours of business staff (HOUR1)	The staff includes managers and general staff responsible for the business of each route. The collected data are expressed in hour.
2.Working hours of operating staff (HOUR2)	The staff includes managers and general staff responsible for the operation of each route. The collected data are expressed in hour.
3.Operating cost (COST1)	Ocean freight forwarders provide international logistics services at a fixed business location. Their revenues come from the difference between buying prices and selling prices of their services. Their operating costs include shipping cost, documentation cost, stuffing cost, terminal handling charge and employee salary.
Cost of operating capital(COST2)	Ocean freight forwarders need to prepay some costs for their clients and may sometimes have overdue payments. Their cash flow is normally high. To suffice such demand, in addition to self-owned funds, they need to use funds borrowed from financial institutions.
Output variables	
1.Amount of full container loads (OUT1)	The number of 20-ft and 40-ft general and high containers, all converted into 20-ft equivalent units (TEU). The loads include self-handled loads and co-loads.
2.Amount of less-than container loads (OUT2)	The amount of self-handled loads and co-loads, all converted into the cubic meter unit (CBM). The loads include self-handled loads and co-loads.

Panel B Contemporaneous Pearson Correlations[a]

Variables	HOUR1	HOUE2	COST1	COST2	OUT1	OUT2
HOUR1	1.000					
HOUR2	0.9028***	1.000				
COST1	0.1396***	0.1416***	1.000			
COST2	0.6296***	0.6142***	0.4461***	1.000		
OUT1	0.8451***	0.8274***	0.1903**	0.1982**	1.000	
OUT2	0.5568***	0.4631***	0.1647*	0.2325**	0.6958***	1.000

a The test is significant at the 10 % (*), 5 % (**), and 1% (***).

4. EMPERICAL ANALYSIS AND RESULS

(1). The Analysis of Relative Efficiency Value

This section presents the results of empirical analysis performed on the basis of the method and hypotheses introduced previous sections. The relative efficiency of each DMU was calculated using the DEA Solver Pro 6.0 (2007). The efficiency value, returns to scale and the slack variables of input and output factors of each DMU are listed in the Appendix A.

Following the appendix, the technical efficiency (TE) is measured by the pure technical efficiency (TPE) and scale efficiency (SE) of each DMU; whether the pure technical efficiency reflects the input resources have been effectively used and minimized in practical operation of each DMU. There are eighteen DMU (16.76%) have a technical efficiency value of 1 that means they are more relatively efficiency than other DMU. The Hong Kong, Vietnam and Africa three lines all have four DMU with 1. Both other and Thailand lines have two DMU with 1 and The China and Indonesia lines also have one DMU with 1. All the other ninety DMU are less relatively efficiency. During the six months, the least three efficient DMU are the Middle East line in February (0.4693), the other line in April (0.4633), and Middle East line in January (0.4595). In terms of the pure technical efficiency, there are thirty-three DMU (30.56%) reached 1. The Hong Kong, Thailand, Vietnam and Africa four lines maintain high pure technical efficiency crossed the six months (within Top 3). The Middle East line has poor performance both in terms of the technical efficiency and pure technical efficiency crossed the six months. It even ranked the sequence of 100 on the technical efficiency and pure technical efficiency in April, with a scale efficiency value of 0.7100. Its poor efficiency is mainly attributed to the technical and scale factors, which have caused the wasted resource, especially while the returns to scale are decreased.

(2) The Analysis of Relative Relative Efficiency Value for Each Shipping Line

After obtaining the mean of TE, PTE and SE of all shipping lines are respectively 0.7277, 0.8650 and 0.8322, this paper further calculated the mean of three kinds of relative efficiency of the six months for each shipping lines and summarized in Table 2.

Table 2 The relative efficiency of lines[b]

Line[a]	TE	PTE	SE	Line[a]	TE	PTE	SE
1	0.7904	0.8904	0.8876	10	0.9204	0.9467	0.9722
2	0.4925	0.7482	0.6582	11	0.5009	0.8294	0.6039
3	0.9734	0.9878	0.9854	12	0.6958	0.8697	0.8000
4	0.7641	0.8638	0.8845	13	0.7988	0.8733	0.9146
5	0.6783	0.8348	0.8125	14	0.4981	0.7235	0.6884
6	0.5996	0.8150	0.7357	15	0.6001	0.7859	0.7635
7	0.7520	0.8408	0.8943	16	0.9815	1.0000	0.9815
8	0.6937	0.8531	0.8131	17	0.9863	0.9995	0.9867
9	0.8070	0.8947	0.9019	18	0.5660	0.8137	0.6955

[a.] 1:China, 2:Eurpon, 3:Hong Kong, 4:Indonesia, 5:Japan, 6:Philippine, 7:Malysia, 8:other, 9:Singapore, 10:Thailand, 11:Karor, 12:triangle trade, 13:New Zealand/Australia, 14:Middle East, 15:American/Canada ,16:Vietnam, 17:Africa, 18:Mediterranean.

Under the comparison, the mean efficiency values of each individual lines and the mean values of all lines include the China, Hong Kong, Singapore, Thailand, New Zealand/Australia, Vietnam and Africa lines all have higher technical efficiency and pure technical efficiency than the mean levels of all the lines during the six months. This suggests that low efficiency is mainly caused by low pure technical efficiency and scale efficiency. The Indonesia and Malaysia lines have higher technical efficiency than the mean level of all lines, but their mean pure technical efficiency is lower than the mean level of all lines. Their poorer pure technical efficiency could be a result of ineffective use of input resources. The Europn, Japan, Philippine and Middle East four lines have lower mean technical efficiency and pure technical efficiency than the mean level of all lines. The efficiency of these lines may have been affected by technical and scale factors, which can result in a waste of input resources. In addition, the triangle trade line has lower mean technical efficiency than the overall mean technical efficiency of all lines, but its mean pure technical efficiency is higher than the overall mean level of all lines. This implies that there is no waste of input resources in this line, but the efficiency of this line is still limited by certain technical and scale factors. The above analysis supports the ocean freight forwarder's business strategy, which is to concentrate on short-sea regions business. Besides, special lines can help a freight forwarder build competitive advantages. The results show such as Africa line, have made a great contribution to the company's profitability. Overall, the high technical efficiency values concentrate in January and June. The pure technical efficiency is high in January, February and June and declines from March to May. Generally, February being the month of Chinese New Year Holidays, despite the fact that there are fewer business days in this month, the huge demand for exports before Chinese New Year will increase the freight forwarder's business in this month. Besides, March, April and May span from the end of first season to the mid of the second season. The freight forwarder's business will be seriously affected before business activities begin to flourish after the holiday.

(3) The Analysis of Business Performance

A. The operating region and operating efficiency

In the Appendix B, Panel A, following the results by Wilcoxon Socres (Rank Sums) and Kruskal-Wallis Test, summarizes the relationships of the operating region and relative efficiency. The results rejected the operating regions and the relative efficiency are not related(F-value: TE, 6.176***; PTE, 2.685**; SE, 5.339***). All of the three operating regions and the three related efficiencys have a statistic significant . In other words, there are different level significant in the three relative efficiency, Mainland China region have the highest performance in the three kinds of relative efficiency, followed by short-sea rregion and deep-sea region.

B. The season and operating efficiency

As the Appendix B, Panel B, The operating period was divided into two seasons. The two season's datas were compared by Wilcoxon Scores (Rank Sums) and Kruskal-Wallis Test. the season is not all have a statistical significant. Except the technical efficiency, the another two relative efficiency (F-value: PTE,3.590***; SE,4.403***) vary by season. in the first season, both the pure technical efficiency and scale efficiency are higher than the second season.

C. The profitability and relative efficiency

According to the proposed hypotheses H3 and H4, the operating revenue and profit margin data were divided into the high, the middle and the low of three groups. As the Appendix B, Panel C and D, summarizes the different statistical significant for different groups of revenues (F-value: TE,3.950**; PTE,10.849***; SE,26.958***) and profit margin (F-value: TE,12.285***; PTE,5.426***; SE,9.528***) among the relative efficiency.

Further, operating revenue and profit margin data were divided into only two groups, such as the high and the low. In the Appendix B, Panel E and F, summarizes the F-value of the two different groups with the relative efficiency (Revenues: TE, 7.399***; PTE, 13.156***; SE, 50.633*** and Profit margin: TE, 11.837***; PTE, 4.332.***; SE, 11.886***). Finally, Chi-Square Distribution was used to test the correlation between the profitability and relative efficiency. The results are shown in Appendix B, Panel G. The test results indicate that the technical efficiency, pure technical efficiency and scale efficiency all differ significantly across different levels of the revenues and profit margin, and also have positively related to revenues (F-value: TE, 5.333^{**}; PTE, 3.704^{*}; SE, 23.156^{***}) and profit margin. (F-value: TE, 9.481^{***}; PTE, 3.704^{*}; SE, 31.071^{***}). The results indicates the higher technical efficiency, pure technical efficiency and scale efficiency can lead to the higher revenues and profit margin.

5. CONCLUSIONS

This paper applied the DEA model to evaluate the operating efficiency based on the business characteristics to help optimize inputs and outputs of inefficient shipping lines and understand the contribution of each line to the company's overall business performance and profitability. In this paper, the analysis showed that compared with Mainland China, short-sea, and deep-sea three regions which connect to nearby region have higher relative efficiency. This result is consistent with the business strategy of the case company. In terms of season, it does not all have a significant effect on all the relative efficiency values. Except the technical efficiency, all the efficiency values will vary by season. Besides, the pure technical efficiency and scale efficiency are better in the first season than in the second. Finally, the analysis of the relative efficiency by profitability indicates that the higher the technical efficiency, pure technical efficiency and scale efficiency can all lead to a higher operating revenue and profit margin.

In generally, the CCR and BCC two models used in the practice, we can easily identify the input or output variables to improve the result of evaluation and how it should be adjusted to achieve the highest efficiency. DEA is a useful and effective method of performance evaluation for enterprises. First of all, it can assist ocean freight forwarders' managers in maintaining the efficiency of each line, evaluate the effects of technical and scale factors on efficient and inefficient and analyze the feasibility of anticipated returns to scale. If the returns to scale are increasing, managers can enhance a shipping line's efficiency by increasing its scale. If the returns to scale are not increasing, they can evaluate the returns to scale, seek improvement strategies and set up their own internal benchmarking system to achieve maximum outputs using the minimum inputs.

Despite the limitation of this case, the results of this study have some important managerial implications for ocean freight forwarders. For instance, they can use data of the entire year or compare the same period of performance between different years to probably get more remarkable results. Besides, factors affecting effective and ineffective behaviors differ across industries, and so do variables of performance behaviors. Therefore, variables of performance standards should be selected based on industry characteristics. As performance evaluation data are considered highly confidential by all entirprise, they can not be easily obtained, future researchers can increase their research subjects to have a more in-depth investigation of the business performance of ocean freight forwarders and provide a wider array of managerial suggestions. The ocean freight forwarders is a 3PL industry that provides international freight forwwarding services with customer satisfaction-oriented. In order to achieve business goals, it has to reinforce relations with niche customers and develop new ones while maintaining positive relations with supply chain partners. Therefore, high service quality, customer trelationship and time management obtained the customer satisfaction are all determined the stability of a company's business performance. Conversely, lack of the customer satisfaction will result in a loss of customers and a decline of business performance.

REFERENCES

[1]. Busija EC, O'NEILL HM, and Zeithaml CP (1997). Diversification Strategy, Entry Mode, and Performance:Evidence of Choice and Constraints. Strategic Management Journal.18(4): 321-327.

[2]. Banker RD, Charnes A, Cooper WW (1984). Some models for estimating technical and scale inefficiencies in data envelopment analysis. Management Science. 30(9): 1078-1092.

[3]. Coelli TD, Rao SP, Battese GE (1998). An Introduction to Efficiency and Productivity Analysis. Boston: Kluwer Academic Publishers.

[4]. Charnes A, Cooper WW, Rhodes E (1978). Measuring the Efficiency of Decision Making Units. European Journal of Operational Research. 2(6): 119-140.

[5]. Dess GC, and Robinson RB (1984). Measuring Organizational Performance in the Absence of Objective Measures. Strategic Management Journal. 5(3): 265-273.

[6]. Farrell MJ (1957). The Measurement of Productive Efficiency. Journal of the Royal Statistical Society. Series A General. 120(2):255-270.

[7]. Green DH, Barclay DW, and Ryan AB (1995). Entry strategy and long-term performance: conceptualization and empirical examination. Journal of Marketing. 59: 1-16.

[8]. Gengui Zhou, Hokey Min, Chao Xu, Zhenyu Cao (2008) Evaluating the comparative efficiency of Chinese third-party logistics providers using data envelopment analysis. International Journal of Physical Distribution & Logistics Management. 38(4): 262-279.

[9]. Golany B, Roll Y (1989). An Application Procedure for DEA. Omega: International Journal of Management Science. 17: 237-250.

[10]. Horngren CH, Datar SM, Foster G, Rajan M, and Ittner C (2009). Costing Accounting A MANGERIAL EMPHASIS. Thirteenth Edition. N.J.: Pearson International Edition.
[11]. Kassem MS and Moursi MA (1971), Managerial Effectiveness. Academy of Management Journal. 14(3): 381-385.
[12]. Oum TH, Waters Ⅱ WG, and Yu C (1999). A Survey of Productivity and Efficiency Measurement in Rail Transport. Journal of Transport Economics and Policy. 33(1): 9-42.
[13]. Robbins SP, DeCenoz DV, Moon H (2008). Fundamentals of Management: Essential Concepts and Applications. Sixth edition. NJ: Pearson Education, Inc.
[14]. Srivastava V (1996).Liberalization, Productivity and Competition. UK:Oxford Univ Pr.
[15]. Tseng JP, Liao LC(2010), The Theory and Practice of Ocean Freight Forwarder Industry. Taiwan: W-Nan Culture Enterprise.
[16]. Venkatraman N and Ramanuyam V (1986). Measurement of business performance in strategy research: A companion of approaches. Academy of Management Review. 1: 52-73.
[17]. Vickery SK (1991). A Theory of Production Competence Revisited. Decision Sciences. 22(3): 635-643.
[18]. Woo CV and Willard G. (1983). Performance representation in business policy research: Discussion and recommendation. Peter presents at the 23nd. Annual national meetings of the Academy of Management, Dallas. Academy of Management, Dallas.

Appendix A The summarize of the relative efficiency, return scale, and slack analysis

DMU	Line [a]	Month	relative efficiency			return scale		slack analysis					
								Input variables				Output variables	
			TE	PTE	SE	$\sum \lambda_j$ [b]		HOUR1	HOUR2	COST1	COST2	OUT1	OUT2
1	1	January	0.6319	0.8427	0.7498	0.437	ir	-246.72	-259.97	-440,313	-9,434	0	0
2		February	0.7566	1.0000	0.7566	1.0000	-	-282.72	-242.83	-364,141	-81,911	0	0
3		March	0.7849	0.8848	0.8871	0.4321	ir	-120.13	-111.08	237,317	-1241	0	0
4		April	1.0000	1.0000	1.0000	1.0000	-	0	0	0	0	0	0
5		May	0.7329	0.7783	0.9416	0.5297	ir	-122.06	-112.05	-261,451	-6,837	0	0
6		June	0.8360	0.8366	0.9992	0.9711	ir	-3.41	-3.43	-8,413	-236	0	0
7	2	January	0.5047	0.8674	0.5818	0.4731	ir	-33.91	-103.32	-513,487	-2,552	0	0
8		February	0.4836	0.8941	0.5409	0.4996	ir	-55.92	-109.92	-479,353	-2,578	0	0
9		March	0.4875	0.6988	0.6976	0.4523	ir	-17.49	-96.79	-614,818	-2,617	0	0
10		April	0.4961	0.7135	0.6954	0.6817	ir	-17.21	-93.26	-602,867	-3,956	0	0
11		May	0.4857	0.6731	0.7216	0.4680	ir	-14.06	-89.97	-631,518	-3,914	0	0
12		June	0.4973	0.6121	0.7745	1.0000	-	-37.50	-81.68	-630,342	-4,216	0	0
13	3	January	1.0000	1.0000	1.0000	0.7775	ir	0	0	0	0	0	0
14		February	0.9155	1.0000	0.9155	0.7167	ir	-191.25	-166.34	-283,442	-5,561	0	0
15		March	1.0000	1.0000	1.0000	0.7204	ir	0	0	0	0	0	0
16		April	1.0000	1.0000	1.0000	0.6966	ir	0	0	0	0	0	0
17		May	0.9247	0.9268	0.9977	0.8115	ir	0	0	0	0	0	0
18		June	1.0000	1.0000	1.0000	1.0000	-	0	0	0	0	0	0
19	4	January	1.0000	1.0000	1.0000	1.0000	-	0	0	0	0	0	0
20		February	0.6890	0.9263	0.7439	0.6367	ir	-75.69	-56.90	-316,412	-1,970	0	0
21		March	0.6550	0.7273	0.9006	0.6706	ir	-43.18	-31.47	-311,639	-1,360	0	0

DMU	Line[a]	Month	TE	PTE	SE	$\sum \lambda_j$ [b]		Input variables HOUR1	HOUR2	COST1	COST2	Output variables OUT1	OUT2
22		April	0.6288	0.7273	0.8601	0.8342	ir	-55.16	-38.61	-189,139	-2,612	0	0
23		May	0.7835	0.7979	0.9819	0.6947	ir	7.11	5.14	56,257	358	5	14
24		June	0.8285	1.0000	0.8285	1.0000	-	50.45	40.53	470,103	3,136	36	128
25	5	January	0.6649	0.9189	0.7236	0.7734	ir	-63.16	-35.44	-400,190	-1,835	0	178
26		February	0.5987	0.9746	0.6143	1.0471	dr	-88.05	-12.69	-423,061	-2,012	0	0
27		March	0.6394	0.7657	0.8351	1.0015	dr	-58.80	-30.70	-443,317	-1,612	0	0
28		April	0.7323	0.8231	0.8897	0.7961	ir	-37.42	-18.79	-276,195	-1,584	0	0
29		May	0.6877	0.7587	0.9064	0.7191	ir	-45.28	-18.21	-290,651	-1,563	0	0
30		June	0.7469	0.7681	0.9723	0.8215	ir	-14.02	-7.91	-134,281	-751	0	0
31	6	January	0.5884	0.9138	0.6439	0.9936	ir	-21.75	-22.87	-196,665	-830	0	0
32		February	0.6202	1.0000	0.6202	1.3422	dr	-39.17	-27.62	-420,021	-1,030	0	0
33		March	0.6016	0.7614	0.7902	0.7456	ir	-29.87	-22.80	-507,192	-860	0	0
34		April	0.5849	0.7762	0.7535	1.0000	-	0	0	0	0	0	0
35		May	0.5675	0.7317	0.7755	0.8395	ir	0	0	0	0	0	0
36		June	0.6351	0.7070	0.8984	1.0000	-	0	0	0	0	0	0
37	7	January	0.6885	0.8729	0.7888	0.2911	ir	0	0	0	0	0	0
38		February	0.8188	1.0000	0.8188	0.4132	ir	-83.35	-59.16	-351,121	-2,218	0	0
38		March	0.7426	0.7958	0.9332	1.0000	-	-43.67	-33.59	-292,572	-1,419	0	0
40		April	0.6894	0.7593	0.9079	0.2344	ir	-51.34	-37.86	-335,640	-2,515	0	0
41		May	0.9023	0.9024	0.9999	0.2729	ir	0.24	0.18	1,701	12	0	0
42		June	0.6703	0.7120	0.9415	1.0000	-	-38.74	-32.59	-332,347	-2,158	0	0
43	8	January	1.0000	1.0000	1.0000	0.2436	ir	0	0	0	0	0	0
44		February	0.5844	0.9672	0.6042	0.2908	ir	-25.19	-34.90	-115,401	-913	0	0

DMU	Line[a]	Month	TE	PTE	SE	$\sum \lambda_j$ [b]		Input variables				Output variables	
								HOUR1	HOUR2	COST1	COST2	OUT1	OUT2
45		March	0.6198	0.7389	0.8389	0.2995	ir	-16.55	-25.16	-470,228	-766	0	0
46		April	0.4633	0.7182	0.6451	0.2174	ir	-22.91	-33.21	-631,501	-1,584	0	0
47		May	0.4948	0.6943	0.7127	0.2413	ir	-20.13	-30.11	-622,211	-1,466	0	0
48		June	1.0000	1.0000	1.0000	0.6699	ir	0	0	0	0	0	0
49	9	January	0.8136	1.0000	0.8136	0.3901	ir	-100.10	-61.39	-331,854	-3,010	0	0
50		February	0.9404	1.0000	0.9404	0.5330	ir	-120.09	-63.70	-302,861	-2,941	0	0
51		March	0.8256	0.8826	0.9354	0.5375	ir	-51.91	-30.24	-207,729	-1,561	0	0
52		April	0.7810	0.8784	0.8891	0.3461	ir	-85.66	-15.42	-117,697	-3,697	0	0
53		May	0.7406	0.8183	0.9050	0.4155	ir	-76.35	-11.43	-314,213	-3,415	0	0
54		June	0.7405	0.7891	0.9384	1.0000	-	-54.51	-31.73	-251,712	-2,912	0	0
55	10	January	1.0000	1.0000	1.0000	0.3857	ir	0	0	0	0	0	0
56		February	0.8584	1.0000	0.8584	0.7912	ir	-59.86	-9.88	-206,366	-1,085	0	0
57		March	0.8068	0.8167	0.9879	0.3619	ir	-57.19	-10.32	-312,688	-1,238	0	0
58		April	0.9989	1.0000	0.9989	0.3449	ir	-31.12	-5.39	-166,106	-1,030	0	0
59		May	0.8583	0.8637	0.9948	0.3929	ir	-38.35	-6.81	-228,227	-1,320	0	0
60		June	1.0000	1.0000	1.0000	0.8289	ir	0	0		0	0	0
61	11	January	0.4733	0.9506	0.4979	0.4230	ir	-23.96	-78.11	-482,012	-1,901	0	0
62		February	0.5025	1.0000	0.5025	0.7181	ir	-39.50	-79.61	-430,855	-1,852	0	0
63		March	0.4971	0.7736	0.6426	0.4368	ir	-34.13	-72.64	-573,612	-1,960	0	0
64		April	0.5071	0.7923	0.6401	0.3953	Ir	-33.26	-69.62	-559,397	-2,900	0	0
65		May	0.5209	0.7598	0.6855	0.4680	ir	-30.79	-66.00	-576,100	-2,825	0	0
66		June	0.5405	0.7003	0.7204	1.0000	-	-28.34	-66.22	-613,143	-3,258	0	0
67	12	January	0.7436	0.9579	0.7763	0.4995	ir	-5.46	-28.61	-411,635	-635	0	0

DMU	Line [a]	Month	TE	PTE	SE	$\sum\lambda_j$ [b]		Input variables				Output variables	
								HOUR1	HOUR2	COST1	COST2	OUT1	OUT2
68		February	0.5561	0.9950	0.5589	0.8868	ir	-22.01	-34.62	-436,778	-882	0	0
69		March	0.6163	0.7557	0.8156	1.0000	ir	-13.19	-23.26	-428,928	-671	0	0
70		April	0.7973	0.8348	0.9550	0.4409	ir	-2.63	-4.44	-83,448	-199	0	0
71		May	0.9477	1.0000	0.9477	0.6300	ir	9.18	15.72	321,264	726	5.74	12.28
72		June	0.5138	0.6745	0.7617	1.0000	-	-15.49	-28.32	-618,592	-1,571	0	0
73	13	January	0.7713	0.8998	0.8572	1.0000	-	0	0	0	0	0	0
74		February	0.7795	0.9816	0.7941	0.4219	ir	0	0	0	0	0	0
75		March	0.8325	0.8492	0.9803	0.4827	ir	-2.02	-3.85	-193,426	-108	0	0
76		April	0.7881	0.8451	0.9325	0.4026	ir	-3.27	-5.96	-403,900	-258	0	0
77		May	0.7869	0.8222	0.9571	0.4139	ir	-2.97	-5.63	-313,321	-253	0	0
78		June	0.8343	0.8421	0.9907	0.3043	ir	3.00	-3.49	-206,291	-177	0	0
79	14	January	0.4595	0.7834	0.5866	0.5912	ir	-128.16	-72.67	-540,175	-3,740	0	0
80		February	0.4693	0.8708	0.5389	0.2996	ir	-155.80	-75.60	-493,653	-3,602	0	0
81		March	0.4984	0.6790	0.7340	0.4617	ir	-122.06	-63.60	-602,633	-3,405	0	0
82		April	0.4912	0.6918	0.7101	0.2749	ir	-121.63	-63.20	-609,307	-5,213	0	0
83		May	0.5266	0.6834	0.7705	0.3305	ir	-108.52	-56.88	-595,243	-4,829	0	0
84		June	0.5437	0.6330	0.8590	0.2674	ir	-76.26	-12.93	-475,984	-4,109	0	0
85	15	January	0.5959	0.8671	0.6872	1.0000	-	-58.57	-111.50	-447,403	-3,156	0	0
86		February	0.5554	1.0000	0.5554	0.4707	ir	-113.17	-126.48	-449,175	-3,726	0	0
87		March	0.5810	0.7175	0.8098	0.7660	ir	-71.64	-86.27	-443,974	-2,896	0	0
88		April	0.6896	0.7718	0.8934	0.5538	ir	-13.17	-19.90	-261,383	-2,632	0	0
89		May	0.6475	0.7233	0.8952	0.5818	ir	-13.36	-51.26	-291,357	-2,762	0	0

DMU	Line [a]	Month	TE	PTE	SE	$\sum \lambda_j$ [b]		Input variables HOUR1	HOUR2	COST1	COST2	Output variables OUT1	OUT2
90		June	0.5313	0.6385	0.8356	0.4543	ir	-73.90	-95.35	-574,058	-5,835	0	0
91	16	January	0.9643	1.0000	0.9643	1.0000	-	-1.08	0	-20,052	-20	0	0
92		February	1.0000	1.0000	1.0000	0.4673	ir	0	0	0	0	0	0
93		March	1.0000	1.0000	1.0000	0.6326	ir	0	0	0	0	0	0
94		April	1.0000	1.0000	1.0000	0.9110	ir	0	0	0	0	0	0
95		May	0.9248	1.0000	0.9248	0.7472	ir	-6.64	0	-188,055	-193	0	0
96		June	1.0000	1.0000	1.0000	0.3827	ir	0	0	0	0	0	0
97	17	January	1.0000	1.0000	1.0000	1.0000	-	0	0	0	0	0	0
98		February	0.9563	1.0000	0.9563	0.4721	ir	-1.67	-2.06	-210,009	-57	0	0
99		March	1.0000	1.0000	1.0000	0.6737	ir	0	0	0	0	0	0
100		April	0.9616	0.9968	0.9647	1.3069	dr	-0.87	-1.11	-169,921	-55	0	0
101		May	1.0000	1.0000	1.0000	0.7471	ir	0	0	0	0	0	0
102		June	1.0000	1.0000	1.0000	0.4184	ir	0	0	0	0	0	0
103	18	January	0.5356	0.8961	0.5977	1.0000	-	-10.76	-63.74	-503,553	-1,387	0	0
104		February	0.5164	0.9433	0.5472	0.6397	ir	-32.29	-66.92	-463,940	-1,543	0	0
105		March	0.5230	0.7268	0.7196	0.7697	ir	-27.16	-51.43	-551,698	-1,499	0	0
106		April	0.4919	0.7304	0.6734	0.4870	ir	-29.91	-58.97	-607,145	-2,501	0	0
107		May	0.4824	0.6866	0.7026	0.5665	ir	-27.95	-57.00	-618,676	-2,480	0	0
108		June	0.8466	0.8992	0.9414	1.2801	dr	11.36	-29.79	151,158	1,488	12.32	12.69

a.1:China, 2:Eurpon, 3:Hong Kong, 4:Indonesia, 5:Japan, 6:Philippine, 7:Malysia, 8:other, 9:Singapore, 10:Thailand, 11:Karor, 12:triangle trade, 13:New Zealand/Australia, 14:Middle East, 15:American/Canada ,16:Vietnam, 17:Africa, 18:Mediterranean.

b.-:constant return to scale.
ir:increase return to scale.
dr:decrease return to scale

Appendix B Analysis of business performance*

	Mean				Wilcoxon Scores (Rank Sums)				Kruskal-Wallis Test		
Panel A	The shipping line and operating efficiency										
Area	TE	PTE	SE		TE	PTE	SE		TE	PTE	SE
MC	0.882	0.939	0.937	F-value	6.176	2.685	5.339				
SS	0.729	0.858	0.846	p-value	.0029***	.0729**	.0062***	p-value	.0031***	.0463**	.0069***
DS	0.674	0.852	0.787								
Panel B	The season and operating efficiency										
Season	TE	PTE	SE		TE	PTE	SE		TE	PTE	SE
First	0.725	0.907	0.889	F-value	-0.798	3.590	4.403	p-value	.369	.002***	.001***
Secend	0.738	0.836	0.792	p-value	.435	.002***	.001***				
Panel C	The relative efficiency and operating revenues (high, middle and low three groups)										
Revenues	TE	PTE	SE		TE	PTE	SE		TE	PTE	SE
High	0.796	0.843	0.936	F-value	3.950	10.849	26.985				
Middle	0.704	0.818	0.847	p-value	.022**	.0001***	.0001***	p-value	.014**	.0003***	.0001***
Low	0.683	0.934	0.726								
Panel D	The relative efficiency and profit margin(high, middle and low three groups)										
PM(%)	TE	PTE	SE		TE	PTE	SE		TE	PTE	SE
High	0.838	0.913	0.917	F-value	12.285	5.426	9.529				
Middle	0.647	0.823	0.786	p-value	.0001***	.0057***	.0002***	p-value	.0001***	.0060**	.0003***
Low	0.699	0.859	0.806								
Panel E	The relative efficiency and operating revenues (high and low two groups)										
	Mean				Wilcoxon Scores (Rank Sums)				Wilcoxon Two-Sample Test		
Revenues	TE	PTE	SE		TE	PTE	SE		TE	PTE	SE
High	0.796	0.843	0.936	F-value	7.399	13.156	50.633	p-value	.007***	.005***	.000***
Low	0.683	0.934	0.726	p-value	.008***	.000***	.000***				

Panel F	The relative efficiency and profit margin(high and low twogroups)											
PM(%)	Mean			Wilcoxon Scores (Rank Sums)				Wilcoxon Two-Sample Test				
	TE	PTE	SE		TE	PTE	SE		TE	PTE	SE	
High	0.838	0.913	0.917	F-value	11.837	4.332	11.886	p-value	.0043***	.0333***	.0072***	
Low	0.699	0.859	0.806	p-value	.001***	.0411***	.001***					

Panel G	The correlation between relative efficiency and operating revenues(Chi-Square)												
Revenues	PE		TPE		SE		PM (%)	PE		TPE		SE	
	High	Low	High	Low	High	Low		High	Low	High	Low	High	Low
High	33	21	22	32	39	15	High	35	19	32	22	35	19
Low	21	33	32	22	14	40	Low	19	35	22	32	18	36
F-value	5.333		3.704		23.156		F-value	9.481		3.704		31.071	
p-value	.021**		.054*		.001***		p-value	.002***		.054*		.001***	

[a.] The test is significant at the 10 % (*), 5 % (**), and 1 % (***).