An evaluation of logistics policy enablers between Taiwan and the UK

Abstract

Purpose

This paper aims to empirically identify crucial international logistics policy enablers and to examine their impacts on logistics performance using survey data collected from 169 responding firms in Taiwan and 109 responding firms in the UK including logistics companies, freight forwarders, shipping companies, agencies and airline companies.

Design/methodology/approach

A multiple regression analysis is used as a method to empirically validate the research model.

Findings

Results indicate the five most important logistics policy enablers according to Taiwanese logistics firms are information technology system, inland transport linkage, simplifying the customs clearance procedures, ports and maritime transport and having a policy to ensure efficient service operation and multiplicity of services. In contrast, for the UK logistics firms, the five most important logistics policy enablers are telecommunications, information technology system, avoidance of unnecessary regulation, inland transport linkage and ports and maritime transport. Results also indicate that logistics policy dimensions in terms of regulation, integration, infrastructure and logistics education have a positive influence on firms' logistics service quality and efficiency.

Originality/value

Theoretical and policy implications from the research findings on logistics policy between these two countries are discussed in this paper.

Keywords Logistics performance, Multiple regression analysis, Logistics firms, Logistics policy

Paper type Research paper

1. Introduction

Along with the development of internationalization and liberalization and continuous improvement of information, communication and transport technology, companies are no longer limited to a belonged country/region and are operating under a global market. Therefore, companies' operation strategy and development goals have changed evidently, and their sourcing, production and marketing activities have been conducted globally. To get along with the global trend and enhance their competitive advantages, companies have been planning their operations globally, which leads to the international division on marketing, manufacturing and logistics distribution activities. This causes a rapid development of international logistics, and governments are committed to improve international companies' competitive advantages and logistics infrastructures.

As an island-based economic entity, Taiwan relies on imports of raw materials and exports of finished products through sea and air transportation. According to the report from Ministry of Transportation and Communications Taiwan (2015), the amount of import and export in Taiwan in 2014 was 257.2 million tons, in which 255.5 million tons of goods were transported by sea, which accounted for 99.34 per cent of total trade volume. There were 1.7 million tons of goods transported by air, which stood for 0.66 per cent of overall trade volume. This reveals the importance of international transportation and logistics to the development of Taiwan's international trade. In addition, logistics cost has relationship with industry's competitive advantage. Well-established logistics infrastructure and facilities result in lower logistics cost in a country or region, which would contribute a more competitive price in the market. In the other words, a higher logistics cost results in a higher price, and some products will lose their comparative advantage in the market. Therefore, a well-established logistics policy can greatly benefit a country's industrial and economic development.

In the past decade, many countries/regions such as Singapore, Japan and Hong Kong, have established their own global logistics policies. For example, Singapore started to promote the "Global e-logistics hub" as to improve its operation efficiency through e-logistics in 2001. In Japan, "3e logistics policy" was designed to make the logistics industry a more efficient, environment-friendly and electronic industry. As for the case of Hong Kong, it has classified logistics as one of the four pillars of the Hong

Kong economy along with trade, finance and tourism. It endeavours to establish aviation and container shipping industry with comparative advantages, which reveals great importance attached to development of logistics policy. To make Taiwan's international logistics policy in line with current trend for future development, the government organized forums in 2006 to find out the industrial, governmental and academic views and needs. Due to different positions and interests among industrial and academic representatives, no consensus on the policy was reached. However, both macro and objective stances should be taken when implementing international logistics policies. One research objective of this paper is to understand and prioritize Taiwan's development goal and plan on logistics policy, which could work as a reference for government's future international logistics policy.

Previous studies have focused on Asian countries/regions as Singapore, Japan, Hong Kong, South Korea and so on. As a similar island-based economic entity, the UK's logistics industry is maturely developed. This paper would compare the UK's current logistics policy and its future development, including aspects of policy enablers and operation performance, which could provide some insight on Taiwan's logistics policy.

2. Literature review

2.1 Definition of international logistics

Along with the development of globalization and growing international competition, procurement, production, marketing and R&D activities could not be completed within one specific region. Operational scale of logistics activities has evolved from national scale to specific country scale, to international scale and eventually to globalization scale. Therefore, the scope of logistics management has been expanded from intra-organization to global. In addition, Langley and Holcomb (1992) stated that integrated global logistics service is crucial for creating customer value. Richardson (1998) also suggested that the key factor for the development of international companies
relies on their logistics and supply chain management ability. If an enterprise can make effective logistics plan and management, it will be able to obtain optimal integration of overall production processes and the global market demand, which would deal with the problems of production output

and capital (Christopher, 1998). Effective logistics management can therefore refer to deliver the right product to the right place at the right time with a reasonable cost (Tilanus, 1997; Rutner and Langley, 2000; Zheng et al., 2000). Therefore, logistics management has become a key for success in the global competition (Tao and Park, 2004; Wang et al., 2015).

International logistics management refers to management operations of marketing, product design, production, procurement, logistics management and supplier management on global market scale, which aims to gain competitive advantages through quick response to market change and customer demand, and reduction on operation cost, inventory cost and operation risks. Chopra and Meindle (2001) defined international logistics management as flow management between each link within the supply chain, which aims for the maximization of profits. Wood et al. (2012) also stated that international logistics system refers to "huge array of carriers, forwarders, bankers, traders, and so on that facilitate international transactions, trades and movements of good and services". Focusing on features of product, material and service, international logistics management organizes supply chain globally as to lower supply chain inventory, operation cost, time, potential cost, risk and crisis. International logistics can also enhance enterprise's competitive advantages through the sense of customer awareness and quick response to customer demand (Lee and Song, 2015).

The niche of international logistics management could be discussed from company level and government level. From company level, international logistics generally covers from material acquisition, design, production, marketing, service, replenishment and inventory management. As with the integration of material flow, business flow and information flow, and the use of supply chain management and information technology (IT), companies could secure their competitive advantage by providing immediate delivery and service. From government level, benefits of international logistics management include increasing gross development product and employment opportunity, and improve Taiwan's economic status in the world. Therefore, the government shall assist companies to conduct cross-regional resource integration with product design, manufacturing, assembly, inventory and delivery. Through simplifying operation of business, material, information and financial flow

management, the government would setup regulations in compliance with international practice and trend, which would give domestic companies competitive advantages by making real-time and on time deliveries.

2.2 Logistics policy

There are several categories in logistics policy. This study roughly categorizes them as regulation, integration, infrastructure and logistics education. The following sections describe these four categories, respectively.

2.2.1 Regulation

Logistics is important to a nation's economy because it deals with cargo delivery not only within the country but also the connection of the country. As logistics is becoming international logistics, regulations for logistics are necessary to manage various issues related international trade. For example, Skowron´ska (2009) stated that the introduction of effective mechanisms to protect the market from excessive concentration and monopolization can improve logistics performance. Several studies addressed the performance improved by corporate governance (Aronsson and Huge Brodin, 2006).

In addition, "sustainability" has become a very important issue which includes the environmental issue and business long-term management. For firms to implement a sustainability strategy in their supply chain operations, the logistics function needs to play a prominent role (Goldsby and Stank, 2000; Mollenkopf et al., 2010). There have been a number of studies addressed in this issue or "green logistics" related issue (Dekker et al., 2012; Lai and Wong, 2012). In addition, reduce waste and reverse logistics have also been discussed in many studies (Dowlatshahi, 2000; Shankar et al., 2008; Dey et al., 2011). Dowlatshahi, 2000 and Barker and Zabinsky (2010) suggested that government should legislate to improve and develop sustainable logistics.

2.2.2 Integration

As logistics involves various activities by different industries from different countries, the integration of these activities is important to improve the logistics flows from suppliers to the final customers. Logistics integration refers to specific logistics practices and operational activities that coordinate the flow of materials from suppliers to customers throughout the value stream (Gustin et al., 1995; Stock et al., 2000). There have been many studies that addressed the relationship between integration and performance (Bagchi and Skjoett-Larsen, 2003; Paulraj and Chen, 2007). Integration in logistics helps increase the speed and fluidity of physical and information flows, help synchronize demand with supply and help manage transactions more accurately (Gelinas and Bigras, 2004; Paulraj and Chen, 2007). Prajogo and Olhager (2012) addressed supply chain integration and performance and found that logistics integration has a significant effect on operations performance. They also found that IT capabilities and information sharing both have significant effects on logistics integration.

2.2.3 Infrastructure

Infrastructure is the most basic yet important element for logistics. Closs and Thompson (1992) defined that logistics infrastructure should include the facilities and links that form the supply and distribution channel. The facilities refer to the physical buildings, whereas the links are the product flow and communication interactions between facilities. Kuse et al. (2010) addressed city logistics planning and stated that logistics infrastructure includes facility, technology and institutional infrastructures. In this study, logistics infrastructure includes facility (hardware) and technology (software). The facility includes vehicles (e.g. trucks, ships, aircrafts, etc.), linkage (e.g. road, rail) and physical buildings (e.g. ports, airports, stations, etc.). The technology includes IT and information communication technology.

2.2.4 Logistics education

Logistics is considered as a relative new subject from 1970 due to the increasing demand for logistics professionals in industry and government (Lancioni et al., 2001). According to the findings of the 2003 Survey of Career Patterns in Logistics (La Londe and Ginter, 2003), there is a new generation of logistics graduates who are making their way up to the logistics executive levels of their firms. However, Wu (2007) organized a number of logistics education related papers and found that a

majority of them are limited to a geographical area and is largely case study-based or survey-based. Logistics education-related programs also have various limitations. For example, Lancioni et al. (2001) indicated five main barriers encountered in the development and planning of logistics course and programs. To improve the logistics education related programs, Wu(2006) examined the key logistics-related skills required at the basic, managerial and business levels in Taiwan from the licensing certification perspective.

3. Methodology

3.1 Research structure

To have a basic understanding on global logistics policy, a questionnaire survey is distributed to collect data, and then factor analysis is conducted to find out what factors the respondent believe are the most important to international logistics policy. Factors derived from factor analysis are prioritized in accordance with their importance as to prioritize the importance of each policy. This study also examines differences between Taiwanese and British logistics policy and comes out with suggestions based on analysis results, which could provide references for the government's international logistics policy.

3.2 Definition and measurement of operational variables

From the section Literature Review, it is known that the purpose of logistics policy is to promote industrial competitiveness and create excellent industrial environment. In recent years, although there has been rapid economic growth in East Asia region, European countries are still more advanced and comprehensive in policy formulating and sustainable management. Logistics policy aims to promote industry development and operation efficiency. More importantly, in the macro aspect, it also aims to long-term sustainable development. Besides referring to previous studies and literatures, measured items mostly drafted from logistics policy of EU and Finland. To be practical and suitable to other countries as well, interviews are conducted against domestic and foreign academic experts as to confirm and validate the identified factors and dimensions. Logistics policy measured items are listed in Table II.

3.3 Analysis methods

This study first conducts descriptive statistics analysis to analyse respondents' details and the importance and satisfaction of the identified logistics policies. The levels of importance of logistics policy are measured by the five-point Likert scale, in which 1 means very unimportant and 5 means very importance. As for the level of satisfaction of logistics policy, 1 refers to very low and 5 refers to very high. Average is calculated as to indicate the importance of logistics policy for participants, whereas the standard deviation helps to understand whether there is big recognition difference among participants on the level of logistics policy importance. The smaller the standard deviation, the participants reveals a closer recognition on importance of the logistics policy. On the contrary, a high standard deviation reveals that participants share different opinions on the importance of logistics policy.

After determining the four priorities for the identified policies, an Exploratory factor analysis (EFA) is then used to analyse the relationship of a group of observed variables, which targets to find out related structures among those variables. Variables will be classified to put those variables into few independent factors and to take account of the condition to lose least information. Factor analysis can be used to identify potential factors, select variables, summarize information, select representative variables, construct validity and simplify data (O'Rourke et al., 2013). Steps for performing factor analysis are as follows:

1. Decide on number of selected factors: This study applies Principal Component Analysis to extract common factors and uses Kaiser Principle to keep eigenvalues greater than 1 as the basis for those common factors.
2. Factor Rotation: Factors are named according to factor loadings which have better to reach 0.5 or above. In order to make common factors have only handful factors with large factor loadings, VARIMAX rotation has been used to ensure no correlation between each factor.
3. Factor naming: According to results of categorisation, name the factors by their characteristics. The principle of factor naming is to name factors with the largest factor loading.

4. Factor score calculation: Find the overall factor score to represent each factor as to conduct further research.

Reliability is used to measure the level of non-error, which is to test the consistency of results (Lu, 2000). This can be explained from test-retest and internal consistency. Test-retest uses the same tool to re-measure an eigenvalue as to find out whether the results are the same; while internal consistency is used to measure whether the internal data are consistent. Four methods are used to measure the reliability, test-retest reliability, composite reliability, split half reliability and Cronbach's alpha value. This study uses Cronbach's alpha value to test the consistency and stability of the international logistics policies of each factor. The results are reliable when the Cronbach's alpha value is larger than 0.7 (Nunnaly, 1978; Santos, 1999; Tavakol and Dennick, 2011).

Confirmatory factor analysis (CFA) is used to test the model fit, reliability and validity (Hair et al., 2010). In the other words, the purpose of using CFA is to test whether the index of latent dimension obtained from the results of EFA can reflect the characteristics of such dimension. AMOS is used to conduct the CFA in this study.

Finally, this study applies the importance-satisfaction analysis proposed by Martilla and James (1977), as it can provide priority reference for policymakers. The mean score of satisfactory is shown in x-axis and level of importance is shown in y-axis. The crossed lines give four quadrants: Keep up the good work, Improvement efforts should be concentrated here, Low priority and Possible overinvestment. Keep up the good work represents respondents feel this item is important, and they are satisfied with such item. Improvement efforts should be concentrated here represents respondents feel this item is important but they are not satisfied with such item. Low priority represents that this item is not important and not satisfied by the respondents. Possible overinvestment represents that this item is not important yet the respondents are satisfied with this item.

3.4 Target sample and reply rate

The target sample are the logistics service providers in Taiwan and the UK, including logistics company, freight forwarder, shipping company, airline company and air freight company. In Taiwan, the population is according to each union's list, including National Association of Chinese Ship owners, National Association of Shipping Agencies, Taipei Airfreight Forwarders & Logistics Association of Taiwan and International Ocean Freight Forwarders and Logistics Association, Taiwan. The questionnaire was sent through post, and the target sample focuses on the position of manager or above. In total, 850 questionnaires are sent out, 149 valid replies are collected and the replied rate is 17.5 per cent.

In the UK, the population is based on the list of The British International Freight Association (BIFA). There are 1,400 members in BIFA, including shipping company, shipping agent, cargo terminal, air freight company, freight forwarder, Customs broker, package industry, rail and trucking companies that operate international transport. Because international logistics policy is mainly related to shipping company, freight forwarder, air freight company and cargo terminal, questionnaires are sent to the selected 407 international logistics related companies. Valid replies are 107, and the reply rate is 26.3 per cent.

4. Analysis result

4.1 Respondents' characteristics

Table I presents a profile of respondents, indicating their job titles, the type of firm for which they worked, years of working experience and number of employees. Approximately 84 per cent of respondents from Taiwan are vice presidents or above or managers/assistant managers. Far fewer respondents are clerk, other, director and sales representative (6.0, 4.7, 3.4 and 2.0 per cent, respectively). In contrast, the title of vice president or above or manager/assistant manager is held by 37.4 per cent of respondents from the UK. Nearly 60 per cent are director, whereas 3.8 per cent of respondents from the UK hold the title of clerk and other. Generally, in the UK, the managing director is in charge of a company's logistics activities. Therefore, the views of directors on logistics policy would be more useful for this study.

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The majority of respondents from Taiwan is involved in shipping agency (45 per cent); following by freight forwarders (21.5 per cent), shipping companies (12.8 per cent), logistics companies (9.4 per cent), other (7.4 per cent) and airlines/expresses (4.0 per cent). As regards respondents from the UK, 63.6 per cent are freight forwarders, 17.8 per cent are logistics companies and 18.6 per cent are in other types of business (Table I). This indicates that there are more shipping agency respondents in Taiwan, whereas freight forwarder is the major respondent in the UK. As regards respondents' companies' number of employees in Taiwan, nearly 60 per cent of companies have 50 employees or less, 12.1 per cent employs between 51 and 100 persons, 18.1 per cent employs 101-500 persons, 12.1 per cent employs 501 persons or more. Regarding the respondents in the UK, nearly 82 per cent have 50 employees or less, whereas 17.8 per cent have the number of employees greater than 50 persons. The majority of the respondents' companies' number of employees have 50 employees or less in both Taiwan and the UK. Nearly three-quarters of respondents in Taiwan (75.9 per cent) have had working experience more than 10 years, whereas 90.7 per cent of respondents in the UK have had working experience of 11 years or more. The majority of the respondents have had working experience more than 10 years in both Taiwan and the UK.

Table I Profile of Respondents

Characteristics	Taiwan (N= 149)		UK(N=107)	
	Number of respondents	%	Number of respondents	%
Job title				
Vice-president or above	59	39.6	22	20.6
Manager/Assistant manager	66	44.3	18	16.8
Director	5	3.4	63	58.9
Sales representative	3	2.0	0	0
Clerk	9	6.0	2	1.9
Other	7	4.7	2	1.9
Type of business				
Logistics company	14	9.4	19	17.8
Freight forwarder	32	21.5	68	63.6
Airline/Express	6	4.0	6	5.6
Shipping company	19	12.8	7	6.5
Shipping agency	67	45.0	3	2.8
Other	11	7.4	4	3.7
Number of employees				
Less than 21 people	52	34.9	63	58.9
21~50 people	34	22.8	25	23.3
51~100 people	18	12.1	8	7.5
101~500 people	27	18.1	8	7.5
More than 500 people	18	12.1	3	2.8
Years of working experience				
Less than 6 years	14	9.4	4	3.7
6~10 years	22	14.8	6	5.6
11~20 years	53	35.6	21	19.6
21~30 years	42	28.2	32	29.9
More than 30 years	18	12.1	44	41.2

4.2 Relative importance of logistics policy attributes between Taiwan and the UK

The results of the analyses for each logistics policy attributes are shown in Table II. To understand the relative importance of logistics policy attributes for logistics firms, each of the variables is assessed using a five-point Likert scale where “1 = very unimportant” and “5 = very important”. The results indicate that the relative importance of logistics policy attributes significantly differed between Taiwanese and the UK firms. Taiwanese logistics firms rate IT system as the most important item, whereas UK firms view telecommunications as the most important consideration. The five most important logistics policy attributes according to Taiwanese logistics firms are as follows:

- IT system
- Inland transport linkage
- International transport infrastructure (e.g. port and airport)
- Telecommunications, and
- Participating in the international standardization work of information exchange in logistics

In contrast, for the UK logistics firms, the five most important logistics policy attributes are:

- Telecommunications
- IT system
- Inland transport linkage
- International transport infrastructure (e.g. port and airport)
- Effective mechanisms for protecting the market from too high concentration and monopolization

In general, the level of importance accorded to logistics policy attributes by Taiwanese respondents is greater than that indicated by the UK respondents. Differences in respect of individual elements are calculated using independent-sample t-tests between respondent groups. Results indicate that logistics policy attributes are at 0.05 significant level between Taiwanese and the UK firms.

Table II Perceived differences of the importance of logistics policy attributes between Taiwan and the UK

Logistics policy attributes	Taiwan	UK	Mean Difference	F
Information technology system	4.60	4.20	0.40	20.40 **
Inland transport linkage	4.60	4.18	0.42	17.05 **
International transport infrastructure (e.g. port and airport)	4.55	4.09	0.46	18.09 **
Telecommunications	4.50	4.29	0.21	5.16 *
Participating in the international standardization work of information exchange in logistics	4.41	3.50	0.91	75.11 **
Integrating coherent logistics practices between companies and authorities	4.40	3.59	0.81	62.73 **
Embed sustainable transport logistics policy in national policies	4.37	3.64	0.73	41.61 **
Knowledge sharing through electronic platforms	4.32	3.52	0.80	63.80 **
Fostering smooth and fast integration and interoperability of different modalities	4.28	3.61	0.67	41.45 **
Funding for logistics research and development	4.25	3.23	1.02	73.63 **

Tighten environmental guidance, balanced against the efficiency objectives	4.25	3.35	0.90	65.07 **
Encouragement of logistics professional qualification	4.24	3.51	0.73	34.13 **
Promote the development and implementation of alternative fuels	4.18	3.65	0.53	18.91 **
Avoid waste and controlled re-use of old products and materials	4.17	3.66	0.51	19.73 **
Effective mechanisms for protecting the market from too high concentration and monopolization	4.16	3.68	0.48	16.45 **
Corporate governance	4.13	3.53	0.60	29.97 **

** p<0.01
* p < 0.05

4.3 Exploratory factor analysis results

Factor analysis is used to reduce the 16 logistics policy attributes to a smaller, manageable set of underlying factors (dimensions). This helps to detect the presence of meaningful patterns among the original variables and extract the main factors. Principal component analysis with VARIMAX rotation is used to identify logistics policy attributes as shown in Table V. The case-to-variable ratio is 16:1, which is achieved as the suggestion by Hair et al. (2006) with a minimum ratio of 5:1.

The data are deemed appropriate for analysis according to the Kaiser-Meyer-Olkin sampling adequacy value of 0.905 (Hair et al., 2006). The Bartlett Test of Sphericity is significant [x^2= 2,278, p < 0.01], indicating that correlations existed among some of the response categories. In interpreting factors, a decision has to be made as to which factor loadings are worth considering. According to Hair et al. (2006), if factor loadings are 0.50 or greater, they are considered important and practically significant. The larger the absolute size of the factor loading, the more important the loading is in interpreting the factor matrix.

The results present that the 16 items yield four factors or dimensions with eigenvalues greater than one (Churchill and Iacobucci, 2002). The percentage of variance for each of the four identified dimensions is shown in Table III. The total variance percentage can be used to indicate how well a particular factor accounts for what all the variables together represent. Factor analysis shows that approximately 69.5

per cent of the total variance is represented by the information contained in the factor matrix, and thus could represent all the logistics policy attributes (Hair et al., 2006). To aid interpretation, only variables with a factor loading greater than 0.50 are extracted, a conservative criterion based on Kim and Muller (1978) and Hair et al. (2006). These four logistics policy factors are shown in Table III and described below:

(1) Factor 1, a regulation dimension, comprises six items, namely, *avoid waste and controlled re-use of old products and materials; promote the development and implementation of alternative fuels; embed sustainable transport logistics policy in national policies; tighten environmental guidance; corporate governance; and effective mechanisms for protecting the market from too high concentration and monopolization*. These items are regulation and sustainability relate aspects in logistics policy. *Avoid waste and controlled re-use of old products and materials* have the highest factor loading on this factor. Factor 1 accounts for 45.63 per cent of the total variance.

(2) Factor 2, an integration dimension, consists of four items: *integrating coherent logistics practices between companies and authorities; knowledge sharing through electronic platforms; participating in the international standardization work of information exchange in logistics; and fostering smooth and fast integration and interoperability of different modalities.* These items are integration related activities. *Integrating coherent logistics practices between companies and authorities* have the highest factor loading on this factor. Factor 2 accounts for 10.05 per cent of the total variance.

(3) Factor 3, an infrastructure dimension, consists of four items, namely, *IT system; telecommunications; inland transport linkage; and international transport infrastructure (e.g. port and airport).*These items are infrastructure related items. *Information technology system* have the highest factor loading on this dimension. Factor 3 accounts for 7.35 per cent of the total variance.

(4) Factor 4, a logistics education dimension, comprises two items: *encouragement of logistics professional qualification and funding for logistics research and development.* These items are related to logistics education activities. *Encouragement of logistics professional qualification* have

the highest factor loading on this dimension. Factor 4 accounts for 6.42 per cent of the total variance.

A reliability test, based on Cronbach's alpha value, is used to test whether these dimensions are consistent and reliable. The Cronbach's alpha value for each dimension is shown in Table III. The reliability value of each factor is well above 0.8, indicating adequate internal consistency (Nunnaly, 1978; Churchill and Iacobucci, 2002).

Table III also shows respondents' importance levels each logistics policy dimension (factor) in the current situation. The results indicate they consider the infrastructure dimension (mean = 4.38) the most important (factor 3), followed by the integration dimension (factor 2) (mean = 3.95), regulation dimension (factor 1) (mean = 3.91) and logistics education dimension (factor 4) (mean = 3.77).

Table III Factor analysis of logistics policy attributes by respondents

	Factor 1	Factor 2	Factor 3	Factor 4
Regulation				
Avoid waste and controlled re-use of old products and materials	.819	.248	.203	.049
Promote the development and implementation of alternative fuels	.798	.131	.146	.106
Embed sustainable transport logistics policy in national policies	.689	.218	.198	.298
Tighten environmental guidance, balanced against the efficiency objectives	.653	.481	.142	.151
Corporate governance	.637	.251	.128	.214
Effective mechanisms for protecting the market from too high concentration and monopolization	.553	.241	.219	.134
Integration				
Integrating coherent logistics practices between companies and authorities	.207	.820	.236	.119
Knowledge sharing through electronic platforms	.276	.796	.156	.220
Participating in the international standardization work of information exchange in logistics	.255	.759	.210	.229
Fostering smooth and fast integration and interoperability of different modalities	.424	.673	.108	.120
Infrastructure				
Information technology system	.152	.204	.822	.055
Telecommunications	.157	.187	.766	.070
Inland transport linkage	.098	.190	.754	.189

International transport infrastructure (e.g. port and airport)	.305	.016	.689	.126
Logistics education				
Encouragement of logistics professional qualification	.253	.188	.162	.870
Funding for logistics research and development	.233	.306	.197	.823
Eigenvalues	7.301	1.608	1.176	1.028
Percentage variance	45.630	10.048	7.350	6.424
Cumulative variance	45.630	55.678	63.027	69.451
Cronbach Alpha	0.878	0.880	0.808	0.864
Mean	3.91	3.95	4.38	3.77

Note: the mean scores are based on a five-point scale (1=very unimportant to 5=very important).

4.4 Results of confirmatory factor analysis (CFA) and second-order analysis

After conducting EFA, a CFA using AMOS is applied to confirm the structure of EFA. The items of the four factors (i.e. regulation, integration, infrastructure and logistics education) are refined based on the goodness-of-fit of CFA.

Figure 1 illustrates the path diagram of a measurement model where the four latent constructs (regulation, integration, infrastructure and logistics education) consist of their corresponding multiple indicators (measures or items). In total, 16 observed variables are enclosed in this model. Six observed variables (Reg1-Reg6) are loaded onto Regulation; four observed variables (Int1-Int4) are loaded onto Integration; four observed variables (Inf1-Inf4) are loaded onto Infrastructure; and two observed variables (Edu1-Edu2) are loaded onto Logistics Education. The statistics criteria for model modification decisions include standardized residual co-variances and model fit indices.

According to Hair et al. (2006), standardized residuals with a value larger than 2.58 or less than -2.58 are considered statistically significant at the 0.05 significance level. Some goodness-of-fit indices are used to assess the fit and unidimensionality of the measurement model (Hair et al., 2006), namely: goodness-of-fit index (GFI), comparative fit index (CFI), adjusted goodness-of-fit index (AGFI), root mean square residual (RMSR) and root-mean-square-error of approximation (RMSEA). The normed chi-square (x^2/df) value is 2.109, and the GFI and CFI value are 0.909 and 0.951, respectively, above

the recommended level of 0.9. The AGFI value is 0.874, which exceeded the recommended level of 0.8. The RMR and RMSEA value are 0.04 and 0.066, respectively, smaller than their respective recommended threshold level of 0.05 and 0.08. This indicates that the model of CFA yielded an acceptable fit level and all item loadings are significant.

After conducting CFA, a second-order CFA is conducted to confirm that the theorized construct in this study loads into certain number of underlying sub-constructs. The results show that x^2/df value is 2.123, and GFI and CFI value are 0.906 and 0.949, respectively. The AGFI value is 0.872. The RMR and RMSEA value are 0.045 and 0.066, respectively. This indicates that the results of second-order analysis are acceptable and all item loading are significant.

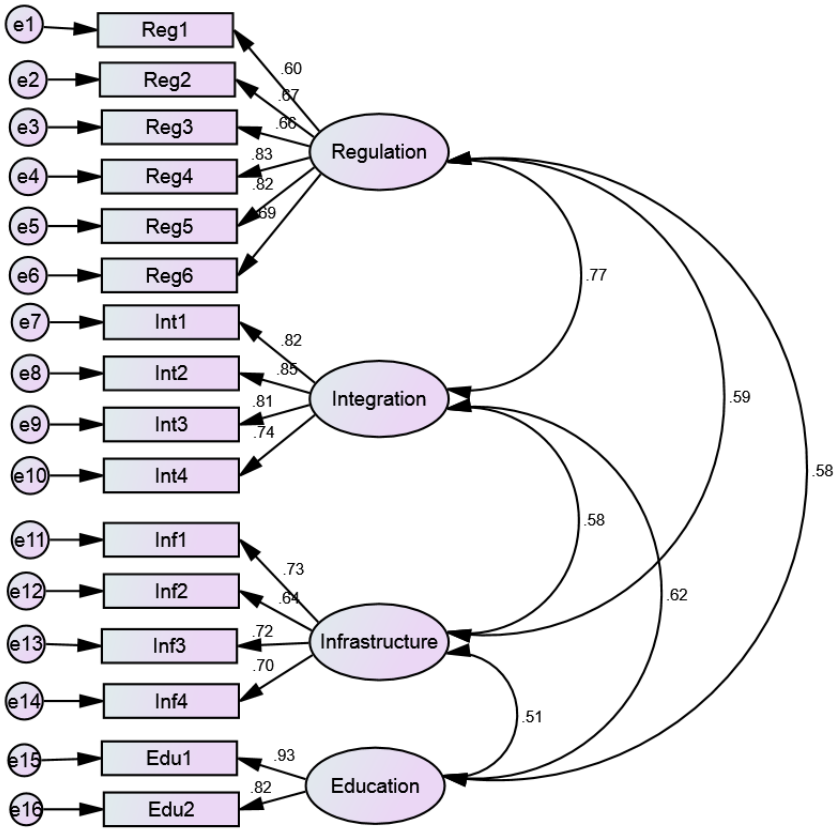

Figure 1 Path diagram representing CFA model

Note:
Reg1: Avoid waste and controlled re-use of old products and materials
Reg2: Promote the development and implementation of alternative fuels
Reg3: Embed sustainable transport logistics policy in national policies

Reg4: Tighten environmental guidance, balanced against the efficiency objectives
Reg5: Corporate governance
Reg6: Effective mechanisms for protecting the market from too high concentration and monopolization
Int1: Integrating coherent logistics practices between companies and authorities
Int2: Knowledge sharing through electronic platforms
Int3: Participating in the international standardization work of information exchange in logistics
Int4: Fostering smooth and fast integration and interoperability of different modalities
Inf1: Information technology system
Inf2: Telecommunications
Inf3: Inland transport linkage
Inf4: Ports and maritime transport
Edu1: Encouragement of logistics professional qualification
Edu2: Funding for logistics research and development

4.5 Importance-satisfaction analysis of logistics policy attributes

Importance-satisfaction analysis is used to compare the importance and satisfaction with logistics policy attributes as perceived by respondents to identify those areas requiring further allocation of resources to facilitate future improvement. The mean scores and standard deviations of all 16 logistics policy attributes for Taiwanese logistics firms are shown in Table IV. The aggregated mean score for importance (mean = 4.34) and satisfaction (mean = 2.96) are plotted in the importance-performance analysis (IPA) grid. Figure 2 shows the four quadrant scatter plots of logistics policy attributes, including Keep up the Good Work, Improvement Efforts should be Concentrated Here, Low Priority and Possible Overinvestment. Based on the results, four items are in the Keep up the Good Work quadrant, three items are in the Improvement Efforts should be Concentrated Here quadrant, eight in the Low Priority quadrant and one in the Possible Overinvestment quadrant.

Table V shows the mean scores and standard deviations of all 16 logistics policy attributes for the UK's logistics firms, in which the aggregated mean score for importance was 3.70 and for satisfaction was 2.88. Figure 3 shows the four quadrant scatter plots of logistics policy attributes. Based on the results, three items are in the Keep up the Good Work quadrant, one items are in the Improvement

Efforts should be Concentrated Here quadrant, nine in the Low Priority quadrant and three in the Possible Overinvestment quadrant. The contents of quadrants are described and discussed below.

4.5.1 Keep Up the Good Work quadrant

Among the 16 logistics policy attributes for Taiwanese respondents, four are in the *Keep up the good work* quadrant (Table IV and Figure 2). They are: *international transport infrastructure (e.g. port and airport), inland transport linkage, information technology system,* and *telecommunications*.

As all the mean scores for the satisfaction rating of these four logistics policy attributes are lower than those for the importance rating, efforts need to be expended in improving logistics firms' satisfaction level with them. For example, regarding *international transport infrastructure (e.g. port and airport)* and *inland transport linkage*, most logistics firms think that such items are important for logistics firms in their business (mean scores in terms of importance level are 4.53 and 4.6, respectively), yet their perceived satisfaction with the provision from government (mean scores in terms of satisfaction level are 3.15 and 3.20, respectively) are relatively low. Therefore, Taiwanese government needs to improving the inland transport linkage service and enhancing international transport facilities or equipment.

Table IV The relative importance and satisfaction of logistics policy attributes in Taiwan

		Importance Level		Satisfaction Level	
	Logistics policy attributes	Mean	S.D	Mean	S.D.
P1	Information technology system	4.60	0.69	3.30	0.69
P2	Inland transport linkage	4.60	0.66	3.20	0.78
P3	International transport infrastructure (e.g. port and airport)	4.55	0.74	3.15	0.74
P4	Telecommunications	4.50	0.70	3.41	0.72
P5	Participating in the international standardization work of information exchange in logistics	4.41	0.74	2.94	0.74
P6	Integrating coherent logistics practices between companies and authorities	4.40	0.72	2.76	0.73
P7	Embed sustainable transport logistics policy in national policies	4.37	0.78	2.79	0.73

P8	Knowledge sharing through electronic platforms	4.32	0.77	2.91	0.70
P9	Fostering smooth and fast integration and interoperability of different modalities	4.28	0.79	2.87	0.73
P10	Funding for logistics research and development	4.25	0.79	2.89	0.84
P11	Tighten environmental guidance, balanced against the efficiency objectives	4.25	0.79	2.78	0.76
P12	Encouragement of logistics professional qualification	4.24	0.88	2.95	0.80
P13	Promote the development and implementation of alternative fuels	4.18	0.86	2.72	0.84
P14	Avoid waste and controlled re-use of old products and materials	4.17	0.79	2.81	0.74
P15	Effective mechanisms for protecting the market from too high concentration and monopolization	4.16	0.84	2.85	0.63
P16	Corporate governance	4.13	0.80	3.07	0.64

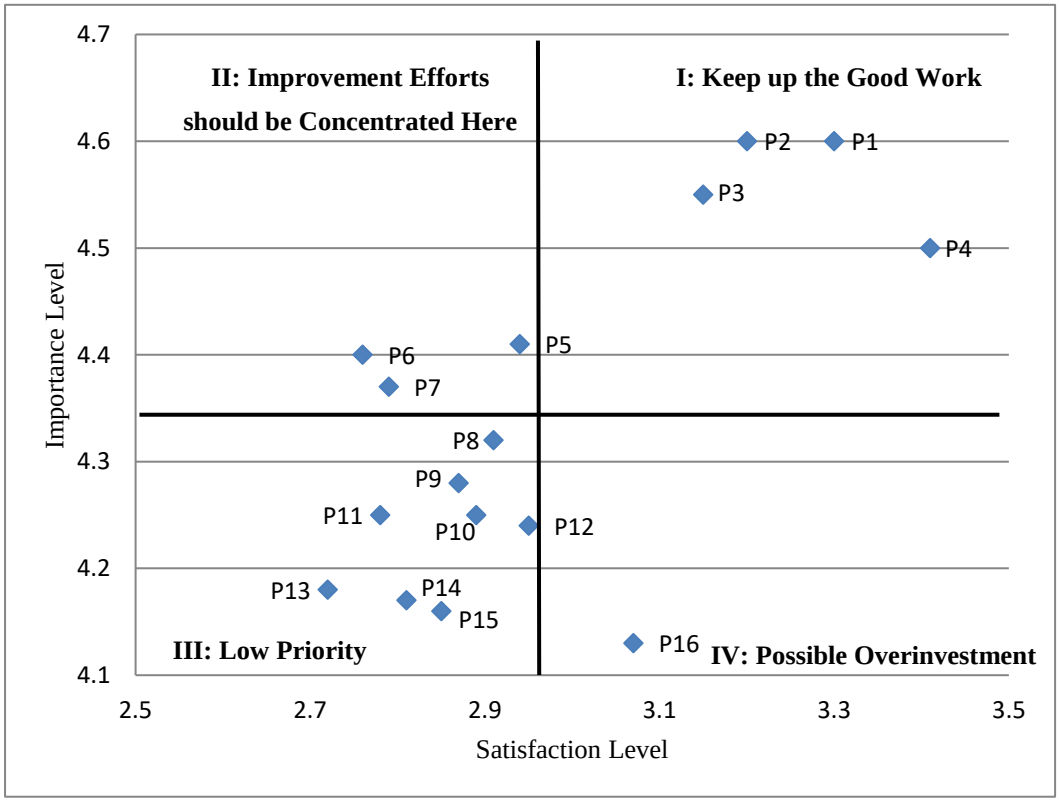

Figure 2 Importance-satisfaction analysis of logistics policy attributes in Taiwan

Table V The relative importance and satisfaction of logistics policy attributes in the UK

	Logistics policy attributes	Importance Level		Satisfaction Level	
		Mean	S.D	Mean	S.D
P4	Telecommunications	4.29	0.74	3.64	0.77
P1	Information technology system	4.20	0.72	3.45	0.74

P2	Inland transport linkage	4.18	0.97	2.85	0.88
P3	International transport infrastructure (e.g. port and airport)	4.09	0.99	2.97	0.76
P15	Effective mechanisms for protecting the market from too high concentration and monopolization	3.68	1.06	2.65	0.95
P14	Avoid waste and controlled re-use of old products and materials	3.66	1.06	2.86	0.79
P13	Promote the development and implementation of alternative fuels	3.65	1.07	2.50	0.91
P7	Embed sustainable transport logistics policy in national policies	3.64	1.01	2.58	0.80
P9	Fostering smooth and fast integration and interoperability of different modalities	3.61	0.87	2.79	0.81
P6	Integrating coherent logistics practices between companies and authorities	3.59	0.91	2.87	0.72
P16	Corporate governance	3.53	0.95	2.95	0.79
P8	Knowledge sharing through electronic platforms	3.52	0.82	3.02	0.70
P12	Encouragement of logistics professional qualification	3.51	1.10	2.64	0.94
P5	Participating in the international standardization work of information exchange in logistics	3.50	0.94	2.89	0.78
P11	Tighten environmental guidance, balanced against the efficiency objectives	3.35	1.00	2.80	0.73
P10	Funding for logistics research and development	3.23	1.11	2.55	0.93

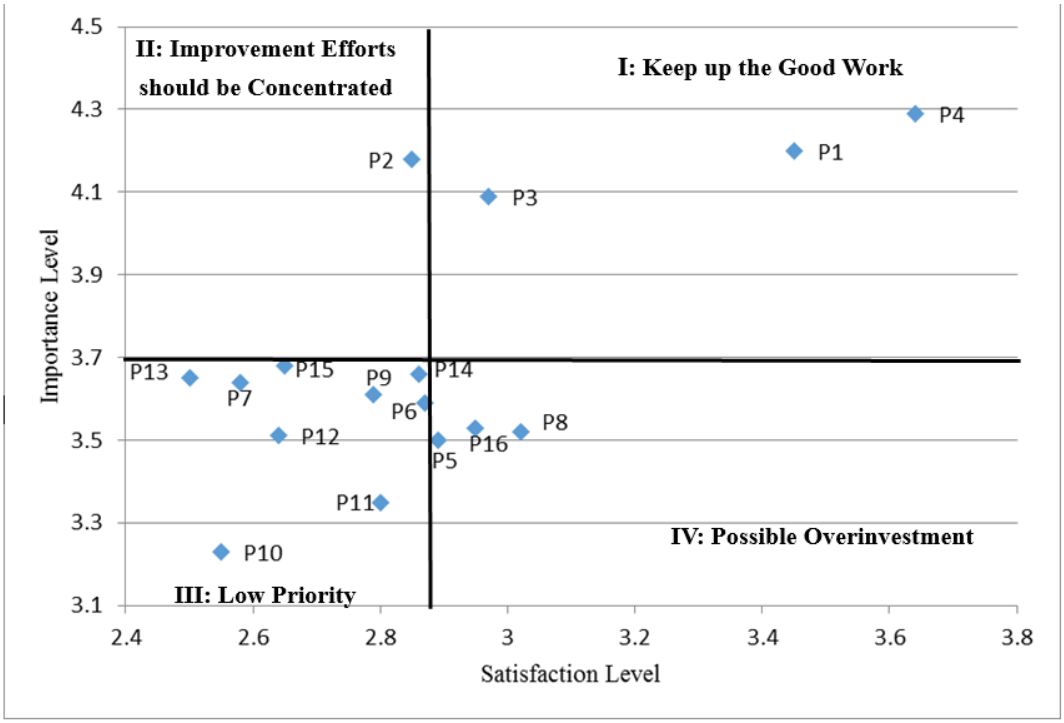

Figure 3 Importance-satisfaction analysis of logistics policy attributes in the UK

With regard to the perceptions from the respondents in the UK, three are in the *Keep up the good work* quadrant, namely: *international transport infrastructure (e.g. port and airport), information technology system,* and *telecommunications* (Table V and Figure 3). The mean scores in terms of importance level for these items are between 4.09 and 4.29, whereas the ones of satisfaction level are between 2.97 and 3.64. This reflects that respondents' satisfaction level for these three logistics policy attributes are low. Most items in the *Keep up the good work* quadrant are infrastructure related dimension. Hence, this study suggests that UK government needs to focus on the logistics infrastructure in order to increase the efficiency of logistics services.

4.5.2 Improvement efforts should be concentrated here

The concentrate here quadrant captures three logistics policy attributes for Taiwanese respondents, namely: *participating in the international standardization work of information exchange in logistics, integrating coherent logistics practices between companies and authorities,* and *embed sustainable transport logistics policy in national policies*. These are rated above average for importance but below average on satisfaction. Importantly, these items are perceived as the second most important logistics policy attributes for respondents (the mean scores are between 4.37 and 4.41), but the satisfaction levels of Taiwanese logistics firms in these respects are rated as the lowest (the means scores are between 2.79 and 2.94).

As regards UK respondents, only one logistics policy attribute locates in the concentrate here quadrant which is *inland transport linkage*. The mean score of importance level for *inland transport linkage* is 4.18, indicating that respondents' importance level with them is high. However, the satisfaction levels of UK logistics firms in these respects are rated as the lowest (the mean score is 2.85). This reflects that improvement efforts and special attention should be directed at and concentrated on the improvement of regulation in Taiwan and the UK.

4.5.3 The Low Priority quadrant

Eight logistics policy attributes are in the low priority quadrant for Taiwanese respondents, including *knowledge sharing through electronic platforms, fostering smooth and fast integration and*

interoperability of different modalities, funding for logistics research and development, tighten environmental guidance, encouragement of logistics professional qualification, promote the development and implementation of alternative fuels, avoid waste and controlled re-use of old products and materials, and *effective mechanisms for protecting the market from too high concentration and monopolization*. They are rated below average for both importance and satisfaction, implying that resource should not be overly concentrated on them. However, this does not mean that government should reduce their efforts to improve in these aspects; in general, all these logistics policy attributes have mean scores of importance level over 4.16, indicating that respondents rate them as somewhere between "important" and "very important". Further, as Taiwanese logistics firms express low satisfaction with these attributes, this suggests government still need to focus on them to increase competitive advantage for logistics firms.

Nine logistics policy attributes are in the low priority quadrant for the UK respondents, namely: *integrating coherent logistics practices between companies and authorities, embed sustainable transport logistics policy in national policies, fostering smooth and fast integration and interoperability of different modalities, funding for logistics research and development, tighten environmental guidance, encouragement of logistics professional qualification, promote the development and implementation of alternative fuels, avoid waste and controlled re-use of old products and materials,* and *effective mechanisms for protecting the market from too high concentration and monopolization*. Most items in this quadrant are related to the aspects of sustainability and integration. Figure 3 displays that the mean scores of importance levels for these logistics policy attributes are between 3.23 and 3.68, reflecting that UK government also needs to focus on them for the objective of sustainability to improve the quality of life.

4.5.4 The Possible Overinvestment quadrant

One logistics policy attribute is in the Possible Overinvestment quadrant from Taiwanese respondents, namely, *corporate governance*. This attribute is viewed as of lower than average importance, while

respondents' satisfaction with it is higher than average importance. Respondents might have considered the attribute as of lower importance than other attributes because it is of relevance primarily to logistics training and corporate governance. Its high satisfaction with the attribute might have been overly providing or auditing such services for Taiwanese logistics firms. In general, the finding suggests that government' efforts should be towards maintaining high standards without overly allocating resource to provide the aforementioned services.

Figure 3 shows that three logistics policy enables in the Possible Overinvestment quadrant from the UK respondents are *corporate governance, participating in the international standardization work of information exchange in logistics*, and *knowledge sharing through electronic platforms*. As indicated in Table V and Figure 3, the mean scores in terms of importance level for these items are between 3.5 and 3.53, whereas the ones of satisfaction level are between 2.89 and 3.02. This indicates that the UK respondents might consider these logistics policy attributes as less important compared with other attributes. Low satisfaction is observed from logistics firms in the UK in this area. Efforts should be towards maintaining high standards without over-using resources in this area.

5. Conclusion and suggestion

The purpose of this research is to compare the international logistics policies between the UK and Taiwan from international logistics service providers' perspective. Through feedbacks collected from British and Taiwanese logistics service providers, the result shows that respondents from both countries believe that logistics infrastructure is an important factor for the development of logistics policy. Relatively speaking, Taiwanese respondents have paid less attention to policies related to sustainable development, including "Avoid waste and controlled re-use of old products and materials", "Promote the development and implementation of alternative fuels" and "Clear long term perspective of regulatory changes (e.g. CO2 emissions reduction) allowing industry to prepare for their future implementation". For British respondents, less attention has been attached to policies relating to logistics education and development.

Although Taiwanese respondents pay more attention to the logistics policies than British respondents, Taiwan's logistics policy performance is lower than that of the UK. In addition, the results show that Taiwanese respondents are least satisfied with the policy of "The significance of transport externalities such as noise, pollution, emissions of carbon dioxide and other greenhouse gases", while the British respondents are least satisfied with the policy of "High quality service at reasonable cost with greater reliability". This indicates that Taiwan needs to improve on the environment and sustainable development, while the British logistics service providers perceive relatively higher logistics cost.

This study categorizes 16 logistics policies into four factors as "Regulation and integration", "Infrastructure", "Sustainable management" and "Education and training". According to the importance-satisfaction analysis, Taiwan government shall primarily improve the logistics policies on "Clear long term perspective of regulatory changes (e.g. CO2 emissions reduction) allowing industry to prepare for their future implementation", "Promote the development and implementation of alternative fuels", "Eradication of corruption", "Effective mechanisms for protecting the market from too high concentration and monopolization", "Participating in the international standardization work of information exchange in logistics" and "Avoid waste and controlled re-use of old products and materials". On the other side, the UK government shall primarily improve its logistics policies on "Infrastructure", "Eradication of corruption", "Corporate governance", "Effective mechanisms for protecting the market from too high concentration and monopolization" and "Fostering smooth and fast integration and interoperability of different modalities". The results could be used as references for logistics policy-making authorities such as Ministry of Transportation and Communications, Council for Economic Planning and Development or Ministry of Economic Affairs.

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