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A framework for the optimal logistics management in an integrated steel mill

Deokhyun Seong¹ and Min Soo Suh²

Abstract

Smoothing the material flow in an integrated steel mill is the most important topic for the streamlined operation. The iron and steel making processes can be considered as decoupled processes before and after the blast furnace from the material flow perspective. An integrated framework for the optimal logistics management is proposed with two different modeling concepts. The first one deals with the problem arising from the ships' arrivals to the blast furnace. The objective is to maintain a proper level of inventory for supporting 24-hr, continuous production activities while trying to minimize all relevant costs such as transportation, demurrage, and blending. The second model is related to the integrated scheduling from oxygen furnaces through continuous casters to hot rolling mills in a steelworks. The raw material management model has been developed and implemented to the integrated steel mill. However, the second model is not developed yet but the modeling framework with respect to the optimization is proposed. The integrated framework proposed will contribute to the optimization of the logistics management in an integrated steel mill.

1. Introduction

As shown in Figure 1, an integrated steel mill consists of a series of facilities where iron ore and other raw materials are converted into steel and, using continuous casting into products such as flat rolled steel or plate. The steel production processes can be categorized into two main functions: iron making to convert iron ore to liquid iron, and steel making through casting to product rolling for final products.

In the iron making process, the main concern is how to minimize the whole operation costs associated with raw materials transportation and blending of different raw materials while supporting the stable operations of blast furnaces running continuously. For the subsequent steel making processes, it is crucial to maximize throughput by integrating the scheduling functions in their related processes such as steel making, casting, and rolling. In this paper, we are proposing a framework to effectively deal with these two separate decision making problems by applying various quantitative methods such as simulation, optimization models, and constraint satisfaction problem approach.

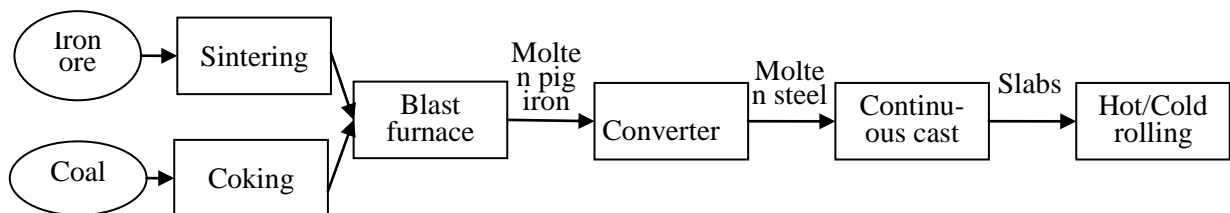


Figure 1. Typical processes of an integrated iron and steel mill

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2. A framework for the logistics management

As shown in Table 1, a framework for the logistics management in an integrated steel mill is proposed. A framework is composed of two models which can be operated separately. The objectives and constraints with sub-models are shown in the table.

Table 1. Overview of the framework

	Raw Material Management Model	Integrated Scheduling Model
Target Processes	- From the procurement of raw materials to the blast furnace	- From the converter to the hot rolling process
Objectives	- The continuous flow should not be interrupted.	- Minimizes the planned inventories. - Maximize the number of consecutive lots at the continuous casting process. - Minimize the number of batches per one roll.
Constraints	- No stockout is allowed for each type of raw materials. - Target quality of the product should be maintained. - Space requirements should be fulfilled for the stock yard. - Condition monitoring system should be developed for any sudden breakdowns through the in-flow processes.	- Each lot should be formed with the same type of materials for each process. - The hot charge roll or the warm charge roll is preferred throughout the processes from the steel making to the rolling processes.
Detailed models needed	- Ship scheduling model: To control the arrival dates of raw material carrying vessels at the plant. - Blending model: To make the optimal blended ores or blended coals. - Simulation model: To trace the material flow from the unloading of the raw materials to the blast furnace.	- Charge forming model: Forming customer's orders into charges to minimize the number of formed charges. The size of each charge is 300 tons. - Cast forming model: Forming charges into a series of charges, called cast, to minimize total number of casts. - Roll unit forming model: Forming slabs produced from the continuous casting process into roll units to minimize the number of roll units.

2.1. A raw material management model

The objective of raw material management at steelworks is to maintain a proper level of inventory for supporting 24-hr, continuous production activities while trying to minimize all relevant costs such as transportation, demurrage, and blending. A proper inventory level prevents both stock-out and yard overflow by maintaining the level within the range from the safety stock minimum level to the maximum stock yard capacity. The inventory level of each raw material brand is determined by shipping schedules where the arrival time of a ship and its loaded quantities are the two major decision variables. To effectively create shipping schedules, we used optimization models to decide the ship arrival times, and their shipping quantities of raw materials from loading ports.

Once shipping schedules are planned, future inventory levels in stock yards can be predicted by simulation. A simulation model is used to provide a daily calculation of the amount of raw materials stored in each cell of stock yards while considering the unloaded quantities from ships and the amounts consumed by downstream production processes such as sintering and coking plants. By running simulation models, the performance of different shipping schedules can be evaluated and compared, thereby improving future forecasts.

The quality of downstream products such as sintered ores and cokes is significantly affected by the mix of different brands of raw materials. For effective control of quality and cost, an optimization model has been developed to determine the optimum consumption rate of each brand while attempting to minimize their purchasing costs and satisfy all the relevant constraints such as the minimum daily consumption of each brand and the chemical properties and effects arising from brand mixing. This material blending model is run together with the simulation model whenever the blending of new materials is required due to a new ship arrival or the complete consumption of a certain brand of raw material.

The integrated model can be composed of three components: ship scheduling, yard operation simulation, and material blending models, as shown in Figure 2. The ship scheduling model determines the arrival times of vessels at the steel plant that departed from various loading ports. Separate schedules should be made for the shipping of iron ore and coal because they are operated separately. The arrival date of the ship should be determined in order to prevent the total inventory level of the yard from exceeding the yard capacity. On the other hand, the ship's arrival date should satisfy the yard's requirements for maintaining a safety level of each brand at all times. The mathematical form of the ship scheduling model is 0-1 mixed integer. The blending is also modeled as 0-1 mixed integer programming. The model should be prepared for daily operations, and it should reflect the current on-hand inventory level per brand fulfilling the quality constraints for each iron ore and coals. Finally, the simulation model is developed to simulate all the processes from the ships' arrivals to the retrieval of the raw materials from the stock yards. The animation also makes it possible to cope with the unexpected situation beforehand.

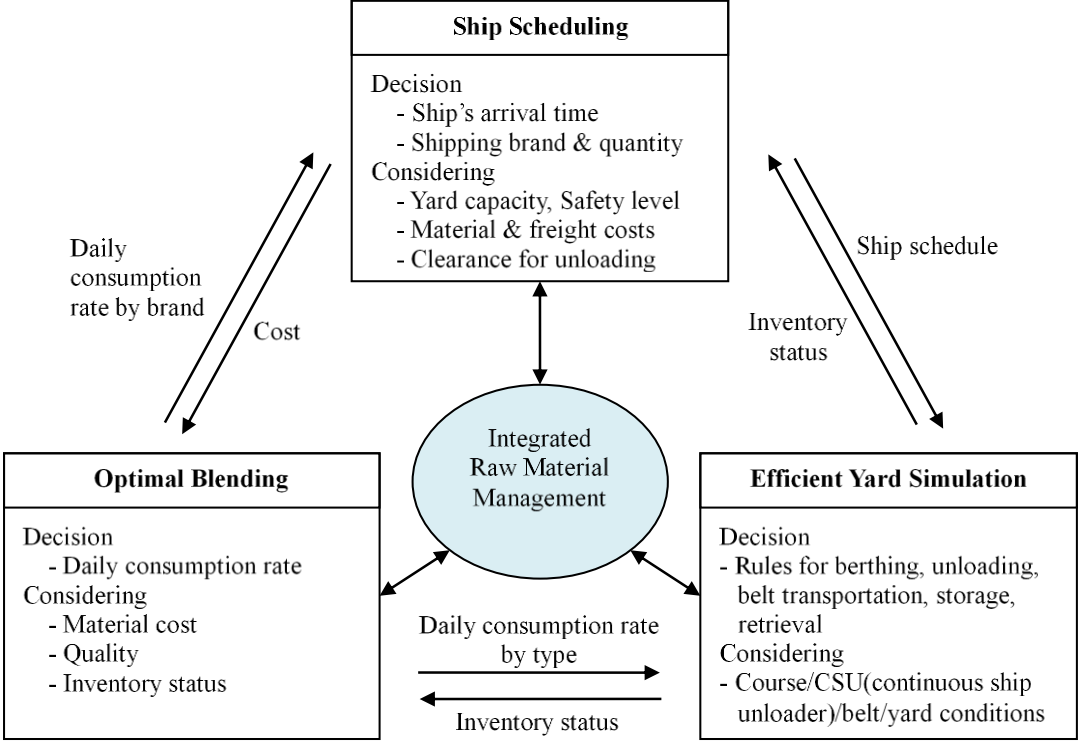


Figure 2. Integrated raw material management framework

2.2. An integrated scheduling model

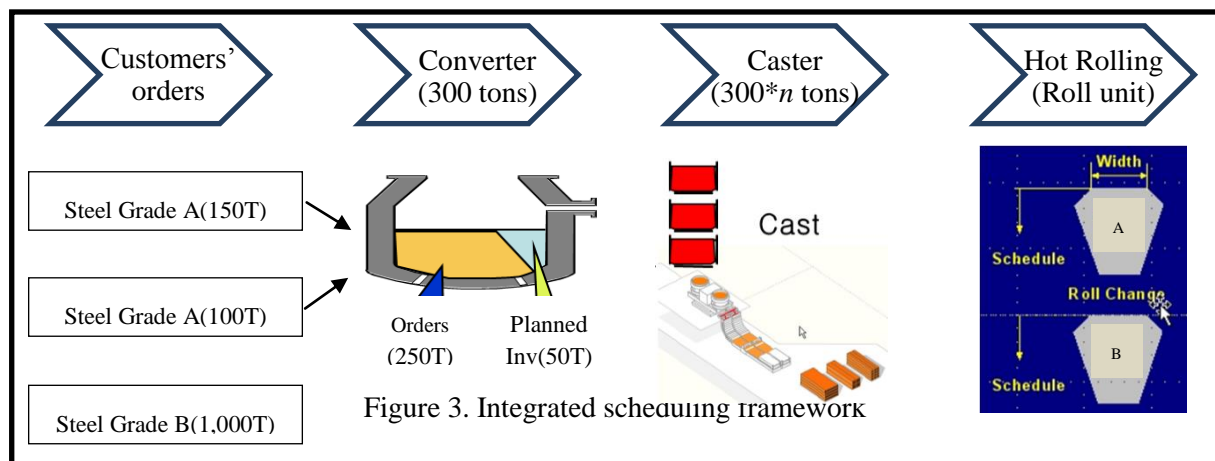
As shown in Figure 3, an integrated scheduling model deals with the scheduling problems arising from the steel making through the continuous casting to the hot rolling processes.

Firstly, we have to form 'charges' from the orders. The weight of each charge should be 300 tons and all orders within a charge should have the same steel grade. When the total weight of orders fall short of 300 tons with the same steel grade, then one charge of 300 tons should be formed. In this case, the difference between total weight of orders and the weight of one charge is the planned inventories. So the objective of a charge forming model is to minimize the number of charges formed with orders.

Secondly, ‘casts’ should be formed at the continuous casting process where a series of consecutive charges called cast is made. The steel grades of consecutive charges within a cast should be the same. The objective is to minimize the number of casts formed with charges.

Finally, the continuous casting process produces slabs whose average weight is about 25 tons. Forming the ‘roll unit’ means determining the rolling sequences of each slab at the hot rolling process. The width of each slab included in a same roll unit should be narrowed as shown in Figure 3. Once rolling operations are finished for a roll unit, work rolls should be replaced as new ones, and slabs of the next roll unit are put into the rolling operation. So the objective of the hot rolling process is to minimize the number of roll unit formed with slabs produced.

We are to implement core scheduling modules based on the Constraint Satisfaction Problem (CSP) approach for integrated scheduling from oxygen furnaces through continuous casters to hot/cold rolling mills in a steelworks. Domain specific variable and value ordering strategies are developed to construct feasible schedules within a limited response time.



3. Expected results

The raw material management model has been developed and implemented to the integrated steel mill. However, the second model is not developed yet but the modeling framework with respect to the optimization is proposed. The logistics management is the primary concern for the streamlined operation in an integrated steel mill because of the continuous process characteristics. The integrated framework proposed will contribute to the optimization of the logistics management in an integrated steel mill. Now, the second model is now under development for the optimal flow.

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The Transformation of Korea Export Gateway System between 1991 and 2010 – A Typological Approach using GeoVisual Analysis

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ABSTRACT

The purposes of this study are to analyze the transformation of Korean export gateways between 1991 and 2010 and to categorize them according to its attribute type. The analytical cycle is every 5 year(1991, 1995, 2000, 2005, 2010) during last 2 decades and the subjects of analysis are 25 trade gateways(21 seaports and 4 airports) in Korea. This study has developed 7 models to analyze gateways' category based on 5 indexes(amount of export, export freight weight, export freight value, number of export countries, export item numbers). These models using geovisual analysis could categorize 25 Korean export gateways into 5~6 types. The outcome of this study gives us a good understanding of Korean trade gateway system and will help many gateway's operators to establish their own developing strategies corresponding to its' attribute type.

I. Introduction

As well known, Korea is one of the most trade-oriented county in the world. So, in 2011, Korea had finally joined 'the ninth one trillion dollars trade club'. Today, Korea has 35 trade gateways(7 international airports, 28 trade seaports). This is very big number considering the national territory size and it is anohter evidence that trade activity in Korea is becoming more important to the national economy. However, Korean trade(export) gateway system has been changed rapidly during last two decades. The 'China effect' and the structural change of Korean export industries were the key dynamics in these trends.

Because the U.S. and Japan have been the most important trade partners during the later half of the twentieth century, Korea has developed its trade gateway(expecially seaport) system mainly along the southeastern coast, which has the proximity advantage, notably toward Japan. While China accounted for only 2.9 percent of the total Korean trade in 1991, a manufacturing transition increased this figure substantially during the 1990s with the strengthening of transnational supply chains along the Yellow Sea Rim. Moreover, with the admittance of China to the WTO, Sino-Korean economic integration accelerated. Korean trade with China increased at a rate significantly faster than with its other trade partners. As a result, in the middle of 2000's, China overtook Japan and the U.S. to become Korea's most important trade partner.

Also, the overall korean export industries has changed more high value-added ones during that period. New Korean export items such as semi-conductor, mobile phone, automobile, high-value vessel and petrochemistry products have replaced the old ones such as footwear, apparel and many labor-intensive products. As a result, several bulk freight seaports and airport(especially Seoul(Gimpo +Incheon) have become more important trade(export) gateways in Korea. These changes mean that the role of traditional export gateways, container seaports like as Busan, has decreased relatively during last 2 decades.

In this context, the purposes of this study are to analyze the transformation of Korean export gateways between 1991 and 2010 and to categorize them according to its attribute type.

II. Research Overview and GeoVisual Analysis

2.1 Research Target, Analysis Index and Models

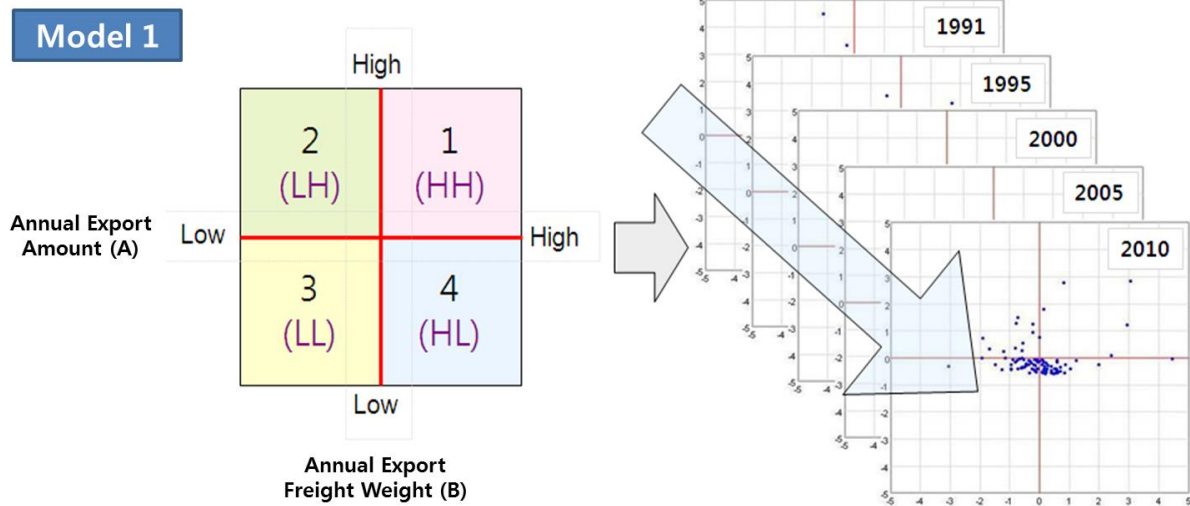
<Table 1> Analysis Target Gateways

	Gateway's name
Seaports (21)	Busan, Incheon, Gwangyang, Pyeongtaek, Gohyun, Yeosu, Okpo, Onsan, Masan, Mipo, Pohang, Mokpo, Gunsan, Tongyong, Jinhae, Tonghae, Wando, Cheju, Mukho, Samcheonpo
Airports (4)	Seoul(Gimpo+Incheon), Gimhae(Busan), Daegu, Cheju

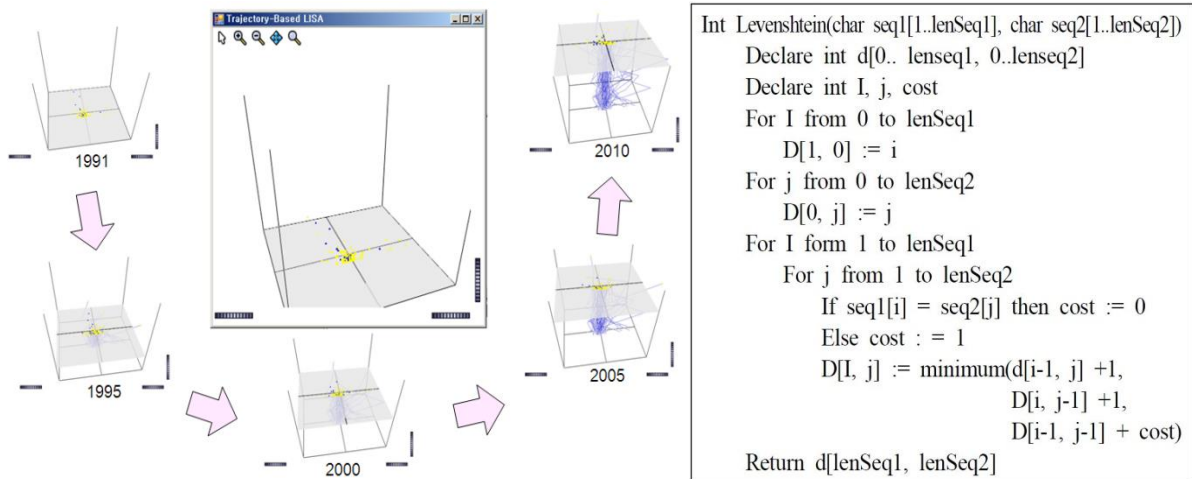
<Table 2> 5 indexes and 7 models for analysis

5 analysis indexes	A : Annual Export Amount(million \$) B : Annual Export Freight Weight(million Ton) C : Export Freight's Value(A/B) D : Numbers of Export Target Countries(\$1,000/year more) E : Numbers of Export Freight Items (based on HS code 4 digits)
7 models combined by analysis indexes	$A \times B$, $A \times C$, $A \times D$, $A \times E$, $C \times D$, $C \times E$, $D \times E$

2.2 GeoVisual Analysis and Cluster Analysis for Categorization – Model 1(sample)



<Figure 1> Making Time-Series T Scatter Plot for the Typological Analysis (sample – Model 1)



<Figure 2> Trajectory-based Scatter Plot for GeoVisual Analysis and Levenshtein Distance Calculation Algorithm for MSQS Cluster Analysis

III. The Changes of Korean Export Gateways Characteristics between 1990 and 2010

This study has examined the changes of 25 Korean gateway's general characteristics during last two decades(1991~2010). The 5 subjects of analysis were annual export amount(Table 3), export freight weight, export freight's value, numbers of export target countries and numbers of export freight items. The major findings and implications are as follows;

<Table 3> Annual Export Amount of 25 Korean Gateways (1991~2010)

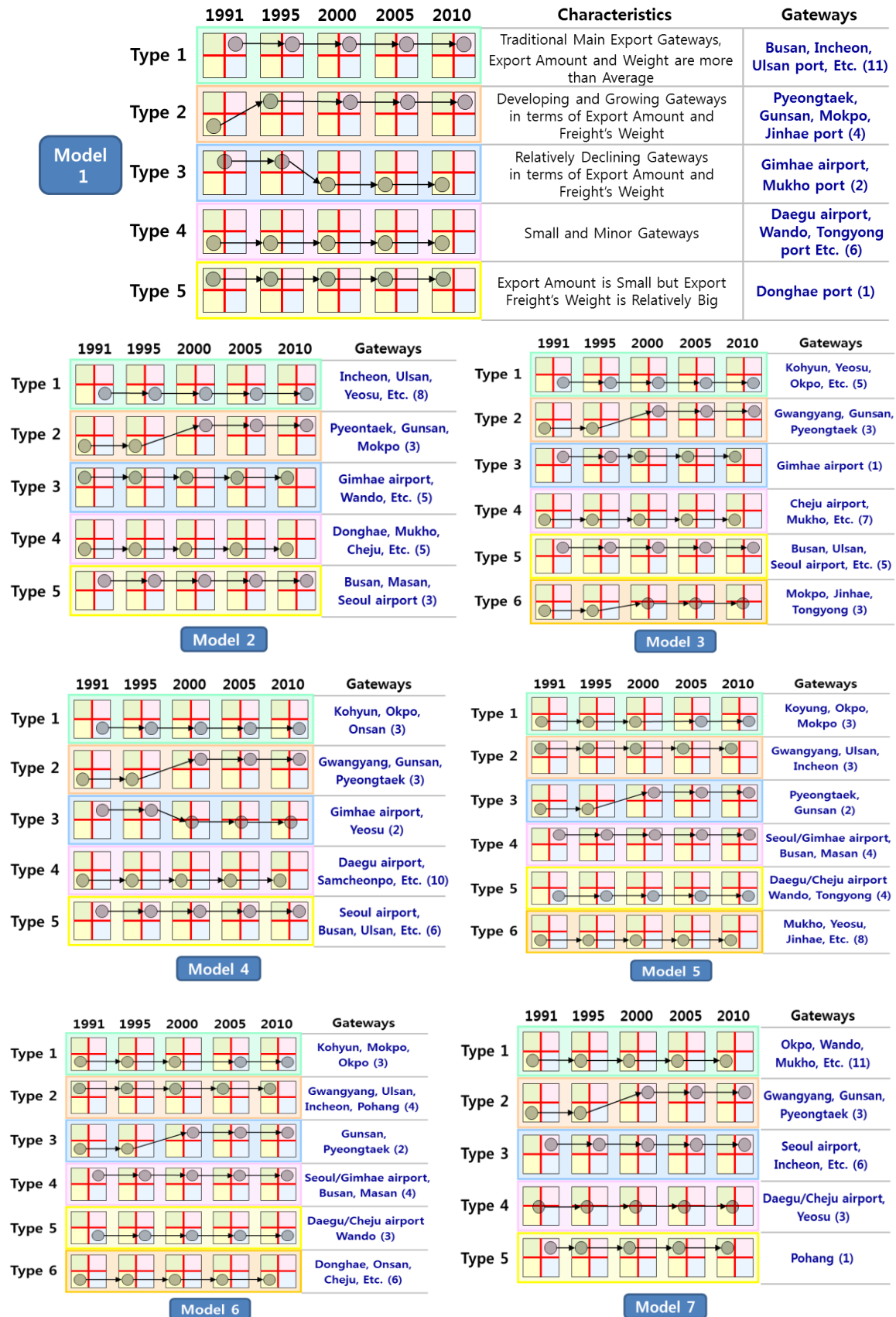
(Unit: US million \$)

Gateway	1991	1995	2000	2005	2010	CAGR
All Seaports	59,373.9*	91,466.1	119,239.0	197,618.7	349,189.8	9.8%
Busan	46,257.8	64,022.9	68,182.8	87,058.6	133,574.7	5.7%
Ulsan	3,395.6	8,423.9	12,576.1	25,296.3	40,557.2	13.9%
Incheon	2,226.2	7,650.0	10,577.5	18,494.8	40,158.1	16.4%
Gwangyang	1,224.3	1,911.9	4,904.9	12,878.3	24,685.3	17.1%
Pyeongtaek	0.1	1.8	1,737.2	12,118.8	16,815.7	86.1%
Kohyun	482.1	1,117.7	1,738.1	3,302.5	12,462.3	18.7%
Yeosu	497.4	1,048.8	2,881.1	5,229.4	11,967.7	18.2%
Okpo	1,156.2	1,230.4	2,016.8	3,954.8	10,206.7	12.1%
Onsan	502.8	1,632.6	3,368.4	6,398.5	9,089.3	16.5%
Masan	201.6	1,678.5	2,063.1	3,670.1	8,758.3	22.0%
Mipo	1,990.2	564.7	2,834.9	4,308.4	6,980.0	6.8%
Pohang	1,233.6	1,344.9	1,777.5	4,400.1	6,811.3	9.4%
Mokpo	21.7	102.2	376.8	3,085.5	5,805.9	34.2%
Gunsan	0.8	233.2	1,244.8	3,077.4	5,584.1	58.9%
Tongyeong	51.9	59.2	55.9	397.7	3,353.9	24.5%
Jinhae	14.4	54.8	271.0	878.0	3,245.5	33.0%
Donghae	48.8	134.2	123.7	204.7	336.7	10.7%
Wando	33.3	36.4	22.0	20.8	44.4	1.5%
Cheju	0.8	5.4	2.1	1.0	12.6	16.0%
Mukho	2.3	8.1	3.9	4.9	5.2	4.3%
Samcheonpo	3.0	3.4	8.0	14.0	0.7	-7.1%
Other seaports	29.2	201.1	2,472.3	2,824.3	8,734.1	35.0%
All Airports	12,001.8	33,183.0	52,502.2	86,399.6	114,781.5	12.6%
Seoul	11,598.1	32,548.6	52,069.9	85,992.6	113,898.1	12.8%
Gimhae	393.6	614.0	371.2	394.5	866.2	4.2%
Cheju	7.4	14.1	13.7	5.5	7.6	0.1%
Daegu	2.4	6.2	10.9	5.8	6.3	5.2%
Other Airports	0.3	0.1	36.6	1.3	3.4	13.4%
Total	71,375.8	124,649.1	171,741.2	284,018.3	463,971.4	10.4%

- Airport gateway's relative growth comparing to seaport gateways
 - owing to hightec export industries, peak period was the mid 2000's but now a little bit stagnant.
- Busan port's monopoly among seaport gateways has been weakened but the power of Seoul(Gimpo->Incheon) airport among airport gateways has been more strong.
 - related industries' concentration on Seoul Metropolitan Area
- Rapid growth of energy and ship-building related seaports
 - one of main factors for the deconcentration of seaport gateway system in Korea
- Containerization was a key factor for export diversification
 - last-movers such as Gwangyang port are the main beneficiaries of export diversification

IV. Research Results

4.1 Classification of Korean Trade Gateways based on 7 analysis models



<Figure 3> Classification of Korean Trade Gateways based on 7 analysis models

V. Conclusions

The purposes of this study are to analyze the transformation of Korean export gateways between 1991 and 2010 and to categorize them according to its attribute type. The analytical cycle is every 5 year(1991, 1995, 2000, 2005, 2010) during last 2 decades and the subjects of analysis are 25 trade gateways(21 seaports and 4 airports) in Korea. This study has developed 7 models to analyze gateways' category based on 5 indexes(amount of export, export freight weight, export freight value, number of export countries, export item numbers). These models using geovisual analysis could categorize 25 Korean export gateways into 5~6 types.

In short, the most prominent growing gateways in Korea in terms of export amount, freight's weight, unit value and diversification are Pyeongtaek, Gunsan, Gwangyang and Mokpo port during last 2 decades. These ports have 2 things in common. One is that they are relative newcomers in containerization and the other is that they are the main beneficiaries of sino-Korean supply chains development since 1990's. On the other hand, Gimhae international airport and several local ports such as Yeosu and Mukho are the representatives of declining trade(export) gateways in Korea during same period. These trends clearly reflect the intensification of leading airport gateway's primacy and partly explain that the development of regional supply chain would be the key factor for each gateway's sustainability.

This study insinuates that the reorientation of Korean trade caused by the China effect is the main factor behind recent changes and differential seaport growth in the Korea. In this context, economic regionalization and trade reorientation could be considered as new explanatory conditions for examining the development of regional gateway systems. Also, the structural changes of national export industries, especially the growth of high value-added export freights, would be the main driving force to change the national trade(export) gateway system. This trend will lead to high competition between airport and seaport gateways.

By diversifying variables, this categorizing research method using the GeoVisual analysis would be very useful for understanding many international logistics issues. The outcome of this study gives us a good understanding of Korean trade gateway system and will help many gateway's operators to establish their own developing strategies corresponding to its' attribute type.

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What Is Going on in the Minimum Wages of Southeast Asian Countries?

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I. Introduction

Since 2012 Southeast Asian countries, which have played an important role based on the low income and rich labor force as production bases for foreign investors, increased minimum wages drastically, and the issue of minimum wage increase became a major concern among foreign companies that advanced into the area. Besides, this has caused difficulties to a number of foreign companies due to the increase of expenses. For example, in the capital cities of each country as of 2013, the minimum wage increased 44% in Indonesia, 35% in Thailand, and 17% in Vietnam, which indicates the far higher level of minimum wage growth than before.

Although the causes might be different among the countries, such minimum wage increase among Southeast Asian countries is expected to continue for a while. Therefore, foreign companies that have advanced or will advance into Southeast Asia need to be prepared and establish management strategies in advance. In this regard, this study examines the deciding factors of minimum wages in Southeast Asian countries in macro-economic perspectives. Based on which the recent drastic increase of minimum wages in major Southeast Asian countries such as Indonesia, Thailand, Laos, and Vietnam are discussed to address the meaning and significance.

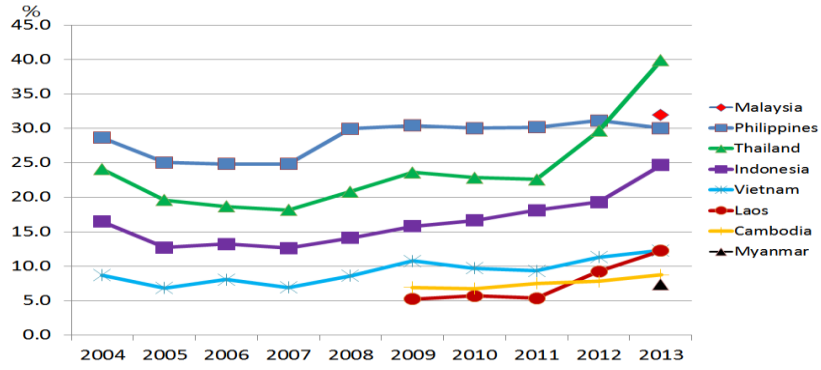
II. Changes in Minimum Wages of Southeast Asia

<Table 1> Changes of the Minimum Wage in Southeast Asian Countries (Monthly; USD)

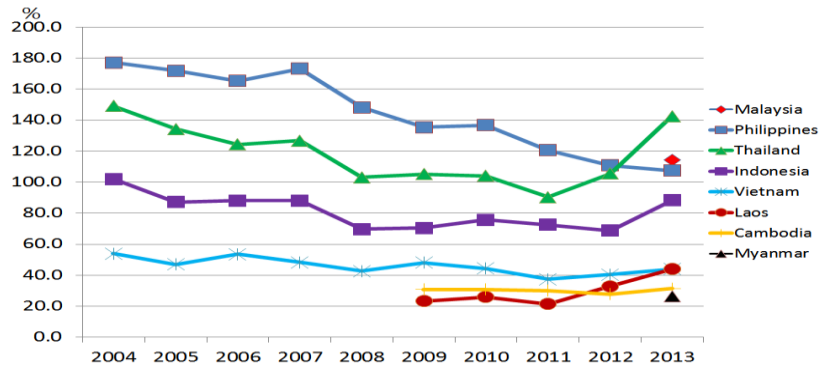
	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2013/ 2004 ¹)
Korea	455. 8	576. 8	675. 3	778. 9	711. 5	651. 6	739. 5	810. 8	845. 4	913. 2	2.0
China	73.7	84.2	101. 6	111. 7	143. 9	146. 4	162. 5	202. 7	237. 7	255. 4	3.5
Malaysia	-	-	-	-	-	-	-	-	-	291. 6	-
Philippines	130. 6	144. 7	168. 0	193. 5	213. 2	198. 2	222. 2	244. 6	263. 2	274. 2	2.1
Thailand	109. 9	113. 1	126. 3	141. 6	148. 3	153. 9	169. 0	183. 3	251. 0	364. 4	3.3
Indonesia	75.1	73.3	89.4	98.5	100. 3	103. 0	123. 0	147. 1	163. 3	225. 4	3.0
Vietnam	39.8	39.5	54.4	54.0	61.3	70.3	72.0	75.6	95.8	112. 1	2.8
Laos	-	-	-	-	-	34.1	42.1	43.3	78.2	112. 0	3.3
Cambodia	-	-	-	-	-	45.0	50.0	61.0	66.0	80.0	1.8
Myanmar	-	-	-	-	-	-	-	-	-	67.0	-

Note. As for Laos and Cambodia, the increase rate in 2013 compared to the year of 2009

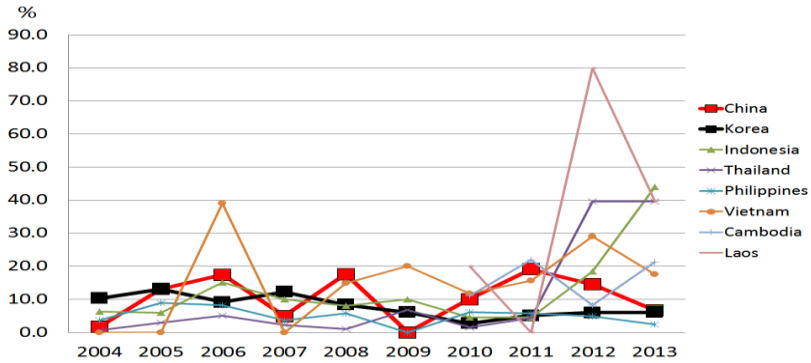
<Figure 2> Minimum Wage Weight of Southeast Asian Countries (compared to Korea)



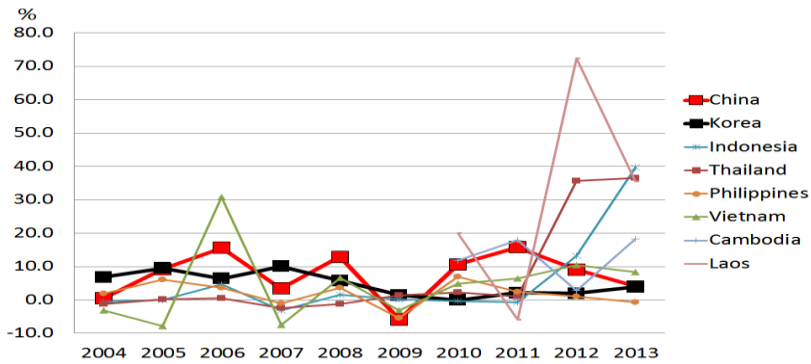
<Figure 3> Minimum Wage Weight of Southeast Asian Countries (Compared to China)



<Figure 4> Changes in the Minimum Wage Growth of Southeast Asian Countries



<Figure 5> Changes in the Real Minimum Wage Growth of Southeast Asian Countries



III. Analysis of the Deciding Factors of Minimum Wages of Southeast Asia

1. Model Selection I

$$\text{Minimum wage growth} = \text{Inflation rate} + \text{Economic growth rate} + \alpha$$

Among the variables in the expression above, the inflation rate and economic growth rate may be commonly applied to the minimum wage increase of Southeast Asian countries in that they make it possible to predict the minimum wage increase (sum of the two variables). Then the next factor to be considered is the cause of the difference between the actual minimum wage growth and the sum of the two variables used to predict the minimum wage growth. This difference is also referred to as α . It is difficult to apply the same value of α to all cases since it may defer depending on the various political matters and policies in each country.

As the sum of the inflation rate and economic growth rate is closer to the actual minimum wage growth, the value of α would be smaller and this will indicate that the effect of non-economic elements such as political matters and policies is limited. In contrast, as the effect of non-economic elements is large, the sum of the inflation rate and economic growth rate would be different from the actual minimum wage growth. Hence, the difference between the actual minimum wage of Southeast Asian countries and the sum of the inflation rate and economic growth rate for the last 10 years should be compared in order to find the significance of the recent minimum wage increase.

<Table 2> Changes in Variable α among Southeast Asian Countries (%)

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Korea	4.0	4.9	2.4	4.8	0.7	-0.9	-0.3	-4.1	-1.7	1.9
China	-9.5	-0.9	4.3	-9.2	-1.3	-15.5	1.5	5.3	-0.2	-3.8
Malaysia	-	-	-	-	-	-	-	-	-	-
Philippines	-4.8	-3.8	-4.3	-7.9	-3.7	-12.3	0.7	-5.7	-3.5	-7.6
Thailand	-8.4	-6.2	-4.0	-7.6	-6.2	-1.1	4.7	-6.7	35.6	30.0
Indonesia	-4.8	-10.2	-3.5	-2.8	-7.8	0.6	-6.9	-7.3	8.0	44.0
Vietnam	-10.4	-15.6	22.3	-15.7	-1.8	-9.4	-0.4	-0.3	4.5	3.4
Laos	-	-	-	-	-	-	12.7	-13.5	64.5	27.6
Cambodia	-	-	-	-	-	-	11.7	12.0	-4.4	11.1
Myanmar	-	-	-	-	-	-	-	-	-	-

Note. Significance levels are 15% +, 10% *, 5% **, 1% ***.

2. Model Selection II

$$\Delta W_{Mt+1} = C_t + \alpha \Delta Y_t + \beta \Delta P_t + \gamma \Delta I_{Dt} + \delta \Delta I_{Ft} + \varepsilon_t$$

Where, the symbol Δ indicates the increase rate of each variable. α , β , γ , δ indicates the coefficient of each variable, showing how many % the minimum wage increases when each variable increases as much as 1%. ε_t indicates the error term while t indicates the time series. As for W_M , the subordinate variable, basically $t+1$ is used since the minimum wage is decided based on the economic variables in the previous term. For example, the minimum wage in 2013 reflects the variables of the previous year, 2012, such as economic growth rate, consumer price growth rate, and so forth.

3. Data and Estimation

<Table 3> Data Description

Variables	Definition	Unit	Period	Data Source
W_M	Monthly Minimum Wage	US \$	2004~2013	Minimum wage commission of each country
GNI	Gross National Income	Million US \$	2003~2012	ADB Data Base
P	Consumer Price Index	Index	2003~2012	ADB Data Base
I_D	Domestic Investment	Million US \$	2003~2012	ADB Data Base
I_F	Foreign Direct Investment	Million US \$	2003~2012	UNCTAD Data Base

<Table 4> Result of Estimation of the Minimum Wage Determining Equation

Variables	Estimation I	Estimation II	Estimation III	Estimation IV
C	3.561** (1.332)	3.633** (1.298)	4.342** (1.459)	1.018 ⁺ (0.489)
ΔGDP	0.414** (0.117)	0.336* (0.124)	0.138 ⁺ (0.102)	0.063* (0.032)
ΔI_D	-	-	-	0.024* (0.010)
ΔI_F	0.048*** (0.017)	0.049** (0.021)	0.044* (0.017)	0.033* (0.013)
ΔP	0.146* (0.090)	0.147* (0.087)	0.155 ⁺ (0.110)	0.624** (0.224)
Obs.	52	44	36	24
F statistic	2.309**	2.213**	2.650**	4.137***
Adjusted R^2	0.204	0.203	0.274	0.450

<Table 5> Comparison of the Expected Minimum Wage Growth and Actual Growth (2013)

	Actual (A, %)	Estimation I		Estimation II		Estimation III		Estimation IV	
		Expected (B, %)	Difference (A—B, , %p)	Expected (C, %)	Difference (A—C, , %p)	Expected (D, %)	Difference (A—D, , %p)	Expected (E, %)	Difference (A—E, , %p)
Korea	6.1	7.5	—1.4	-	-	-	-	-	-
China	6.7	9.3	—2.6	9.6	—2.9	-	-	-	-
Indonesia	44.0	5.8	38.2	5.7	38.3	5.7	38.3	5.1	38.9
Thailand	39.5	3.3	36.2	3.2	36.3	2.8	36.7	3.4	36.1
Philippines	2.3	5.6	—3.3	5.4	—3.1	5.1	—2.8	3.9	—1.6
Laos	39.7	10.3	29.4	10.3	29.4	10.2	29.5	-	-
Vietnam	17.5	7.6	9.9	7.8	9.7	8.2	9.3	-	-
Cambodia	21.2	18.9	2.3	18.6	2.6	17.7	3.5	-	-

IV. Conclusion

This study examines the current condition and changes of minimum wage increase in major Southeast Asian countries, which is one of the major issues recently. In addition, a minimum wage determining model is set up with regard to macroeconomic variables, and the minimum wage determining mechanism is analyzed based on the estimation expression. By comparing the actual minimum wage growth and expected one in the years of 2013, the difference is discussed in this regard. We examined the causes of rapid increase in the minimum wages of Southeast Asian countries as well as the consistency with estimated results to address the significance.

One thing noteworthy regarding the general change patterns is that the gap of minimum wages among China, Malaysia, the Philippines, Thailand, and Indonesia is gradually narrowed or closer to the same point. In view of such changes stated above, it is predicted that the minimum wage in developing countries such as Vietnam, Laos, and Cambodia where the current income level is relatively low would be close to that of the other Southeast Asian countries for the future. In any case, the drastic increase of minimum wages in major Southeast Asian countries including Indonesia and Thailand is, indeed, different from the existing change patterns. Both in the traditional output expression, which defines that the minimum wage growth is the sum of the inflation rate, economic growth rate, and manipulating variable α , and the estimation expression in reference to macroeconomic variables, this phase is evident. In particular, the difference between the actual minimum wage growth and estimated one in Indonesia, Thailand, and Vietnam among Southeast Asian countries is outstandingly higher than the previous averages.

The drastic increase of minimum wages in Southeast Asian countries may result from different causes depending on the country. However, such common factors over different regions stated above have brought in synergy effects, which facilitated minimum wage increase further. It is expected that such minimum wage increase will continue among Southeast Asian countries, and especially in combination with special political and economic conditions in each country, minimum wages may increase on a greater scale. Foreign companies that have advanced or will advance into Southeast Asia, therefore, should take into consideration such changes in minimum wage increase as major variables in full understanding of and preparation for the possibilities of future minimum wage increases.

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The Effect of marina landscape design on the images and recommendation intention

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ABSTRACT

Marina plays a role as an outpost for oceanic leisure as well as a tourist attraction of destination landscape. The purpose of this research was to find the effect of marina design attributes on the image and then the image on recommendation intention in the landscape. The results of the study suggested that first, functionality influenced on the recommendation intention in mediating two factors such as attractiveness and composedness. Second, functionality and symbolicity affected recommendation intention (RI) in mediating cognitional and emotional image, respectively. Third, both functionality and symbolicity for the cognitive image had an effect on the recommendation intention.

I. Introduction

Concern about marine leisure and sports raised the need for the coastal infrastructure supporting marine activities. Recently, marina as a yacht harbor plays a role as an outpost for oceanic leisure as well as a tourist attraction of destination landscape. The purpose of this research was to find the effect of marina design attributes on the image and then the image on recommendation intention in the marina landscape.

II. Literature Review

2.1 Marina

Marina landscape was composed of those facilities, including yacht, lodging, convenience store, park, and urban background. It means how important the landscape was to coastal city, Busan. This study was to find landscape design attributes of the marina and then the effect of the attributes on the image and then the intention.

2.2 Marina Landscape Image

Image is a picture gained from the object in the brain and thus defined as knowledge, impression, prejudice, imagination, or affective thinking about a destination or an object (Baud-Bovy·Lawson, 1977). Image on this study was conceptualized as cognitive and emotional things (Baloglu·McCleary, 1999; Pike·Ryan, 2004; Chen·Hsu, 2000; Mayo·Jarvis, 1975). This study was to find the relation between the image and the intention.

III. Method

Main survey was conducted from October 22 to November 5 in 2009, after the pretest was done to extract the variables related to the design attributes, images, and intention from the literature review. The subjects was selected from college students. The yacht harbor in the Suyong bay was selected for the study area. 270 college students joined the evaluation process after watching the video photographed the marina landscape. 9 questionnaires was excluded for the final analysis.

IV. Results

4.1 The results of reliability and validity tests

<Table 1> Exploratory factor analysis of exogenous variables

item	symbolicity	functionality	communality
A1	.321	.793	.731
A2	.106	.855	.742
A3	.332	.730	.643
A4	.878	.204	.813
A5	.870	.243	.816
A6	.764	.275	.659
Eigenvalue	3.398	1.007	
variance(%)	56.636	73.414	
Cronbach's α	0.777	0.846	

<Table 2> Confirmatory factor analysis of endogenous variables

	item	Estimate	S.E.	t-value	CR	AVE
urbanity	C2	0.674			0.805	0.509
	C15	0.739	0.098	9.997		
	C18	0.769	0.099	10.288		
	C22	0.743	0.097	10.034		
attractiveness	B6	0.735			0.827	0.544
	B8	0.734	0.089	11.273		
	B9	0.808	0.094	12.374		
	B17	0.705	0.086	10.825		
stability	C25	0.834			0.880	0.712
	C26	0.885	0.08	15.062		
	C28	0.714	0.073	12.301		
composedness	C10	0.776			0.841	0.576
	C8	0.839	0.077	13.373		
	C7	0.823	0.081	13.173		
	C5	0.532	0.075	8.271		
safety	B11	0.844			0.917	0.787
	B12	0.866	0.066	16.419		
	B13	0.848	0.073	16.047		
convenience	B1	0.838			0.895	0.740
	B2	0.884	0.065	15.999		
	B3	0.780	0.070	14.054		
recommendation intention	D1	0.911			0.886	0.723
	D2	0.798	0.054	16.231		
	D3	0.840	0.056	17.617		
fit index	$\chi^2 = 333.466$ df= 231 p=0.000 RMSEA=0.041 GFI=0.907 AGFI=0.879 CFI=0.970 IFI=0.970					

4.2 The results of hypotheses

The structural equation model was used to test the hypotheses. The results suggested that the fit index were χ^2 =(df=379, p=0.000), RMSEA(0.049), GFI(0.869), AGFI(0.839), CFI(0.947), and IFI(0.947).

< **Table 3** > Results of hypotheses test

	λ^*	S.E.	t-value	p-value	
H1-1	0.421	0.112	4.142	<0.001	o
H1-2	0.734	0.128	6.132	<0.001	o
H1-3	0.572	0.138	4.901	<0.001	o
H2-1	0.211	0.123	1.938	0.053	x
H2-2	0.521	0.138	4.310	<0.001	o
H2-3	0.474	0.176	3.645	<0.001	o
H3-1	0.408	0.097	4.162	<0.001	o
H3-2	-0.033	0.101	-0.318	0.751	x
H3-3	0.114	0.11	1.096	0.273	x
H4-1	0.407	0.112	3.661	<0.001	o
H4-2	0.04	0.113	0.365	0.715	x
H4-3	-0.191	0.146	-1.587	0.113	x
H5-1	0.656	0.15	5.726	<0.001	o
H5-2	0.007	0.09	0.098	0.922	x
H5-3	0.096	0.093	1.265	0.206	x
H6-1	-0.067	0.116	-0.744	0.457	x
H6-2	0.187	0.091	2.604	0.009	o
H6-3	-0.016	0.068	-0.259	0.796	x
model fit	$\chi^2=613.015$ df=379 p=0.000 RMSEA= 0.049 GFI= 0.869 AGFI= 0.839 CFI= 0.947 IFI= 0.947				

λ^* : standardized path coefficient

V. Conclusions

The results of the study suggested that first, functionality influenced on the recommendation intention in mediating two factors such as attractiveness and composedness. Second, functionality and symbolicity affected recommendation intention (RI) in mediating cognitive and emotional image, respectively: functionality→image→RI(0.373) > symbolicity→image→RI(0.268). Third, both functionality and symbolicity for the cognitive image had an effect on the recommendation intention.

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A Study on Efficient Financial Support for Small Enterprise by Analysis of Loan Default Rates

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ABSTRACT

We analyze the way for efficient financial support to improve the competitiveness of small enterprise by the analysis of loan default rates between the government fund and bank's loan for small business in the view of national balanced economy. We find that (i) the loan default rate for government fund is lower than that of bank's loan for small enterprise except 2008; (ii) the loan default rate of local banks is lower than that of nationwide banks; and (iii) the loan default rate of local 'P Bank' which operates a supporting center for small business is significantly lower than that of nationwide banks. The difference of loan default rates between 'P Bank' and nationwide banks amounts to 0.822%. The loan default rate of local 'P bank' is also significantly lower than that of other local banks.

I. Introduction

The present small-enterprise policy in Korea has been established since the IMF crisis in 1997. The policy has helped to make relevant regulation and laws for small enterprise whose business units are making 87.5% of total businesses, comprising 38.9% of total number of employees in Korea. Yet the policy nature as welfare and a count-measure against unemployment has resulted in numerous number of livelihood start-ups and in turn caused structural problem such as the decrease of net profit in small enterprises due to fierce competition among small enterprises.

The policy fund for small enterprise has been subsidized about 300 billion won per year since 1999 for the start-ups and improvement of small enterprises. Studies have shown mixed results regarding the effect of the policy fund. Some studies have shown that the policy fund has relieved the unemployment rate but has not contributed to the economic growth. Other studies indicated that the policy fund has little relationship with managerial outputs and employment.

The prominent feature of the policy fund for small enterprise with low interest rate and easiness of loan has relieved the burden of interest charges and increased the accessibility to the fund. This paper focuses on the most important characteristic of the policy fund which distinguishes from bank loan, that is, the role of Small Enterprise Supporting Center (SESC).

Many studies have shown that the recommendation process and consultation related with management and technology provided by SESC have been mostly helpful. It has been reported that the effect of policy fund related with education, consultation, and consulting by SESC has been better than the policy fund without them in monthly sales volume.

We analyze the way for efficient financial support to improve the competitiveness of small enterprise by the analysis of loan default rates between the government fund and bank loan for small business in the view of national balanced economy.

Our study is organized as follows. In Section II, we discuss the status of small enterprises and the policy fund. In Section III, we describe the sample, and report the results in Section IV. Section V contains our conclusions.

II. Status of Small Enterprise and Policy Fund in Korea

2.1 Status of Small Enterprise

<Table 1> Summary Statistics for Small Enterprise in Korea

(Units:

number in thousands, %)

Category	Small Enterprise (1)		Small-sized Business (2)		Medium-sized Business (3)		Small & Medium-sized Business (1)+(2)+(3)	
	Number	Ratio	Number	Ratio	Number	Ratio	Number	Ratio
Business	2,686	87.5*	270	8.8	110	3.6	3,066	99.9
Employee	5,218	39.0**	2,673	20.0	3,859	28.8	11,750	87.7

Note: The total number of business and employee is 3,069,000 and 13,398,000, respectively.

* $(2,686,000/3,069,000) \times 100 = 87.5\%$.

** $(5,218,000/13,398,000) \times 100 = 39.0\%$.

Source: Korea Bureau of Statistics (2009), "The Survey of Total Number of Businesses in Korea."

<Table 2> Closure Ratio of Small Enterprise for 1997-2009

(Unit: in thousands)

Year	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Start (A)	442	401	629	932	997	1,167	946	828	814	945	1,060	1,101	963
Closure (B)	185	419	407	598	684	768	816	699	754	758	848	794	786
Ratio (B/A)	41.8	104.5	64.7	64.2	68.5	65.8	86.3	84.5	92.6	80.2	80.0	72.1	81.6

Source: "Yearly Statistics of National Tax," National Tax Service in Korea.

2.2 Status of Policy Fund for Small Enterprise

The policy fund for small enterprise helps to create new employment and seeks the balanced development of industry with the aid of Regional Credit Guarantee Foundation. Since 1999, the policy fund has met the demand of small enterprises in need of fund.

III. Data

The sample was obtained from 4 nationwide banks and 3 local banks for 2007- 2011. Since about 90% of the policy fund was backed by the certification of guarantee, this study used the bank loan by credit guarantee.

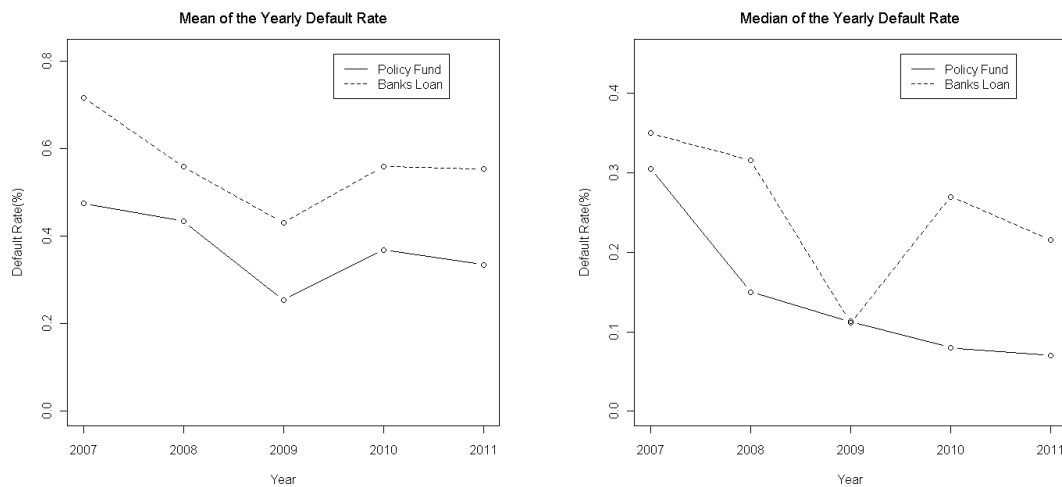
IV. Results

4.1 Analysis of Total Data

<Table 3> Tests of Statistical Significance By Years for Two Types of Financial Support

Year	Mean (Policy Fund)	Mean (Bank Loan)	Difference	<i>t</i> -value	d.f	<i>p</i> -value	Wilcoxon <i>T</i>	<i>p</i> -value
2007	0.474	0.716	-0.243	-2.276	3	0.012**	3037	0.074***
2008	0.434	0.558	-0.124	-1.211	3	0.114	2982.5	0.129
2009	0.254	0.43	-0.176	-2.475	3	0.007*	3210.5	0.104
2010	0.368	0.558	-0.191	-1.987	3	0.024**	3278	0.179
2011	0.334	0.553	-0.219	-2.211	8	0.014**	2912.5	0.068***

*, **, *** Significant at the 0.01, 0.05 and 0.10 level, respectively.



<Figure 1> Mean and Median of Yearly Default Rates for Two Types of Financial Support

4.2 Analysis by Interest Rates

<Table 4> ANOVA on Difference of Default Rates by Interest Rates

Type	Factor	d.f	Sum of squares	Sum of mean squares	<i>F</i>	<i>p</i> -value
Policy Fund	Interest	6	7.333	1.222	1.482	0.212
	Residual	130	111.975	0.861		
Bank Loan	Interest	6	11.663	1.944	2.712	0.015**
	Residual	174	124.732	0.717		

** Significant at the 0.05 level.

<Table 5> Multiple Comparisons with Banks Loan

Interest Level	Over 0.8	Under 0.8	Under 0.7	Under 0.6	Under 0.5	Under 0.4	Under 0.3
Mean Default Rate	1.389	0.702	0.688	0.599	0.523	0.496	0.431
Under 0.8	a*	b	b	b	b	b	

* Different letter denotes the difference in the mean.

4.3 Analysis by Bank Types

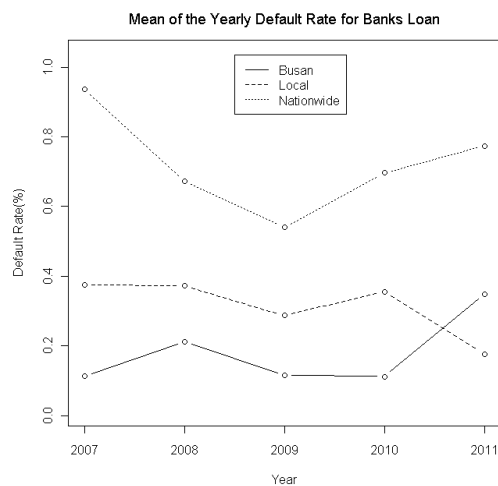
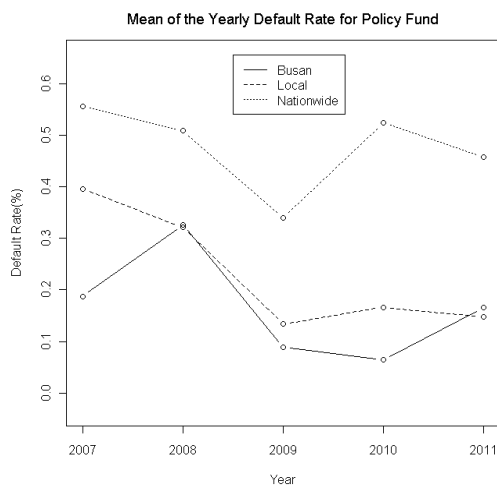
<Table 6> Tests of Statistical Significance about Difference in Default Rates between Banks for Two Types of Financial Support

Type	Year	Local Banks	Nationwide Banks	Difference	t-value	d.f	p-value	Wilcoxon T	p-value
Policy Fund	2007	0.352	0.556	-0.205	-1.701	79.9	0.093*	721.0	0.407
	2008	0.322	0.508	-0.186	-1.459	78.0	0.149	744.0	0.815
	2009	0.124	0.340	-0.216	-3.404	73.3	0.001*	618.0	0.051***
	2010	0.140	0.524	-0.384	-4.163	82.3	0.000*	572.0	0.005*
	2011	0.152	0.457	-0.305	-3.591	80.2	0.001*	645.5	0.059***
Bank Loan	2007	0.334	0.936	-0.603	-4.292	81.8	0.000*	576.0	0.017**
	2008	0.345	0.672	-0.327	-2.391	79.8	0.019**	627.0	0.134
	2009	0.251	0.540	-0.289	-2.563	82.0	0.012**	641.0	0.028**
	2010	0.314	0.696	-0.382	-2.659	79.4	0.009*	634.0	0.125
	2011	0.204	0.773	-0.569	-4.105	63.2	0.000*	503.5	0.011**

*, **, *** Significant at the 0.01, 0.05 and 0.10 level, respectively.

<Table 7> Tests of Statistical Significance about the Difference in the Default Rates of P Bank by Two Types of Financial Support

Year	Policy Fund	Bank Loan	Difference	t-value	d.f	p-value	Wilcoxon T	p-value
2007	0.187	0.114	0.073	0.869	9.0	0.796	21.0	0.746
2008	0.326	0.212	0.114	0.642	8.0	0.730	18.0	0.896
2009	0.089	0.116	-0.027	-0.394	10.6	0.351	25.0	0.551
2010	0.064	0.112	-0.048	-0.894	5.7	0.204	13.0	0.111
2011	0.166	0.348	-0.182	-0.770	4.9	0.238	20.0	0.529



<Figure 2> Mean of Yearly Default Rates among P Bank, Local Banks and Nationwide Banks

V. Conclusions

This study analyzed the way for efficient financial support to improve the competitiveness of small enterprise through the comparison of the loan default rates between the policy fund and bank loan for small enterprise in view of national balanced economy.

We find that (i) the default rate of the policy fund is lower than that of the banks loan for small enterprise except the year of 2008 and the difference among the default rates fetches to 0.243%. The difference in the default rates outstands in 2011. It may be due to the fact that the policy fund changes to the priority system which subsidizes the people first who took education and consulting courses beginning 2010; (ii) the loan default rate of local banks is lower than that of nationwide banks across the policy fund and the bank loans. The difference in the loan default rate by local banks and nationwide banks amounts to 0.384% for the policy fund and 0.605% for banks loan. The result indicates that the loan to small enterprise is regionally oriented since small enterprise is based on the region; and (iii) the loan default rate of the local 'P Bank' which operates the consulting center on its own for small enterprise is significantly lower than that of nationwide banks. The difference in the default rates amounted to 0.822%. Yet there was no notable difference across the policy fund and banks loan for 'P Bank.' The loan default rate of the local 'P bank' is also lower than that of the other local banks. Therefore, the lower default rate of the policy fund is attributable to consulting and education system, not to lower interest rate set by the policy.

It has been reported that the policy fund increases the sales volume of small enterprise and the fund has positive effect on the performance of management for small enterprise. But the policy fund can't accomodate all of 2.7 million of small enterprise in Korea. Banks loan take most of loan to small enterprise. Therefore, The financial support under frequent start and closure of small enterprises these days needs to be associated with the appropriate consulting and education for the balanced economy as a whole. The banks loan to small enterprise is now over 100 trillion won. If the default rate ever rose, it gives much financial distress to the banks. In turn, the national economy suffers from it.

The banks need to benchmark the expertise of the Small Enterprise Development System which has been accumulated over the last 20 years by serving thousands of small enterprises. In addition, the Small Enterprise Development System which oversees the policy fund also needs to intensify the consulting and educational infrastructure for the efficient financial support to small enterprise.

When small enterprise takes loan from local banks, the borrowing should be based on pure creditability. For regional financial system in accordance with spontaneous economic principle to work properly, the banks need to develop credit rating model associated with stylized and standard ability of the counsellor at the Small Enterprise Development System. It is crucial since small enterprise does not have enough financial data for applying for loan.

Many of start-ups are excluded from the policy fund since the lending process still puts a lot of emphasis on the figure of the sales volume. Therefore the policy fund tends to be not properly served according to its original purpose. Considering that there is a great need for money at the beginning stage of small enterprise, the policy fund and bank loan need to be allocated more to start-ups rather than to growing enterprise with better statistics in terms of sales volume and managerial environment. The appropriate credit rating model needs to incorporate the evaluation and recommendation by the counsellor at the Small Enterprise Development System.

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How do sellers design their auctions: An empirical study on online auction price evaluation

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Abstract

In online auctions, sellers need to consider the final price evaluation from buyers. High final price evaluation of auction winners indicates high participation of them in the future. It is helpful for sellers in retaining their old customers, thus increasing the revenue. This study investigates the final price evaluation of online auction winners' by examining its antecedents. Empirical analysis reveals that perceived enjoyment, starting price and consumer surplus are positively related to the final price evaluation, while bid increment is negatively related to it.

Keywords: Online auction, final price evaluation, auction design, consumer surplus

1. Introduction

Online auction has been widely investigated in information systems (IS) area. One thing that online auctions differ from other E-business is that the price is not fixed. Dynamic pricing is one of the major characteristics of online auctions. Therefore, there are many studies on the antecedents of auction final price (Kamins, Drèze, & Folkes, 2004; Lucking-Reiley, Bryan, Prasad, & Reeves, 2007; Melnik & Alm, 2002; Walley & Fortin, 2005; Yu-Shu & Lih-Tsyr, 2009). All these studies shed lights on the online auction studies.

However, seldom has been done about the buyers' evaluation of the final auction price which is actually very important to sellers. High final price evaluation of auction winners indicates high participation of them in the future. It is helpful for sellers in retaining their old customers, thus increasing the revenue. So, in this study, a model based on perception framework was developed with perceived enjoyment, starting price, bidding increment, and consumer surplus as the antecedents of final price evaluation. The research results provide insights into how sellers implement their selling strategies and design their auctions to boost customer loyalty and interest towards the sustainable bidding activities.

2. Research on final price of online auctions

Researchers have conducted many studies to examine final auction price, especially its antecedents. For instance, the quality of sellers' reputation increases the final auction price (Melnik & Alm, 2002). Higher trust in sellers' credibility causes higher auction price (Ba & Pavlou, 2002). The feedback was found to affect final auction price and the effect of negative feedback is more significant than that of positive feedback (Lucking-Reiley et al., 2007). Surprisingly, in another study, greater feedback leads to lower final price (Becherer, Halstead, & Taylor, 2008).

In addition, the parameters set by sellers are also associated with final price, together with the number of bidders or bids. For example, higher reserve price set by sellers and more bidders lead to higher final auction price. (Kamins et al., 2004). Bid increment and auction duration were found to increase the final price (Lucking-Reiley et al., 2007). When the initial bidding history of an online auction is good, the final price is high (Walley & Fortin, 2005). The increase in the number of bids triggers the number of "sold" auctions, and sometimes final price as well (Becherer, Halstead, & Taylor, 2008). The starting price, the reserve price set by sellers, and the number of bids and bidders positively influence the final price premium (Yu-Shu & Lih-Tsyr, 2009).

3. Research model and hypotheses development

It is believed that individual perception is influenced by the perceiver, the situation, and the target he/she perceives (Robbins & Judge, 2011). In this study, the perceiver is the winner; the situation refers to some factors of the auctions; the perceiver's target is the final auction price.

In online auctions, bidders can regard the auction activity as a game. Winners, as the perceivers, may have different feelings or experience during the bidding process. It may bring enjoyment to them, for example, competing with or winning the auction successfully over other bidders (Gilkeson & Reynolds, 2003). The enjoyment perceived during the bidding process may enhance their positive evaluation of the final price. The more enjoyment they experience, the higher evaluation they would give to the final price. Therefore, we hypothesize:

H1: Perceived enjoyment positively affects final auction price evaluation.

As the situational factors, starting price and bid increment set by sellers may also influence the winners' perception. The starting price is the price specified by the seller as the minimum starting bid (Ariely & Simonson, 2003). A high starting price usually means a high final price to the winner, at least not a low one. When the starting price is low, a potential bidder is afforded the opportunity to observe lower bound on what others are willing to pay (Gilkeson & Reynolds, 2003) and join the auction later. The final auction price may also be perceived low in the case and the winner may be more satisfied with the price. Therefore, we hypothesize:

H2: Starting price negatively affects final auction price evaluation.

Bid increment refers to the monetary amount added each time by bidders. A big bid increment means a quick rise to the final price by a few bids. If sellers set a high bid increment, bidders may push the auction price to a very high level. A high bid increment implies high uncertainty of the auction. Whoever wins the auction at the end may feel high opportunity cost (Yen, Hsu, & Chang, 2013) and give low evaluation on the final price. Therefore, we hypothesize:

H3: Bid increment negatively affects final auction price evaluation.

Finally, as the perception target, the factor of the final price itself may also influence the winners' evaluation. Individual likes to seize the biggest profit. The amount of consumer surplus (Bapna, Goes, Gupta, & Karuga, 2008) is the additional reward to bidders and boosts their final price evaluation. The more surplus obtained by winners, the more positive evaluation they would give to the final price. Therefore, we hypothesize:

H4: Consumer surplus positively affects final auction price evaluation.

4. Research methodology

This study has both objective and subjective measures. Objective measures include auction starting price, bid increment, and final price. Subjective measures include perceived enjoyment, reservation price, and final price evaluation. Consumer surplus is calculated by the difference between each winner's reservation price and the final auction price standardized by the final auction price in order to reduce the effect of different product values. *Auction starting price, bid increment, and final price* can be obtained from the auction web pages. The *reservation price* is measured by a single question to the respondents asking their willingness-to-pay for the auction.

The measures of *perceived enjoyment* were adopted from Cui and Lai (2012). All the original six items were kept, including both the adventure and joy bidding. *Final auction price evaluation* was created by the authors purposefully for this study because there are no existing measures for it in previous literature. Four items are finally developed based on bidding context. They are "The final price in this auction is low", "I think I bid something worth the money", "This auction saves money for me", and "I am satisfied with the final price". The questionnaire was first developed by one of the authors and then pretested by four business professors. Online bidders were also recruited to check the questionnaire to ensure content validity.

The data were collected from Taobao, the biggest Chinese online auction website. The winners of auctions that just ended were contacted through WangWang, an instant messenger of Taobao. They were invited to participate in an online survey. The objective data were also retrieved from the auction webpages. Finally, we got 150 samples in the first round of data collection.

5. Data analysis and results

Non-response bias was tested first and no violation was found. Reliability and validity of the subjective measurements were then tested by exploratory factor analysis. Two factors were extracted as expected with all the item loadings to their target constructs higher than 0.7. The Cronbach's alpha values of perceived enjoyment and final price evaluation are 0.900 and 0.918, respectively, which are higher than the recommended threshold level, 0.70. The AVEs of the two variables are 0.662 and 0.804, respectively, which are higher than the recommended value, 0.5. Thus, the convergent validity was confirmed. In addition, both of the AVEs are higher than the shared variance of the two factors, 0.144, thus confirming the discriminant validity.

The hypotheses were tested by hierarchical regressions with 4 models, indicated by Table 1. Model 1 only includes the control variables. Model 2 has perceived enjoyment added. Model 3 has starting price and bid increment added and Model 4 consumer surplus. H1 that proposes the positive effect of perceived enjoyment on final price evaluation was tested by the comparing Model 2 to Model 1. The significant R^2 change (8.8%, $p=0.001$) and coefficient of perceived enjoyment (0.309, $p=0.001$) in Model 2 support H1. H2 and H3 that propose the negative effect of starting price and bid increment on price evaluation were tested by Model 3, in which the R^2 is significantly increased by 12.7%. The significant coefficient of bid increment (-0.409) indicates that H3 is supported. However, the

coefficient of starting price is significant but positive (0.358), indicating the effect of starting price on price evaluation is not negative as expected. Therefore, H2 is not supported. The effect of consumer surplus on final price evaluation in H4 was tested by Model 4. The R^2 in Model 4 is significantly increased by 8.2% from Model 3. The significant coefficient of consumer surplus (0.294) indicates that H4 is supported.

Table 1. The Hierarchical Regression Results

Independent variables	Final auction price evaluation			
	Model 1	Model 2	Model 3	Model 4
Gender	0.048	0.001	-0.052	-0.038
Age	0.088	0.068	0.070	0.100
Education	0.035	0.017	0.021	0.018
Income	-0.223*	-0.187*	-0.139#	-0.122
Perceived enjoyment		0.309***	0.255**	0.247**
Starting price			0.358***	0.306***
Bid increment			-0.409***	-0.385***
Consumer surplus				0.294***
Adjust R^2	2%	10.8%	23.5%	31.7%
Adjust R^2 change		8.8%	12.7%	8.2%
F change	1.757	15.373***	12.905***	18.094***

#: $p=0.1$; *: $p=0.05$; **: $p=0.01$; ***: $p=0.001$.

6. Discussion and conclusions

Our research findings show that the relationship between starting price and final price evaluation is positive rather than negative, which means the higher starting price, the higher evaluation of the final price will be given by winners. The unexpected phenomenon can be explained by signal theory. In online auctions, it is difficult for bidders to check the quality of products because of the information asymmetry (Spence, 1973). Bidders may use the starting prices as a signal of its true value or the level of the product quality. Although high starting price may potentially raise the final price, winners still feel it is worth the money. Therefore, the starting price shows positive effect on the final price evaluation.

The research findings provide some insights for sellers to design their auctions. As we all know, starting price and bid increment are the two factors that may directly affect the final price. Many auctioneers choose low starting prices to attract bidders (for example, there are a lot of “start-from-one-dollar” auctions in Taobao as the promotions). However, they will have to set high bid increments in the same auctions to counteract the effect of low starting prices. However, our research findings indicate that high starting price with low bid increment may be more effective.

This study investigates the effects of perceived enjoyment, starting price, bid increment, and consumer surplus on the final price evaluation. It pioneers the studies of final price evaluation and provides practical implications to sellers as above. However, there are also limitations in this study. More psychological factors will be included in the model and more data will be collected to verify the model in the future.

Reference

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Green port development in Hong Kong – reduction of marine and port-related emissions

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Abstract

The impact of air pollutant emissions from shipping and port operations towards environment and health is a pressing global concern. The marine and port sectors have contributed significantly to the growth of the supply chain industry and the economic development, while, at the same time, the pollutant emissions rising from ships and port-related operations have inflicted adverse public health concerns. Leading ports and terminals continuously impose measures to reduce the greenhouse gas emitted during vessel berthing. Hong Kong, being the third largest container port in the world and having the second cruise terminal running into operation, urgently requires comprehensive green port operations and practices. This paper evaluates and benchmarks the latest measures conducted by the leading ports over the world in reducing the greenhouse gas emissions from ship and port operations. International regulations, onshore power supply, vessel speed reduction, and fuel switching are analyzed. Recommendations on the future green port development in Hong Kong are proposed.

Keywords: Greenhouse gas emission, maritime logistics, port, green harbour

1. Introduction

The development of green marine and port operations is a pressing global concern (Chan, 2013; Doherty and Hoyle, 2009; Galbraith et al., 2008). In Hong Kong, the impact of the Greenhouse gas (GHG) emissions from marine and port-related activities have come to the attention of scholars, industrial practitioners, environmental advocates, and government (Ng et al., 2013; Yau et al., 2013). The Chief Executive of the Hong Kong Special Administrative Region (HKSAR), Leung Chun-ying, has pledged to make combating pollution one of his top priorities during his five-year term. He announced plans in January 2013 about submitting new legislations by the fourth quarter of 2013 on the requirement of oceangoing vessels to switch to low sulphur fuel when berthing at Hong Kong. Over the years, there is no regulation in Hong Kong capping the sulphur content in fuel used by vessels within its waters. The major reference is the Annex VI to the International Convention for the Prevention of Pollution from Ships (MARPOL Annex VI) of International Maritime Organization (IMO). It caps the global sulphur content of marine fuel at 3.5% starting from January 2012. The Environmental Bureau of Hong Kong released a Clean Air Plan for Hong Kong in March 2013, calling for a mandatory switch to fuel with a maximum of 0.5% sulphur content for all ocean-going vessels (OGVs) at berth, the use of cleaner marine diesel for other vessels, and the implementation of on-shore power facilities for the new Kai Tak Cruise Terminal in Hong Kong. There is a need for Hong Kong to develop a cleaner port through the implementation of various programs, including benchmarking studies against good port practices over the world, mandatory fuel switch legislation, vessel speed reduction, and the use of on-shore power facilities in the terminals.

Marine and port sector has contributed highly to the economic development of Hong Kong, but at the same time, it has an adverse impact to the public health of residents living close the ports. The global carbon emissions from fossil fuels have increased significantly in the recent years, over 16 times from 1900 to 2008. Transportation, including road rail, air, and marine transportation, is the third largest global emission sector. International shipping is estimated to have emitted 870 million tones, which is 2.7% of the global emissions of carbon dioxide (CO₂) in the same year. The Port of Los Angeles (POLA) indicates that pollution from one vessel call is equivalent to about 69,000 diesel truck miles. A recent survey indicates that following 1.2 million adults for two decades showed that exposure to pollutants such as Particulate Matter (PM) as well as nitrogen (N₂) and sulphur dioxide (SO₂) is directly linked to an 8% increase in Lung Cancer Deaths (Turner et al., 2011; Arden Pope III et al., 2002).

Transport and Housing Bureau in Hong Kong revealed in November 2013 that there are 190,859 numbers of vessels arriving Hong Kong in 2012, including 106,380 from cargo vessels and 84,479 from passenger vessels. There are nine container terminals operated by five operators in Hong Kong. Besides the container terminals, there are two cruise terminals, Kai Tak Cruise Terminal and Ocean Terminal. The two terminals are receiving six mega cruise ships per month from June 2013 to December 2014. With over thousands of residents living near the container and cruise terminals, there is an urgent need to increase the awareness of the industry, citizens, and the next generation the importance of protecting the harbor environment for a better health and living environment in Hong Kong. This paper evaluates the GHG emissions situation in the terminals, benchmarks the green port initiatives against other ports in the world, and reviews the possible green port programs to be carried out in Hong Kong.

2. Ship emission impact towards harbour front

Hong Kong was the world's third largest container port in 2012, after Shanghai and Singapore (World Shipping Council, 2013). The container terminals are situated in Kwai Chung and Tsingyi, located in the north-western part of the harbour, with 24 berths of about 7,694 metres of deep water frontage. It covers a total terminal area of about 279 hectares which includes container yards and container freight stations. The nine container terminals have a total handling capacity of about 20 million TEUs (20-foot equivalent units) which helps maintain Hong Kong as a major port of Southern China. In the meantime, the emissions from the port and its related activities affect the health of every citizens and visitors in Hong Kong. Emissions from ships, trucks, locomotives, and cargo-handling equipment give rise to serious health problems, including asthma emergencies, cancers, heart attacks, and premature deaths. Chan (2013) estimated that SO₂ emissions from vessels are leading to 365 premature deaths each year in Hong Kong, in addition to an increased number of hospital-bed days, outpatient visits, and the costs of productivity losses.

Besides the nine container terminals, the two cruise terminals, Kai Tak Cruise Terminal (Kai Tak) and Ocean Terminal, will receive six cruise liners per month from June 2013 to December 2014. 59% of cruise liners berthing at Kai Tak from June 2013 to December 2013 are owned by the Royal Caribbean. Similarly, 44% of cruise liners berthing at Ocean Terminal during this period are Carnival owned. Current emissions from an OGVs via the use of bunker fuel contains 2.8% to 3.5% sulphur content while low sulphur fuel contains only 0.5% SO₂ content, with a 70% reduction emission (Ng, 2013). Environmental advocate estimated that the SO₂ concentration is equivalent to the emission from 2,800 to 3,500 road vehicles. The CO₂ emission of an OGV is equivalent to two to five times of an aircraft (Friends of the Earth, 2013). Mega cruise ships consume large amount of fuel to maintain the needs on board even when they are docked. Advocates urged the need of the cruise ships to switch fuel at berth. Mariner of the Seas, Royal Caribbean International and Sun Princess, Carnival have committed switching fuel at berth. The number of cruises on fuel switching commitment is still lower than expected. Ng (2013) estimated that there will be 43 tonnes of SO₂, 44 tonnes of NO_x, and 5 tonnes of particulate matter (PM₁₀) emitted by the cruises during their visit at Kai Tak from 2013 to 2014. Thus, there is an urgency of the cruises to commit fuel switching during their berths in Hong Kong.

3. Green port practices

Leading ports over the world have imposed measures on eliminating the emissions from the vessels. Five major areas of green port practices are discussed below to seek for opportunities on the green port development in Hong Kong. These include international regulations, onshore power supply, vessel speed reduction, fuel switching, and technology development. Ng et al. (2013) reviewed green port measures carried out in the ports authorities and government agencies (Table 1).

Region/Port	Measures				
	Engine standards	Onshore Power Supply	Fuel sulphur content	Fuel switching	Vessel Speed Reduction
EU	✓		✓	✓	
US	✓		✓		
California		✓		✓	✓
Hamburg		✓	✓	✓	
Antwerp		✓	✓	✓	
Rotterdam		✓	✓	✓	
Amsterdam		✓	✓	✓	
Singapore				✓	
Taiwan		✓		✓	✓
Yantian / Shekou		✓			
Hong Kong			✓	✓	

Table 1. Green port measures in leading port authorities and government agencies in the regions.

3.1. International Regulations

Government and environmental organizations are drivers on emission control. Annex VI is one of the regulations enforced by IMO. It is one of the important tools set up in the International Convention for the Prevention of Marine Pollution from Ships (MARPOL Convention) to set limits on sulphur oxide and nitrogen oxide emissions from ship exhausts and prohibits deliberate emission of ozone depleting substances. Hong Kong is one of the countries that ratified this regulation. MARPOL Annex VI is adopted in 1997, addressing air pollution from ocean-going vessels. MARPOL Annex VI is revised in 2008 and entered into force in 2010. Under the revised convention, the global cap is reduced to 3.5% in 2012, then progressively to 0.5% in 2020, subject to feasibility review no later than 2018. Limitations on air pollutants are also revised. For example, for NO_x emissions from marine diesel engines installed in ships, it is required to comply with the following requirements. Engines installed on or after 1 January 2011 are required to comply with a ‘Tier II’ emission limit. A more stringent ‘Tier III’ emission limit on engine operations and installations in the Emission Control Areas (ECAs) will be adopted in January 2016. Marine diesel engines installed on or after 1 January 1990 but not prior to 1 January 2000 are required to comply with ‘Tier I’ emission limits. The revised regulations are expected to bring benefits to the atmospheric environment and human health.

3.2. Onshore power supply

The on-shore and shoreside power supply enable the replacement of traditional diesel auxiliary engines and power supply. The European Commission recognized shoreside power, known as cold ironing, in 2006. Any vessels at berth should use shoreside electricity in community ports, especially for ports that are near to residential areas. The shoreside power is supplied by wind in Sweden. Hydro power is introduced in leading ports, including the ports in California, port of Gothenburg in Sweden, and the ports of Yantian and Shekou in China. With the shoreside power, the SO₂ in Port of Long Beach (POLB) has saved 283 tonnes per year and nitrogen oxide has saved 580 tonnes per year while in POLA has saved 1 tonne per day. The use of electricity generated on-shore power supply by vessels can replace the onboard-generated power from diesel auxiliary engines. The government of Hong Kong is planning to secure funding to install the on-shore power supply facilities at Kai Tak Cruise Terminal. There are still operational and commercial constraints for Ocean Terminal to install on-shore power supply to improve the air condition along the coastal front. The use of electricity-powered equipment in the terminal replacing the diesel-powered supply greatly reduces the CO₂ emissions. The MTL invested HK\$170 million to convert 94 RTGCs into electric-RTGCs and HIT invested HK\$140 million on a crane-electrification programme at Kwai Tsing Container port. Similarly, other terminals are converting their fleet of RGCs from diesel to electricity.

3.3. Vessel speed reduction

Vessel speed reduction is important to the environment along coastal harbor front. The reduction of vessel speed lowers the GHG emissions. Leading ports in vessel speed reduction (VSR) programs are POLA, POLB, and the Port of San Diego (POSD). The program aimed to reduce air pollutants and GHG from vessels by slowing down their speeds. POLA and POLB present rewards to ship operators when they meet the requirements of the program. The rewards will be given to vessel operators for slowing down to 12 knots or less within 40 nautical miles (nm). The VSR program 'Green Flag program' in POLB provides incentives for vessel operators who voluntarily reduce the speed of their vessel, for example, reduction in dockage fees. Ships burn less fuel and emit less air pollutants through speed reduction. The number of vessels slowing down in the 20 to 40 nautical mile zone has increased from 40% in 2008 to 75% by March 2009. In 2008, POLB estimated that the program reduced 678 tonnes a year of NO_x, 453 tonnes of SO_x, 60 tonnes of diesel PM, and more than 26,000 tonnes of CO₂ equivalent (Ross and Associates Environmental Consulting, 2009; POLB, 2009). POSD in San Diego also requested cargo vessel operators entering or leaving San Diego Bay to observe a 12-knot speed limit. For cruise ships, a 15-knot limit is requested. The VSR zone extends 20 nautical miles seaward from Point Loma.

3.4. Fuel switching and Emission Control Area

Burning of bunker fuel in vessels emit heat and GHG. The use of low sulphur fuel oil during vessel berthing and the adoption of ECA come to the attention of port authorities and government. An ECA can be designated for SO_x and PM, or NO_x, or all three types of emissions from ships, subject to a proposal from a Party to Annex VI discussed in Section 3.1 of the paper. Setting up an ECA allows the address of ship emissions produced outside jurisdictional boundaries, in areas where ship emissions could still impact the local region. Consistent regulations following the MARPOL Annex VI parties enable the control of ship emissions in a broader area with more stringent requirements. These facilitate the elimination of air pollutant and the protection of public health. Fuel switching programs are started to be organized in various regions including Hong Kong. A Fair Winds Charter (FWC) program is introduced in Hong Kong. The FWC is an industry-led, voluntary, at-berth fuel switching programme for OGVs calling at Hong Kong. It is the first initiative of its kind in Asia, and the only shipping-industry led fuel switching initiative in the world. Participating vessels switch to low sulphur fuel (0.5% sulphur content or less) while at berth in Hong Kong. Through the program, shipping associations and organizations urged government to introduce legislation for at berth fuel-switching and collaborate across the Pearl River Delta (PRD) region to regulate in line with international standards.

3.5. Technology development

Various technologies are developed in regions to improve the ship and port operation emission issues. Europe Union (EU) has adopted technologies including seawater exhaust gas scrubbing, low-sulphur residual oil and selective catalytic reduction. Thus, vessels in Europe are started to show improvements in ship emission reductions. With the adoption of scrubbing, the SO₂ has been reduced 90%, NO_x has been reduced 3 to 5% and PM has been reduced 50%. Furthermore, starting from 1 January 2010, the European Sulphur Directive required any seagoing vessels to use a maximum of 0.1% sulphur fuel oil when at quay for more than two hours. Ports in Sweden have adopted selective catalytic reactors, also known as the retrofitting equipment. The total emissions including SO₂, NO_x and PM have been reduced significantly. In the port of Vancouver in Canada, vessels are encouraged to replace the conventional engine air inter-cooler by the water-injection and humid-air motors. The use of fuel oil can be highly reduced and the seawater can be used with this kind of motors. By replacing the motors, the total emissions can be reduced by 40 to 50%. In the Port of Vancouver, fuel additives are used as to increase the cost efficiency. In other words, there would be less fuel oil consumed during sailing. The NO_x has been reduced about 30% and PM has been reduced more than 65%.

4. Conclusion and future development

Hong Kong, being the third largest container port in the world and having the second cruise terminal running into operation, requires the need of comprehensive green port operations and practices to minimize the impact of air pollutant emissions from the shipping and port operations. Current issues in the GHG emissions in the container and cruise terminals are reviewed, especially on the coming needs of cruise fuel switching in the Kai Tak Cruise Terminal. The mandatory vessel speed reduction in designated zone in Hong Kong should be further studied and developed. Latest environmental

measures from the leading ports all over the world are discussed. Five major aspects of green port practices, including international regulations, onshore power supply, vessel speed reduction, and fuel switching are evaluated. Suggestions and future green port development in Hong Kong are discussed.

5. References – available upon request

Financial Supply Chain Management and Supply Chain Finance: A Concise Literature Review

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Abstract

Supply chain management research largely focuses more on material flow and information flow than on financial flow. The literature on financial supply chain and supply chain finance primarily grows out of analytical models or mathematical programming models. The paper calls for empirical studies with theoretical basis in this research area.

Keywords: supply chain finance, financial supply chain, literature review

1. Introduction

Supply chain management includes three intertwined elements, providing goods for clients, obtaining information to manage the business, and getting the cash to generate profits (Delk, 2000). Therefore, supply chain managers attempt to deliver the right quantity of right products to the right location at the right time and condition at right cost. On the other hand, finance managers need to ensure that the right amount of cash is at the right place at right time at right cost of funds. Actually, supply chain processes interlock financial processes (Camerinelli, 2009a). It is valuable to coordinate operational and financial decisions in supply chain (Li, Shubik & Sobel, 2013). Otherwise, **financial difficulty can be contagious because financial status of a firm depends not only on its own, but also on the decisions and behaviors of its supply chain partners (Xu, Sun, & Hua, 2010).**

Although there is a limited literature on the financial aspects of the supply chain (Fairchild, 2005), this paper tries to review the professional and academic literatures on financial supply chain and supply chain finance and to propose theoretical basis for this research area.

2. Issues and challenges in financial supply chains

The following news illustrates the necessity of solving financial issues in supply chains even though quantitative easing provides cheap money for enterprises.

“Some of the world’s largest consumer products groups are delaying payments to advertising agencies and commodity producers for up to six months, squeezing cash flows and causing alarm at critical points in their supply chain (Financial Times, May 31, 2013).” “In order to improve cash position, P&G, Johnson & Johnson, Wal-Mart, and Unilever started to extend the payment period to suppliers (Hong Kong Economic Journal, June 11, 2013).”

However, squeezing suppliers or service providers may damage the collaborative relationships in supply chains and result in higher purchasing cost in the long run, especially when suppliers face higher cost of capital than powerful focal companies in a supply chain (Hofmann & Kotzab, 2010). To prevent this issue from happening, firms need to ponder how to manage working capital from supply chain perspective. From financial point of view, a supply chain is a chain of accounts receivable, inventory, and accounts payable (Camerinelli, 2009a) which are major components of working capital. Integrated working capital management can create value for all supply chain members.

Another issue is lack of common language between supply chain professionals and finance professionals because financial information and metrics are expressed as highly synthesized monetary amounts and non-financial metrics, on the other hand, are communicated in various forms. To better manage supply chain, a common ground needs to be identified. Farris II and Hutchison (2002) indicated that cash conversion cycle (CCC) is a time-based metric that links inbound operations with suppliers, manufacturing operations of the leading company, and outbound operations with customers. CCC can be used to understand how financial flows impact the supply chain (Farris II & Hutchison, 2003). By using CCC to manage working capital, supply chain managers and finance managers can share a common view on business and supply chain performance. A wide variety of professional

articles provide examples and case illustrations of how CCC was used to evaluate the benefits of supply chain finance (Presutti & Mawhinney, 2007; Hutchison, Farris II, & Fleischman, 2009; Camerinelli, 2009b; Schlegel & Merke, 2011).

In a conceptual paper, Gomm, M. L. (2010) proposed a framework for financial issues in supply chain management by applying finance theory. Supply chain finance should support order cycle management, working capital management, and fixed asset financing. Pfohl and Gomm (2009) not only suggest a conceptual framework but also build a mathematical model to quantify the value of supply chain finance on the basis of new institutional economics.

Through a case study, Fellenz et al. (2009) identified technological challenges for supply chain finance. Kristofik et al. (2012) found that the common challenge for all parties is the working capital management and the specific challenge for banks that offer supply chain finance products is how to know the creditworthiness of the suppliers and buyers. By survey method, More and Basu (2013) disclose that lack of common vision among the supply chain partners is the most critical challenge for SCF.

3. The integration of operational decisions and firm financing in supply chains

Hofmann and Kotzab (2010) indicated that the supply chain management literature basically overlooks financial impacts and accounting supports. Generally speaking, the financial flow in the supply chain is parallel to and constraints the physical flows of goods. When external financing is no big deal, it is reasonable that supply chain management studies only focus on material flow and information flow. However, because the influence of credit crisis still exists, it is essential to consider financial constraints in supply chain.

In operations research, production and inventory systems are often studied in isolation from the other aspects of business operations (Li, Shubik & Sobel, 2013). Researchers have embarked on fixing this weakness by creating models integrating inventory and financial decisions. Buzacott and Zhang (2004) is one of the first to investigate the impact of asset-based financing on production and inventory decisions and verify the significance of synchronization of production and financing decisions to financially constrained start-up firms. Chao, Chen and Wang (2008) characterized the optimal inventory control strategy for a self-financing retailer facing cash flow constraints periodically restocks from a supplier and sells to the market.

A natural extension to Chao et al. (2008) is to consider external financing from banks or suppliers. Because it is a common practice for suppliers selling to retailers on credit, trade credit is the most important source of short-term financing. Gupta and Wang (2009) investigated the impact of common credit terms in a discrete-time inventory model with random demand. Different from other literature, Lee and Rhee (2011) explored the influence of trade-credit on supply chain coordination from a supplier's perspective. Further, Kouvelis and Zhao (2012) studied the interaction of short-term financing and inventory decisions. They compared supplier financing with bank financing from the perspectives of the supplier, retailer, and supply chain, and found that trade credits always increase profitability for the supplier because the retailer orders more than under bank loans. Yang and Birge (2012) study how different priority rules of order repayment influence trade credit usage and supply chain efficiency when there are multiple creditors. Yang and Birge (2013) demonstrated that trade credit enhances supply chain efficiency by serving as a risk-sharing mechanism when demand is uncertain. In addition, Tanrisever et al. (2012) explore how start-up firms make tradeoff between production and process development and cash reservation to avoid bankruptcy. Li, Shubik and Sobel (2013) show that inventory theory is useful in analyzing of operational and financial coordination issues and proved the financial value of coordinating operational and financial decisions. They also found that firms that cannot get capital subscriptions have lower inventories, borrow more short-term loans, and are more likely to be default.

Other studies on the influence of financing on inventory decisions were extended to supply chain context. Because supply chain members are linked by trade credit relationships, Guedes and Mateus (2009) examine the trade credit linkages on the propagation of liquidity shocks in supply chains. In a similar vein, Luo (2013) examined the impact of cash flows on the individual firm's operational decision and the overall supply chain efficiency and demonstrated the importance of material and

financial integration of in supply chains by showing that the supplier could effectively mitigate the bullwhip effect through liquidity provision. Jing and Seidmann (2013) identified that marginal production cost plays a central role in determining whether bank credits or trade credits should be used to alleviate double marginalization in the supply chain with a manufacturer and a capital deficient retailer. Srinivasa Raghavan and Mishra (2011) revealed that supply chain financing brings a triple-win for the lender and the cash-strapped two-level supply chain with a retailer and a manufacturer.

Other forms of financial arrangement between supply chain partners were also examined. Babich (2010) examined how the manufacturer's order decision was influenced by its financial subsidies to the supplier in order to reduce supply risks. Ma, Xue, Zhao, and Lin (2013) explored the optimal inventory control policies for a loss-averse retailer using self-financing or external borrowing to cope with its working capital constraints in short product life cycle supply chain.

Besides the above operations research models, the survey study conducted by Leng and Zailani (2012) claimed that financial flow, rather than information flow and material flow, has a significant impact on supply chain performance. The reason is that better managed information flow and material flow are already necessary condition for supply chain management. The integration between material flow and financial flow may further enhance supply chain performance.

In summary, similar to the studies on supply chain coordination, the academic research on financial supply chain management grow out of analytical models or mathematical programming models. Empirical studies on financial supply chain management are scarce. We expect this stream of research in the future.

4. Concluding remarks

Traditionally, supply chain management research focuses more on operational aspect than financial aspect. Conceptual papers give us insight into what metric to measure the financial supply chain management success. Operation research models shed light on the mechanism of integration of financial and operational supply chain. However, the firm with sufficient financial resource may not be able to better manage its financial supply chain. Financial resource alone is not sufficient condition for better performance. The intangible capabilities, such as, financial management skills and organizational learning, may be more relevant than tangible financial resources (Bhaird, 2013). Resource-based view (RBV) argues that sustainable competitive advantage comes from resources and capabilities that are valuable, rare, imperfectly imitable, and not substitutable (VRIN). RBV may explain why firms can have good financial supply chain management and provide solutions of how to achieve it. We advocate survey studies offering theoretical explanations in this research domain.

References will be provided upon request

In Search of Third-Party Logistics Synergies and the Effects on Performance

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It is held that the competitiveness of firm in the market can be significantly improved by outsourcing its logistics function to third-party logistics providers (3PLs). A survey result of 200 companies in South China offered an empirical support to this argument. Findings suggested that a close collaboration between the firm and logistics providers is likely to create synergies among the parties for greater efficiencies and better results. In search of these synergies, the firm is advised to integrate its operations with 3PLs and to remain flexible in dealing with the third-party. Featuring with these operational characteristics, it is believed that the firm can have a better chance to benefit from the outsourcing of logistics function to third-party logistics providers.

Keywords: *Strategic orientations, 3PLs synergies, Logistics performance, Market performance, Operations management*

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In Search of Third-Party Logistics Synergies and the Effects on Performance

Introduction

In the last two-decade, China has been increasingly integrated into the world economy at a stunning pace (Zhou and Li 2007). China has supplied not only the manufacturing goods to the world market but it is also a large market for many consumable products. Its rapid economic development and drastic change in the marketplace has provided a good opportunity for business to local and foreign firms (Quer et al. 2007). To capture this opportunity, one suggestion from the strategic marketing literature is that the firm has to develop its own direction from the competitor and customer. These orientations are strategically importance in guiding the firm to use resources productively. A firm with strong competitor and customer orientations tends to have a good performance in the market (Day 1990). Findings of recent research, however, suggested differently. It is argued that some other variables are likely to operate between strategic orientations and firm performance. It is because of their interventions that turn the expected effect unobservable (Sinkovics and Roath 2004). In this study, the inter-firm collaboration is proposed to be one of these intervening variables. A firm is likely to perform better by working closely with third parties under the synergy effect. Based on this proposition, this study aims to investigate the cause and effect of inter-firm collaboration synergies in the context of firm outsourcing its logistics to the third-party (i.e. 3PLs). Results of this study are reported in this paper that consists of literature review, research method, analyses and findings, and implications and conclusion.

Literature Review

The nature and characteristics of research variables are defined in this section. Each of these variables assumes a role to play in the model that represents its relationship with others in the form of hypothesis. Altogether there are four research variables; they are strategic orientations, 3PLs synergies, logistics performance, and market performance.

Strategic orientations

Gatignon and Xuereb (1997) defined strategic orientations as a specific approach that is implemented by firms in achieving a superior performance. An example of adopting strategic orientations is to direct organizational resources in gathering information on competitor's activities and customer's needs (Narver and Slater 1990). In this research, there are two components that constitute strategic orientations. Competitor orientation represents the firm's ability and willingness in identifying, analyzing, and responding to competitors' actions. Customer orientation is the provision of products and services in satisfying the need of customers (Deshpandé et al. 1993).

3PLs synergies

Any positive effect arising from outsourcing a firm's logistics function to third parties is known as 3PLs synergies. These third-party logistics providers (3PLs) share part or all of the tasks for firm in sourcing, capacity planning, conversion, and distribution of finished goods. The 3PLs are held to be more experience and closer to the market that may help improve the firm's competitiveness and achieve a better result (Yeung et al. 2006). Integration and flexibility are underlying factors of 3PLs synergies. The former denotes the closeness between the firm and its logistics partner in sharing information and risk. It suggests how well these partners and their operations are united to create a mutually beneficial outcome (Byrne and Javed 1992). Flexibility represents the ability of firm in adapting changes in the business environment (Slack 2005). It is held that a firm with an open system and flexible in operations is less likely to have disputes with its logistics partners (Suarez et al. 1995).

Firm performance

In this study, firm performance is to be assessed from two related but separated areas. The first area is logistics performance. It indicates the increased efficiency and saving as a result of outsourcing the logistics function to third parties. Market performance is the other area of interest. It suggests the overall competitiveness of firm in the market that translates into profit (Narver and Slater 1990; Yeung et al. 2006).

Research Method

A set of research hypothesis is proposed to fill in the knowledge gap that is identified from the literature between strategic orientations and firm performance. Below are the hypotheses to be tested in this study:

H₁ Strategic orientations have a positive effect on 3PLs synergies. That is, the more competitor- and customer-oriented of the firm, the better is the chance of creating synergies with third-party logistics providers.

H_{2a} 3PLs synergies have a positive effect on logistics performance. That is, the closer the collaboration between the firm and third-party logistics providers, the better is the logistics performance of the firm.

H_{2b} 3PLs synergies have a positive effect on market performance. That is, the closer the collaboration between the firm and third-party logistics providers, the better is the performance of firm in the market.

H₃ Logistics performance has a positive effect on market performance. That is, the better the logistics performance of the firm, the better is the performance of the firm in the market.

To empirically test these hypotheses, a survey was conducted in South China targeting to companies with an experience of using 3PLs services in their day-to-day operations. A sample consisting of 200 firms was eventually obtained from a mail survey. It was a quite diversified sample that covered companies from various industries including the manufacturing, retailing, and trading sector. All have been working with their logistics partners for at least three-year times. Responses were made from senior staff members of sampled companies with a key responsibility in managing the distribution function but they are also knowledgeable on firm performance. They were requested to answer a set of Likert scale-typed questions on firm's strategic orientations, firm performance, and relationships with third-party logistics providers (3PLs). All these questions were modified from the existing measures with references to the local context (Narver and Slater 1990; Sinkovics and Roath 2004).

Analyses and Findings

Data was analyzed by using a structural equation modeling (SEM). At the first glance, the research model seemed to be statistically difference from the actual model, which was derived from the data ($c^2 = 239.64$, $df = 156$, $p < .001$) (Jöreskog 1969). Given the chi-square is very sensitive to a large sample; it renders the test result to be unreliable (Marsh et al. 1998). As such, alternative fit indices were employed to assess the model fit. These indices were root mean square residual (RMR = .047) comparative fit index (CFI = .936), Tucker-Lewis index (TLI = .922) and normed chi-square ($c^2/df = 1.536$). All reached the conventional level of acceptance (Carmines and McIver 1981; Hu and Bentler 1995; Jöreskog and Sörbom 1979). Based on these results, the research model was supported by the data and can be further interpreted (see Figure 1).

<< Insert Figure 1 about here >>

It was found that competitor orientation and customer orientation loaded significantly onto strategic orientations. The respective factor loading of these two components was 0.752 and 0.860, which was very high. A similar result was also observed from 3PLs synergies that the respective factor loading of integration and flexibility was above the threshold. These results confirmed that strategic orientations and 3PLs synergies have a two-factor structure.

Based on the path analysis, all research hypotheses were empirically supported by the data. First, strategic orientations have a positive effect on 3PLs synergies ($\beta = .703$, $p < .001$). The chance of creating synergies with 3PLs is good for companies who focus on competitor's activities and customer's needs. Second, 3PLs synergies are important to the firm because of the significant effect on both logistics performance ($\beta = .560$, $p < .001$) and market performance ($\beta = .464$, $p < .001$). A closer collaboration between the firm and third-party logistics providers can achieve not only a higher efficiency in distribution but also enhance the competitiveness of firm in the market. Last, logistics performance predicts market performance ($\beta = .452$, $p < .001$). A good performance in logistics may translate into competitiveness that eventually allows the firm to make more profits.

Implications and Conclusion

Several implications for theory and practice are able to draw from this research study. On the theory side, a newly created construct known as 3PLs synergies is successfully established that operates between strategic orientations and firm performance. Hence, it is promoted by strategic orientations and acts as a predictor of firm performance. It offers a better explanation on firm performance by

separating it into two distinct areas for examination. As a result, it is discovered that market performance of firm is indeed contingent on logistics performance and 3PL synergies. It provides an alternative path in accessing the effect of strategic orientations on firm performance via the synergy of inter-firm collaboration, which in this study is termed as 3PLs synergies.

Outsourcing the logistics and distribution function to third parties for a better result is probably the key implication to practice. It allows the firm to concentrate its resources on the core business. This inter-firm collaboration may possibly pave way for creating synergies that leads to a good performance. The firm is advised to work closeness and openness with third-party logistics providers (3PLs) in searching of these synergies.

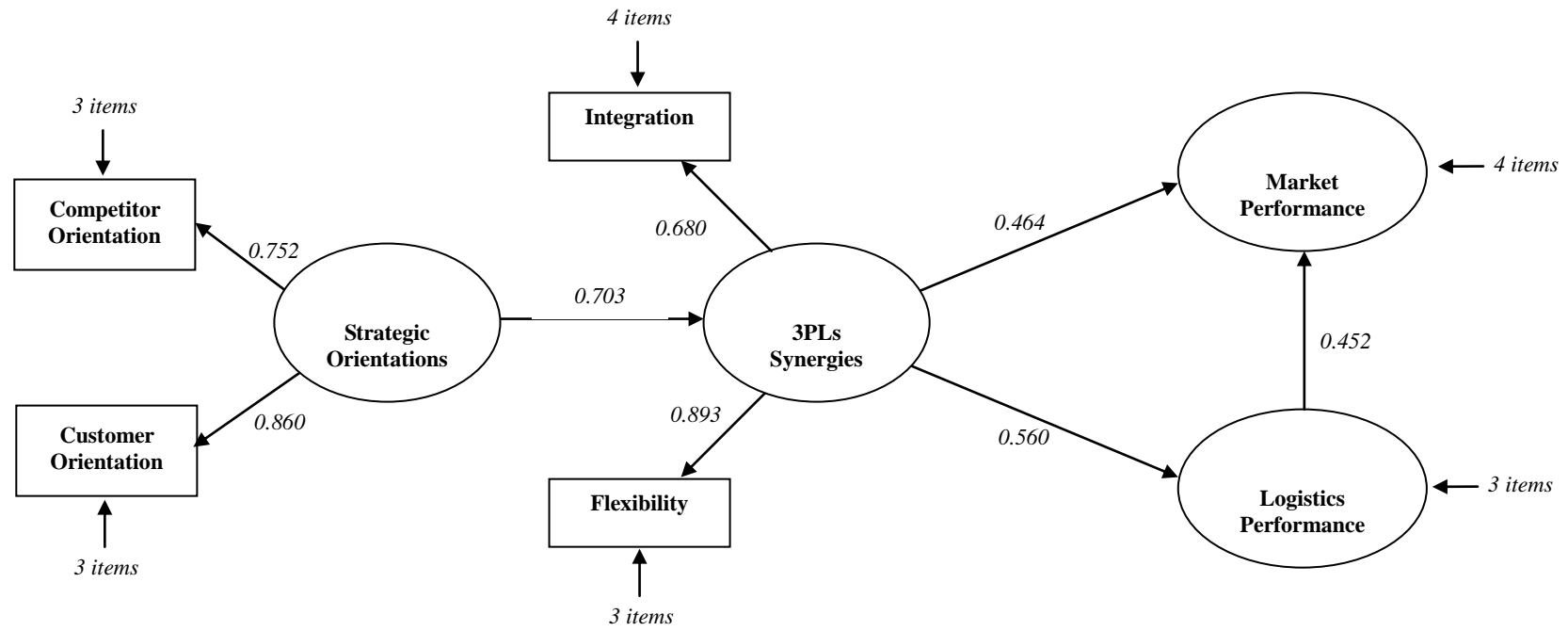
To conclude, this study represents an attempt to link a marketing concept with an idea that is popular in operations management. Results of this study revealed that even the firm directs all its attentions on the competitor and customer; it may not end up with a high performance. The firm has to outsource the logistics function to the third-party in searching of synergies.

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Figure 1 **Structural Model of 3PLs Synergies**



All path coefficients are significant at 0.001 levels