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# **KMI International Journal of Maritime Affairs and Fisheries**

Analysis on Container Throughput and Interaction of Korea, China and  
Japan Hub Ports

An Analysis of New Criteria for Permanent Observer Status on the  
Arctic Council and the Road of Non-Arctic States to Arctic

Clusters Initiatives in Port Hinterlands

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# Analysis on Container Throughput and Interaction of Korea, China and Japan Hub Ports

Yong-An PARK\*

## ABSTRACT

The port industry in North-east Asia, as the cases of economic, cultural, industrial, diplomatic and other activities among countries shows us dynamic interaction between hub ports. Japanese hub ports such as Kobe, Yokohama, and Osaka enjoyed the preoccupation effect in the liner trades and they transshipped the containers of neighbouring countries and ports from the early 1970s. Since the late 1980s, Busan port could improve its competitiveness in handling costs and connectivity for Japanese medium and small sized regional ports, and expanded its feeder networks to Chinese Northern regional ports in 1990s. A few Chinese ports could be the transshipment hub ports in North-east Asia which menaced the hub status of Kaoshiung and Taiwanese hub port in 2000s, and it may have weakened the feeder network around Korean ports.

Through pair correlation, partial correlation, panel data, and panel regression, this study finds significant implications in clarifying interaction and interrelation among the hub ports in North-east Asia. First, the relationship among ports changes continually. Therefore, dynamic interaction among hub ports would continue in 21st century. Second, the panel data and panel regression show us that the container throughput of five hub ports are connected with each other and also have its own specific characteristics. Third, there could be lock-in-effect in port activity, which causes auto-correlation of panel data. Finally, the fluctuation of container throughput of hub ports is affected mainly by trade amount and less by berth length.

**Keywords :** North-east Asia, hub port, interaction, panel regression

Journal of Economic Literature classification: Q2, O1, R3

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\* Research Fellow: Korea Maritime Institute. E-mail: yapark@kmi.re.kr, <http://www.kmi.re.kr/>

## 1. Introduction

North-east Asian countries, composed of South Korea, China, Japan, Taiwan, East region of Russia and North Korea, show us dynamic interaction of economic, cultural, industrial, diplomatic and other activities among the countries. In port industry, after the containerisation of commercial shipping from the 1960s the status of ports in the region has been changed incessantly. Kobe port, as an early bird of container terminal operation, had enjoyed the preoccupation effect in the liner trades and handled transshipment containers of neighbouring countries and ports from 1970s to 1980s. In the late 1980s, Busan port could improve its competitiveness of handling costs and connectivity for Japanese medium and small sized regional ports due to lower stevedoring costs and feeder costs between Busan and Japanese ports other than Kobe (Kim, 2001). Since the late 1980s, Busan port transferred and expanded its feeder networks to Japanese and Chinese ports in order to collect transshipment containers. Also in 1990s, the port of Shanghai attained the hub status and recorded higher rate of increase in container throughput. These dynamic phenomena in the port industry of North-east Asia countries implicate that the status of ports is under continual threat and opportunity from competition and cooperation.

In the literature of container port, there are several papers on interaction of the container ports in North-east Asia. These papers are focused on competition and cooperation among container ports (Song, 2002; Yap and Lam, 2006; Anderson et al., 2008; Ishi et al., 2013). However, the definition and clarification of interrelation among regional hub ports or regional ports seems to be quite complicated and difficult to find proper answer (Lam and Yap, 2011). Also the volatile tendency of shipping activity connecting ports makes it complex to define the interrelation between ports.

The analysis of interaction among hub ports in North-east Asia was scrutinised with time series or cross sectional data, rarely with panel data (Chang, 2000; Ha, 2003; Anderson et al., 2008; Low et al., 2009; Lam and Yap, 2011; Ishi et al., 2013). Differently from the previous papers on interaction among hub ports in North-east Asia, this paper builds a panel data set of the five major ports in the region: Busan, Shanghai, Tianjin, Hong Kong and Kobe.

**Table 1.** Summary of literature review on interaction among hub ports

| Author                | Subject                                | Data                    | Methodology   |
|-----------------------|--|-------------------------|---|
| Chang(2000)           | Effect of disaster on port competition | Time series (1994-1997) | Literature review                                   |
| Ha(2003)              | Comparison of service quality          | Cross-section           | Comparative analysis by interview and questionnaire |
| Anderson et al.(2008) | Competition between Busan and Shanghai | Time series             | Game-theory   |
| Low at al.(2009)      | Assessment of hub status               | Cross-section           | Evaluation of shipping networks                     |
| Lam and Yap(2011)     | Hub status                             | Time series (1996-2006) | Slot capacity calculation                           |
| Ishi et al.(2013)     | Port competition                       | Time series (1990-2008) | Game-theory   |

**Source :** Author's elaboration.

On the premise that container throughput of a container port depends on its handling capacity and trade amounts of the country which the port belongs to and the other neighbouring countries, this paper aims to clarify interaction and interrelation among the major hub ports in North-east Asia. In addition, through the panel regression this paper examines whether the container throughputs of five hub ports are connected with each other and also have its own specific characteristics. Since the expansionary development strategy of container facilities in a port would cause competition for attracting transshipment containers from neighbouring areas, this tries to trace the development trends of the port.

The next section of this paper reviews the policy background of container port and liner shipping. The three main countries in North-east Asia, Korea, China and Japan have their own respective policy and strategy on port and shipping industries. In addition, the bilateral shipping agreements between the three countries change the interrelation and develop the interaction between the ports in the region. The section three describes the data collection on port facilities such as berth length and container throughput of the main hub ports, and addresses correlation analysis, using pair and partial correlations. The section three also presents panel regression using the panel data which combines the data of cross sectional and time series. In panel regression this study examines the statistic characteristics of panel data and models. The section four concluded this study and suggests further studies. This study would implicate the understanding of port competition of North-east Asia in 21st century.

## 2. Interrelation among hub ports in the region

### 2.1 Background

This study reviews serially the policy background of port and shipping in Korea, China and Japan. The development plan of container port in Korea started as a part of economic policy (Kim et al., 2009). The Korean government has established Five Years' Economic Development Plan from 1962. During the Fourth Five Years' Economic Development Plan (1977-1981), the Korean government built the container terminal at Berth 5 in Busan. In Korea, the central government constructed and managed container terminals till 1989. In 1989, the central government organized the Korea Container Terminal Authority (KCTA) which built and managed container terminals in Korea from 1989 to 2003. The Korean government introduced the Port Basic Plan on the basis of the law in 1995. The Busan Port Authority was established. in 2003; the Incheon Port Authority was formed in 2005; and the Yeosu-Gwangyang Port Authority was registered in 2011. The Korean government adjusts each development plan of container terminals through the Port Basic Plan.

After inauguration of the Open Door Policy in 1978, the government and the Communist Party of China tried to encourage trade and reform state owned enterprises. Nevertheless, the port industry remained in the condition of vertical integration and central control by the government till 1984 (Cullinane and Wang, 2007). The Ministry of Communication, the owner of ports, managed all activities and decision making. In 1984, the Chinese government began to decentralise the governance of port activities by introducing first joint management system of the central government and the Tianjin municipal government in Tianjin port (China Port Magazine, 1998; Cullinane and Wang, 2007). On the basis of successful operation of Tianjin port, the central government enlarged its policy of decentralization of port operation. In 1987, the municipal government attained the autonomous power on management of all ports except the port of Qinhuangdao (China Port Magazine, 1998; Cullinane and Wang, 2007). Also the foreign direct investment in port industry was introduced in 1987. The Chinese government established the Port Law and the Rules of Port Operation and Management in 2004. The Rules of Port Operation and Management divided the port authority in China into a port administration bureau and a port business enterprise.

In Japan, although the Japanese government adjusts each development plan of container terminals through implementing the Port Restructuring Plan and controlling the amounts of public bond of municipalities for constructing port facilities (Tsumori, 1998), container terminals have been built and managed by the local public enterprises such as the Tokyo Port Management Corp. and the Kobe Port Management Corp.. The Japanese

government has tried to enhance the status of Japanese main ports by introducing reform schemes in port industry such as working hour extension and integration of operation among Japanese ports.

The bilateral shipping agreement between Korea and China was concluded in 1993 and the liner routes have been in service from 1989 (Baik and Park, 2002). The liner routes between Korea and Japan is traditional liner services which were started in the early 1950s. However, the bilateral shipping agreement between Korea and Japan is not concluded but both parties established the Korea-Japan Shipping Working Committee in 1987 (Baik and Park, 2002). The participation of Japanese liners into Korea-Japan liner routes was not allowed till 1995. The market was opened to Japanese lines from 1996 (Baik and Park, 2002). The shipping routes by bulk vessels between Shanghai and Japanese ports were opened in 1978 and the liner routes of full container vessels between China and Japan were launched in 1980 (Wang and Ducruet, 2012).

## *2.2 Construction and operation of container terminals*

In 1970s, Japanese ports are the leaders of development of container terminal in North-East Asia. Kobe port opened the container terminal in 1970, following the operation of container terminals at Yokohama and Osaka in 1969 in Japan (Japan Port Association; Japan Maritime Promotion Association, 1984).

In 1979, Busan port opened its first container terminal at Berth 5. At the beginning of containerisation in the late 1960s and in the early 1970s, Korea, China and Japan developed a few major container ports. The Korean government also underlined the concentration of container handling capacity at the two ports: Busan and Incheon in the early 1970s. Although the Korea government decided to disperse the handling capacity of Busan into Gwangyang in 1985, the government had built the container terminals mainly at Busan port till the late 1990s. In 1995, on the process of construction of Gwangyang container terminals, the earthquake at Kobe occurred. This disaster at Kobe caused Busan port to handle twice the volume of its optimum capacity (Park et al., 2006). In order to lessen the congestion around Busan port, the Korean government finalized the Busan New Port Plan in 1996.

Till the early 1980s, the major container ports in China were Shanghai, Huangpu, Tianjin, and Qingdao which handled 33 thousand TEUs in 1979 (Informa UK, 1981).

Expansion of port facility was focused on these four ports and Dalian port in 1980s. The port of Tianjin commenced the container terminal, constructed by Chinese technology in 1981. In addition from 1990s the Chinese government designated serially as an international shipping center Shanghai port in 1996, Dalian port in 2003, and Tianjin port in 2006 (IAPH and China ports and Harbours Association, 2008). The Shanghai municipal government and the Chinese government completed their basic study on the development

of the Yangshan New Port Plan which aimed to make Shanghai port as a logistics hub in 1997. The Chinese government announced in 2001 that the Yangshan New Port would be completed in 2005.

The operation of Yangshan New Port in Shanghai promoted competition among hub ports in North-east Asia for catchment of transshipment containers. Busan port has collected transshipment containers mainly from China and Japan. Since the Yangshan New Port and other hub ports at Northern region in China have tried to gather transshipment containers from the Northern regions of China, Busan port was facing a decreasing growth ratio of transshipment containers from other countries. Hence in 21st century Korean, Chinese and Japanese hub ports compete for the containers of China's Northern region (Ha, 2003; Notteboom, 2006).

Japan also concentrated the container facilities on the major ports: Kobe, Osaka, Yokohama, and Tokyo in 1970s. The Japanese government established and implemented the Port Restructuring Plan every five years from 1961 (Ministry of Transportation, 1994). At the seventh Port Restructuring Plan from 1986 to 1990 and the eighth from 1991 to 1995, the Japanese government aimed to disperse the container handling capacity of the major ports into medium and small sized regional ports in order to lessen the congestion in adjacent areas of the major ports and reduce feeding costs between the regional ports and the major ports (Ministry of Transportation, 1994; Tsumori, 1998). However, in the late 1990s, the Japanese government also changed its port policy from decentralisation to centralisation of main trunk routes in a few ports.

Therefore, in 1970s and in 1980s, the liners focused their deployment of fleets at Japanese ports and Kobe port became a hub port in North-East Asia. In 1970s and in the early 1980s Busan port used the main liner routes at Japanese hub ports such as Kobe, Yokohama and Osaka through feeding between Busan and Japanese hub ports.

### *2.3 Competition and cooperation in main trunk and feeder routes*

Ports interact with all other ports through shipping networks, and have competitive and complementary relationships or share both aspects for servicing a shipping route (Yap and Lam, 2006). Therefore, the interrelation among ports is realised through shipping networks and the analysis on the interrelation has to be confined to the ports in close proximity in shipping networks, which share their own hinterlands (Yap and Lam, 2006). The shipping networks which connect other continents, regions in the other continents, and countries in the same region are decided by shipping companies which are the demanders of port activities (Zeng and Yang, 2002; Park and Medda, 2010). However, the status of a port will be classified into hierarchical order in accordance with the shipping networks which the port handles (Zeng and Yang, 2002). The ports in the same region and continent are faced with diverse aspects and combination of competition and cooperation

for attracting deployments of fleets of shipping companies.

In North-east Asia, container ports continually meet with opportunity and challenges from competitors and followers, and technological changes. In 1970s and in the early 1980s, Japanese major ports such as Kobe, Tokyo, Osaka and Yokohama, and Hong Kong were leading ports (Hoshino, 2010). These ports provided neighbouring domestic and foreign ports with feeder networks for connection to global shipping networks. Regulation and deregulation on port industry from the central governments also promotes the multiple relationships among ports through changing management and operation system, modifying strategic position of each port in port industry and enlarging opportunities of foreign direct investment (Cullinane and Wang, 2007; Hoshino, 2010).

In 1980s, the dissemination of hub function of Japanese hub ports into Chinese ports and Korean ports seems to be caused by the shifts of manufacturer following the low production costs in foreign countries (Hoshino, 2010). These interrelations among ports are closely connected with economic trends, specifically the competitiveness of manufacturing industries (Hoshino, 2010). In addition, the policy reform and the Open Door Policy since 1978 promoted the export-oriented industries and the development of container system in China (Wang and Ducruet , 2012).

In 1990s, Busan port was the most successful newcomer to vie for Chinese and Japanese traffic due to cost-competitive and efficient strategies (Tsumori, 1998; Kim, 2001; Yap and Lam, 2006). In 2000s, a few Chinese ports could be transshipment hub ports in North-east Asia, menace the hub status of Kaoshiung, Taiwanese hub port, and weakened feeder network around Korean ports (Yeo et al., 2008; Lam and Yap, 2011). For example, the increase of international transshipment containers in Shanghai port will strengthen the coastal shipping activities along the coast of China (Wang and Ducruet, 2012). In 2000s, Chinese ports also meet with competition with the Chinese ports which have the same hinterlands (Li and Oh, 2010; Lam and Yap, 2011).

### 3. Correlation analysis and panel regression

#### 3.1 *Data collection and summary*

##### 3.1.1 Data collection

The main sources of this study's data is from Containerisation International Yearbook online and C-i online, its internet version. The Containerisation International Yearbook informs us records of specification of each container port and terminal such as container throughput, berth length and depth, area of container yards, and calling liners. The C-i online provides us with the information of container throughput of each port in

time series from 1970 to 2011.

This study also uses the data of Chinese ports in the Chinese Foreign Trade Ports by the People's Transportation Press Co., which includes container handling, construction history, and management and operation of each Chinese port. The statistics books, published by the Japan Port Association and the Ministry of Construction and Transportation of Japan, provide us with the information on development and operation of Japanese container ports and terminals.

International Monetary Fund (IMF) provides data on World export, and export and import of each country. Because this study cannot find any data sources of trade amounts within containers of each country, this study uses the export amounts of the World, Korea, China and Japan.

The five ports are selected as representative ports among hub ports in each country. This paper chooses the five ports in accordance with the following procedure. First, we search an available dataset of container ports in North-east Asia. This paper could build the panel data of container ports North-east Asia from the datasets of C-i online and Containerisation International Yearbook. However, in 1970s, the records of container ports in North-east Asia include only Korean, Japanese and Taiwan ports. In the early 1980s the records illustrate a few of Korean, Japanese and Chinese ports: Busan, Incheon, Kobe, Osaka, Yokohama, Tokyo, Shimizu, Nagoya, Shanghai and Tianjin. Among these ports, this paper assembles mainly the hub ports in competition with Busan, and the representative ports in each country: Busan, Kobe, Shanghai, Tianjin, and Hong Kong port. Especially Kobe port was a main port in North-east Asia from 1970s to 1980s. It provided Busan port with feeder and hub networks at that period. The interrelation between Busan port and Kobe port shows us a dynamic transition in feeder and hub networks in North-east Asia.

### 3.1.2 Building panel data

This paper builds a panel data of the five ports from 1982 to 2010. A panel data is combination of time series and cross-section data, survey over time in the same cross sectional unit (Gujarati, 2003). The inputs of five ports in handling containers are certain resources: employees, equipment and provisions, electricity, area, depth and length of berth, and information technology. However collectable data of the inputs from 1982 to 2010 is strictly limited to number of quay cranes and length of berth. Though the quay cranes affect the productivity of a port and a container terminal, the calculation of handling capacity of a quay crane is quite complicate and needs lots of time. Therefore this study adopts length of berth as a representative indicator of inputs of a container port.

The outputs of a container port include number of calling vessels, tonnage of cargoes, revenues, profits, and container throughput. Among these outputs, collectable datum is restricted to the record of container throughput in C-i online and

Containerisation International Yearbook. Generally a container terminal in a port tends to design the proposed factors of productivity and service quality which considers the interrelation between inputs and outputs (Ha, 2003; Choi and Ha, 2005)

In respect of demand side of container movement in North-east Asia, the amounts of foreign trade will be a good macroeconomic variable which decides the amounts of cargo flow in the region. In addition the trade amount also is affected by the economic indicators such as GDP of partner countries, distance from export country to partner countries, and per capita GDP of partner countries, common borders with partner countries, density of transport infrastructure in partner countries (Limao and Venables, 2001; Ferrari et al, 2011; Park, 2012). Nevertheless, this study would stress the examination of effects from trade fluctuation in North-east Asia on container throughputs in the five major ports.

### 3.1.3 Summary of panel data

Since the container throughput data of Chinese ports in C-i online have been recorded since 1982, this study collects time series data from 1982 to 2010. Tianjin port handled 41 thousand TEU at minimum record among the five major ports in 1982 and Shanghai port serviced 29,069 thousand TEU at maximum in 2010 as shown in Table 2. During the same period the world export rose from 1.7 trillion US dollar in 1982 to 16 trillion US dollar in 2010.

**Table 2.** Summary of input data

| Item                                | Min   | Max     | Mean  | Standard deviation |
|-------------------------------------|-------|---------|-------|--------------------|
| Throughput (Thousand TEU)           | 41    | 29,069  | 6,098 | 7,256              |
| Berth length (m)                    | 384   | 11,935  | 4,356 | 3,098              |
| World exports (billion US dollar)   | 1,697 | 16,008  | 6,143 | 4,159              |
| Export of Korea (billion US dollar) | 21.9  | 466.4   | 156   | 126                |
| Export of China (billion US dollar) | 22.2  | 1,578.3 | 367   | 460                |
| Export of Japan (billion US dollar) | 138.4 | 782     | 408   | 178                |

**Source :** Informa UK, Containerisation International Yearbook, each year.  
IMF, International Financial Statistics Yearbook, each year.

The container throughput of Busan port has increased from 786 thousand TEU in 1982 to 14,194 thousand TEU in 2010. The amount of export of Korea has recorded 21.9 billion US dollar in 1982 and 466.4 billion US dollar in 2010. The container throughput of Shanghai port has increased from 66 thousand TEU to 29,069 thousand TEU in 2010 since the amount of export of China has risen widely from 22.2 billion US dollar to 1,578

billion US dollar during the same period. Kobe port has increased slightly from 1,463 thousand TEU in 1982 to 2,915 thousand TEU in 2010. The amount of export of Korea has recorded 138 billion US dollar in 1982 and 782 billion US dollar in 2010.

## 3.2 Correlation analysis

### 3.2.1 Pair correlation

The correlation coefficients of container throughput with other variables show us mostly positive relation from 1982 to 2010 as listed in Table 3. However the coefficients of container throughput with berth length and trade amount in 1990s are lower than the other periods due to the effect from the lowering status of Kobe and shutdown of operation after the Kobe earthquake in 1995. The synchronization and globalisation of each economy and the countries in North-east Asia are considered to cause the similar correlation coefficients of World exports, trade amounts of Korea, China and Japan with container throughput.

In 1980s, the length of berth had the higher correlation with container throughputs than trades of World, Korea, China and Japan. This phenomenon may be caused by deficiency of port facility in comparison to throughput increase. In 1990s, the correlation coefficients of container throughput with other variables became lower than those in 1980s due to the shutdown of Kobe port. In 2000s, the correlation coefficients of container throughput with other variables rose slightly than those in 1990s.

**Table 3.** Correlation coefficients of container throughput with other variables

| Country/Item             | Berth length (m) | World exports (billion US\$) | Trade amounts of Korea (billion US\$) | Trade amounts of China (billion US\$) | Trade amounts of Japan (billion US\$) |
|--------------------------|------------------|------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|
| Total period (1982-2010) | 0.60             | 0.66                         | 0.66                                  | 0.64                                  | 0.65                                  |
| 1980s(1982-1989)         | 0.70             | 0.33                         | 0.33                                  | 0.33                                  | 0.34                                  |
| 1990s(1990-1999)         | 0.28             | 0.27                         | 0.24                                  | 0.28                                  | 0.23                                  |
| 2000s(2000-2010)         | 0.56             | 0.36                         | 0.36                                  | 0.35                                  | 0.35                                  |

**Source :** Informa UK, Containerisation International Yearbook, each year.  
IMF, International Financial Statistics Yearbook, each year.  
Author's elaboration based on the two data

At the level of each port, all ports except Kobe record positive high correlation coefficients of container throughput with other variables as presented in Table 4. Kobe also shows lower correlation coefficients than other ports from 1982 to 2010. Furthermore, in 1990s, Kobe presents negative correlation coefficients of container throughput with trades

of World, Korea, China and Japan. The port of Hong Kong has higher correlation of container throughput with berth length in 1980s and lower in 1990s and after 2004. In 2004, the Chinese central government transferred its governance of port management to municipal governments. The decentralisation of port governance in China seems to decrease correlation coefficients of container throughput with berth length in Hong Kong after 2004 by lowering port investment in relation to the throughput increase.

**Table 4.** Correlation coefficients of container throughput with other variables

| Country/Item             |          | Berth length (m) | World exports (billion US\$) | Trade amounts of Korea (billion US\$) | Trade amounts of China (billion US\$) | Trade amounts of Japan (billion US\$) |
|--------------------------|----------|------------------|------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|
| Whole period (1982-2010) | Busan    | 0.89             | 0.96                         | 0.95                                  | 0.91                                  | 0.95                                  |
|                          | Shanghai | 0.98             | 0.98                         | 0.98                                  | 0.99                                  | 0.93                                  |
|                          | Tianjin  | 0.94             | 0.97                         | 0.97                                  | 0.99                                  | 0.92                                  |
|                          | HongKong | 0.87             | 0.90                         | 0.90                                  | 0.81                                  | 0.93                                  |
|                          | Kobe     | 0.25             | 0.38                         | 0.38                                  | 0.34                                  | 0.44                                  |
| 1980s (1982-1989)        | Busan    | 0.50             | 0.96                         | 0.97                                  | 0.99                                  | 0.97                                  |
|                          | Shanghai | 0.86             | 0.94                         | 0.95                                  | 0.99                                  | 0.96                                  |
|                          | Tianjin  | 0.88             | 0.91                         | 0.92                                  | 0.98                                  | 0.93                                  |
|                          | HongKong | 0.96             | 0.99                         | 0.99                                  | 0.98                                  | 0.99                                  |
|                          | Kobe     | 0.62             | 0.94                         | 0.94                                  | 0.89                                  | 0.95                                  |
| 1990s (1990-1999)        | Busan    | 0.94             | 0.97                         | 0.87                                  | 0.98                                  | 0.80                                  |
|                          | Shanghai | 0.85             | 0.88                         | 0.75                                  | 0.92                                  | 0.66                                  |
|                          | Tianjin  | -                | 0.93                         | 0.82                                  | 0.96                                  | 0.75                                  |
|                          | HongKong | 0.55             | 0.97                         | 0.91                                  | 0.99                                  | 0.88                                  |
|                          | Kobe     | -0.31            | -0.73                        | -0.73                                 | -0.63                                 | -0.73                                 |
| 2000s (2000-2010)        | Busan    | 0.68             | 0.90                         | 0.90                                  | 0.90                                  | 0.87                                  |
|                          | Shanghai | 0.98             | 0.98                         | 0.98                                  | 0.98                                  | 0.95                                  |
|                          | Tianjin  | 0.91             | 0.95                         | 0.97                                  | 0.99                                  | 0.91                                  |
|                          | HongKong | 0.84             | 0.91                         | 0.88                                  | 0.85                                  | 0.91                                  |
|                          | Kobe     | -0.57            | 0.91                         | 0.91                                  | 0.87                                  | 0.95                                  |
| After 2004 (2005-2010)   | Busan    | 0.85             | 0.91                         | 0.94                                  | 0.91                                  | 0.92                                  |
|                          | Shanghai | 0.96             | 0.96                         | 0.97                                  | 0.97                                  | 0.87                                  |
|                          | Tianjin  | 0.93             | 0.87                         | 0.93                                  | 0.97                                  | 0.75                                  |
|                          | HongKong | 0.39             | 0.72                         | 0.64                                  | 0.50                                  | 0.85                                  |
|                          | Kobe     | -0.64            | 0.92                         | 0.90                                  | 0.83                                  | 0.97                                  |

**Source :** Informa UK, Containerisation International Yearbook, each year.  
IMF, International Financial Statistics Yearbook, each year.  
Author's elaboration based on the two data

### 3.2.2 Partial correlation

In the partial correlation analysis which measures the degree of association between two random variables, the berth length and the trade amount of each country contributes positively to the increase of container throughput of each port from 1982 to 2010 as shown in Table 5. In Busan and Shanghai the port facility symbolized in berth length leads the growth of container throughput. This seems to be caused mainly by the expansionary development. On the other hand, in Hong Kong, the trade volume of China is main source of container throughput increase. In Tianjin, the berth length and the trade amount of each country contributes positively to the increase of container throughput. Meanwhile Kobe port could enjoy the pre-occupation effects from the early 1970s to the early 1980s, but it faced challenge from other ports in 1980s and it was damaged by the Kobe Earthquake in 1995 (Chang, 2000; Shibasaki, 2005). It lost the status of hub port in North-east Asia from the mid of 1990s. Hence, Kobe port shows lower correlation coefficients than the other ports.

If we divide the period from 1982 to 2010 into the three periods: 1980-1989, 1990-1999, and 2000-2010, each period lists different characteristics of main drivers for throughput increase. In 1980s, in all ports except Hong Kong, the main propeller of throughput increase is the trade amount of each country. However in 1990s Busan could handle more throughputs due to expansion of facility and Hong Kong also did so due to expansion of facility and trade increase in China. Tianjin which did not expand its facility in 1990s recorded higher productivity due to trade increase in China. In 2000s, the main source of throughput increase in Busan, Shanghai and Kobe is the trade increase of each country. Tianjin can handle more throughputs due to both facility expansion and trade increase. In 2000s, Hong Kong shows us lower correlation of container throughput with facility expansion and trade increase. The lower correlation coefficient at Hong Kong port seems to be occurred by passive investment at Hong Kong port and expansionary investment at mainland ports.

**Table 5.** Correlation coefficients of container throughput with other variables

| Country/Item             |          | Berth length (m) | World exports (billion US\$) | Trade amounts of each country (billion US\$) |
|--------------------------|----------|------------------|------------------------------|--|
| Total period (1982-2010) | M-1      | 0.33***          |                              | 0.48***                                      |
|                          | Busan    | 0.73***          |                              | -0.05  |
|                          | Shanghai | 0.72***          |                              | 0.05   |
|                          | Tianjin  | 0.97***          |                              | 0.53***                                      |
|                          | HongKong | -0.17            |                              | 0.58***                                      |
|                          | Kobe     | 0.41             |                              | 0.19   |
|                          | M-2      | 0.05             | 0.37                         | -0.16  |
|                          | M-3      | 0.35***          |                              | Korea:0.05,<br>China:-0.03 Japan: -0.03      |

| Country/Item              |          | Berth length (m) | World exports (billion US\$) | Trade amounts of each country (billion US\$) |
|---------------------------|----------|------------------|------------------------------|--|
| 1980s<br>(1982-1989)      | Total    | 0.79***          |                              | -0.59***                                     |
|                           | Busan    | 0.41             |                              | 0.96***                                      |
|                           | Shanghai | 0.15             |                              | 0.98***                                      |
|                           | Tianjin  | 0.55             |                              | 0.95***                                      |
|                           | HongKong | 0.11             |                              | 0.74   |
|                           | Kobe     | -0.27            |                              | 0.93***                                      |
| 1990s<br>(1990-1999)      | Total    | 0.56***          |                              | -0.51***                                     |
|                           | Busan    | 0.82***          |                              | 0.57   |
|                           | Shanghai | 0.25             |                              | 0.67   |
|                           | Tianjin  | -                |                              | 0.96***                                      |
|                           | HongKong | 0.84***          |                              | 0.99***                                      |
| 2000s<br>(2000-2010)      | Total    | 0.46***          |                              | 0.34***                                      |
|                           | Busan    | -0.39            |                              | 0.83***                                      |
|                           | Shanghai | 0.38             |                              | 0.62*  |
|                           | Tianjin  | 0.67**           |                              | 0.97***                                      |
|                           | HongKong | 0.19             |                              | 0.32   |
|                           | Kobe     | 0.01             |                              | 0.93***                                      |
| After 1997<br>(1998-2010) | Busan    | -0.51*           |                              | 0.87***                                      |
|                           | Shanghai | 0.14             |                              | 0.71***                                      |
|                           | Tianjin  | 0.66             |                              | 0.97***                                      |
|                           | HongKong | 0.20             |                              | 0.27   |
|                           | Kobe     | 0.25             |                              | 0.90***                                      |
| After 2004<br>(2005-2010) | Busan    | -0.17            |                              | 0.76   |
|                           | Shanghai | 0.33             |                              | 0.64   |
|                           | Tianjin  | 0.81             |                              | 0.89**                                       |
|                           | HongKong | -0.12            |                              | 0.35   |
|                           | Kobe     | -0.13            |                              | 0.95***                                      |

Note : \*significant at 10 percent level; \*\* significant at 5 percent level; \*\*\* significant at 1 percent level.

Source : Informa UK, Containerisation International Yearbook, each year.

IMF, International Financial Statistics Yearbook, each year.

Author's elaboration based on the two data

### 3.3 Panel regression

Before estimating coefficients of variables, we test the suitability of models by examining statistic characteristics of panel and panel models, contemporaneous correlation between data of the ports, heteroskedasticity test between data of the ports, serial auto-correlation of each port, significance test of random effects model, Hausman test of

efficiency of fixed effect model and random effect model, autocorrelation of panels, and Sargan test of over-identifying restrictions in order to find out suitable models as shown in Table 6. Even though this study adopts two cases of sample: Case I includes the five ports-Busan, Shanghai, Tianjin, Hong Kong, and Kobe; Case II excludes Kobe, the statistical characteristics of Case I and II in suitability have the similar results.

**Table 6.** Summary of Searching suitable models and suitability tests

| Test/Method  | Case I   | Case II   |
|--|--|---|
| Variables  | Dependent: container throughput<br>Independent: berth length, amount of export and import of each country<br>Port: Busan, Shanghai, Tianjin Hong Kong, Kobe  | Dependent: container throughput<br>Independent: berth length, amount of export and import of each country<br>Port: Busan, Shanghai, Tianjin Hong Kong   |
| Tests for contemporaneous correlation  | chi2(10) = 52,<br>Probability >chi2 = 0.0000   | chi2(6) = 23.9,<br>Probability >chi2 = 0.0005   |
| Tests for panel-level heteroskedasticity                                     | chi2 (4) = 65<br>Probability >chi2 = 0.0000  | chi2 (4) = 110.78<br>Probability >chi2 = 0.0000   |
| Tests for serially auto-correlation in random effects model                  | Serial correlation:<br>LM( $\rho = 0$ )= 138<br>Probability >chi2(1) = 0.0000;<br>ALM( $\rho = 0$ )= 14,<br>Probability >chi2(1) = 0.0109<br>Joint Test:<br>LM(Var(u)=0,rho=0) = 833 Probability >chi2(2) = 0.0000 | Serial correlation:<br>LM( $\rho = 0$ )= 83.6,<br>Probability >chi2(1) = 0.0000;<br>ALM( $\rho = 0$ )= 72.09,<br>Probability >chi2(1)= 0.0000<br>Joint Test:<br>LM(Var(u)=0,rho=0) = 85 Probability >chi2(2) = 0.0000 |
| Characteristics of error term in fixed effects model                         | F(4.13)=72<br>probability> F = 0.000   | F(3.74)=5.98<br>probability> F = 0.0008   |
| Significance test of random effects model                                    | chi2(1) = 813<br>Probability > chi2 = 0.0000   | chi2(1) = 13.1<br>Probability > chi2 = 0.0003   |
| Hausman test   | Probability >chi2 = 0.887  | Probability >chi2 = 0.663   |
| Auto-correlation of error term in fixed effects model & random effects model | modified Bhargava et al.<br>Durbin-Watson = 0.15 in fixed effects model  | modified Bhargava et al.<br>Durbin-Watson = 0.17 in fixed effects model & random effects model  |
| Sargan test of over-identifying restrictions of dynamic panel model          | chi2(170) = 166,<br>Probability > chi2 = 1.000   | chi2(170) = 138.15,<br>Probability > chi2 = 1.000   |

Source : Informa UK, Containerisation International Yearbook, each year.  
IMF, International Financial Statistics Yearbook, each year.  
Author's elaboration based on the two data.

This study adopts the following panel regression function,

$$\text{Conit} = \alpha + \beta_i \text{Berthit} + \gamma_i \text{Trit} + u_i + \epsilon_{it} \quad (1)$$

Where,

Conit : Throughput of port  $i$  in year  $t$

Berthit : Berth length of port  $i$  in year  $t$  in meter

Trit : Amount of export and import of the country in year  $t$  which port  $i$  belongs to

### ***Contemporaneous correlation test among panels in fixed effects model***

Tests of contemporaneous correlation in Case I and II conclude that there is contemporaneous correlation among panels. This seems to be affected by the trend of World trade which can change the trend of container throughput in each port.

$$H_0 : \text{Cov}(\epsilon_{it}, \epsilon_{jt}) = 0$$

### ***Heteroskedasticity test between panels in fixed effects model***

There is panel-level heteroskedasticity. The Modified Wald test for groupwise heteroskedasticity rejects at 1% significance the null hypothesis excluding heteroskedasticity among panels. Each port shows its respective characteristics in panel regression.

$$H_0 : \text{Var}(\epsilon_{it}) = \sigma^2, \quad \forall i = 1, \dots, I$$

### ***Auto-correlation test of error term in random effects model***

Tests for error-component model tells that in Case I and II there is serially auto-correlation in error term  $\epsilon_{it}$ , under the assumption of excluding random effects. In random effects model, we could find auto-correlation in error term  $\epsilon_{it}$ . Adjusted Lagrangian Multiplier (ALM) shows auto-correlation in error term  $\epsilon_{it}$ . The random effects model assumes that the individual error terms are not correlated across time series units, as shown in Equation 2 (Gujarati, 2003).

$$\epsilon_{it} = \rho \epsilon_{it-1} + v_{it} \quad (2)$$

$$H_0 : \rho = 0$$

### ***Test on characteristics of error term at fixed effects model***

In Case I and II the null hypothesis of that all panels do not have its own characteristics in error term  $u_i$  in Equation 1 has been nullified. It means that fixed effects model is more suitable than panel generalized least squares (Panel GLS).

$$H_0 : u_i = 0, \quad \forall i = 1, \dots, I$$

### ***Significance test of random effects model***

Breusch and Pagan Lagrangian multiplier test for random effects concludes that in Case I and II the null hypothesis which variance of error term  $u_i$  is naught has been rejected. Therefore, random effects model may be more suitable for estimation than pooled ordinary least squares.

$$H_0 : \text{Var}(u_i) = 0, \quad i = 1, \dots, I$$

### ***Hausman test of efficiency of fixed effect model and random effect model***

The Hausman test does not nullify the null hypothesis. Hence there is no systematic difference between fixed effects model and random effects model, and both fixed effects model and random effects model may result consistent estimators.

$$H_0 : \text{Cov}(\text{Berthit}, u_i) = 0, \text{Cov}(\text{Trit}, u_i) = 0, \quad i = 1, \dots, I$$

$$H_1 : \text{Cov}(\text{Berthit}, u_i) \neq 0, \text{Cov}(\text{Trit}, u_i) \neq 0, \quad i = 1, \dots, I$$

### ***Auto-correlation test of error term in fixed effects model & random effects model***

Auto-correlation of error term in fixed effects model and random effects model is evaluated by modified Bhargava et al. Durbin-Watson statistics. Since the values of modified Bhargava et al. Durbin-Watson statistics are far away from 2 in the two models, the null hypothesis could be rejected and there is auto-correlation.

If there is first-order autocorrelation, we have the following equation,

$$e_{it} = \rho e_{it-1} + v_{it} \quad (3)$$

$$H_0 : \rho = 0$$

While Equation 2 tests autocorrelation in random effects model, Equation 3 tests autocorrelation in random effects model and fixed effects model. In fixed effects model error term  $e_{it}$  is not a random variable but assumed to be a parameter (Gujarati, 2003).

### ***Sargan test of over-identifying restrictions***

Sargan test for over-identifying restrictions concludes that over-identifying of dynamic panel model is proper. The null hypothesis is not rejected.

The Table 7 gives us six models of panel regression: Model1-1, 1-2, and 1-3 are three models of generalized least squares; Model 2 is a fixed effects model; Model 3 is a fixed effects model with auto correlation; and Model 4 is a random effects model with auto-correlation. In all models, trade volume affects more container throughput of each port than berth length as the results of partial correlation. In East Asia, trade volume is the decisive variable for container throughput of port. Among the models of generalized least squares, Model 1-2 with heteroskedasticity and contemporaneous correlation has better

t-value and Wald  $\chi^2$ . Model 2 of fixed effects model shows us the similar result with the result of Model 1-1, generalized least squares model with heteroskedasticity. Model 4, random effects model with autocorrelation, has slightly better R2 and F value than Model 3.

**Table 7.** Panel regression results of container throughputs of the five ports

| Variable/Model | 1-1<br>Panel GLS<br>with<br>heterosked-astic | 1-2<br>Panel GLS<br>with heteroskedastic &<br>cross sectional corr. | 1-3<br>Panel GLS<br>with<br>homoskedastic | 2<br>Fixed<br>e.m. | 3<br>AR(1),<br>fixed | 4<br>AR(1),<br>random |
|----------------|--|---|---|--------------------|----------------------|-----------------------|
| Constant       | -807   | -252  | -165                                      | -1907              | 12803                | 2089                  |
| Berth          | 1.27***<br>(9.23)                            | 0.65***<br>(19.35)  | 0.72***<br>(4.2)                          | 1.25***<br>(7.7)   | 0.17***<br>(2.2)     | 0.26***<br>(3.3)      |
| Tr             | 3.38***<br>(6.05)                            | 5.12***<br>(58.6)   | 5.03***<br>(6.6)                          | 4.14***<br>(7.4)   | 3.75***<br>(10.5)    | 4.21***<br>(11.6)     |
| Sample Size    | 145  | 145   | 145                                       | 145                | 140                  | 145                   |
| R2             | -  | -   | -   | 0.49               | 0.48                 | 0.49                  |
| F              | -  | -   | -   | 237.1              | 63.8                 | -                     |
| Wald $\chi^2$  | 258.68                                       | 7825  | 146.67                                    | -                  | -                    | 182                   |

**Note :** \*significant at 10 percent level; \*\* significant at 5 percent level; \*\*\* significant at 1 percent level.  
Source : Informa UK, Containerisation International Yearbook, each year.  
IMF, International Financial Statistics Yearbook, each year.  
Author's elaboration based on the two data.

## 4. Conclusion

The port industry in North-east Asia, as the cases of economic, cultural, industrial, diplomatic and other activities among countries shows us dynamic interaction between hub ports through changeable shipping networks. Japanese hub ports such as Kobe, Yokohama, and Osaka could enjoy the preoccupation effect in the liner trades by container ships and handled transshipment containers of neighbouring countries and ports from the early 1970s. Since the late 1980s, Busan port could improve its competitiveness of handling costs and connectivity for Japanese medium and small sized ports, and expanded its feeder networks to Chinese Northern regional ports, for example Yantai in Shandong Province and Dandong in Liaoning Province. Furthermore, the shifts of manufacturer following the low production costs in foreign countries propelled dissemination of hub function of Japanese ports into Chinese and Korean ports. Furthermore Chinese hub ports have enhanced their hub status by inducing global shipping companies and developing port facilities since 1990s.

Nevertheless, the definition and clarification of interaction and interrelation among ports are quite difficult and complex due to basic function of a port connecting to global networks through shipping services. In addition, the volatile tendency of shipping activity connecting ports makes it hard to define the interrelation between ports.

Through pair correlation, partial correlation, and panel data and panel regression, this study finds some implications in clarifying interaction and interrelation among the hub ports in North-east Asia. First, the relationship among ports changes continually. The hub status of a port keep changing and a hub port can face challenges from a feeder port and other hub ports. Therefore, this dynamic interaction among ports will exist in 21st century. Second, the panel data and panel regression show us that the container throughput of five hub ports are connected with each other and also have its own specific characteristics. The synchronization and globalisation of each economy and the countries in North-east Asia are considered to cause the similar correlation coefficients of World exports, trade amounts of Korea, China and Japan with container throughput. At the level of each port, all ports except Kobe record positive high correlation coefficients of container throughput with other variables. Kobe also shows lower correlation coefficients than other ports from 1982 to 2010. Furthermore, in 1990s, Kobe presents negative correlation coefficients of container throughput with trades of World, Korea, China and Japan. Third, there could be lock-in-effect in port activity, which causes auto-correlation of panel data. Finally, the fluctuation of container throughput of hub ports is affected mainly by trade amount and less by berth length. In all models, trade volume affects more container throughput of each port than berth length as the results of partial correlation. In East Asia, trade volume is the decisive variable for container throughput of port.

Although this study finds some implication on port activity and interaction among the five ports, some questions still remain. How much do the regulation and deregulation on port industry from the central governments and change shipping networks? How could we define the competition and corporation among ports? These questions would present us meaningful prospect to forecast the status of ports in future.

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# An Analysis of New Criteria for Permanent Observer Status on the Arctic Council and the Road of Non-Arctic States to Arctic

Peiqing Guo\*

## ABSTRACT

According to new criteria for admitting permanent observers to the Arctic Council, aspiring states must recognize the sovereignty and sovereign jurisdiction of Arctic states. Due to inherent mistakes neglecting history, logical and international law, the new criteria are problematic. Under this new situation, non-Arctic states need to weigh advantages and disadvantages before submitting an application. This study argues that observer status will bring more obligations but fewer rights, and will have negative consequences. The permanent observer status is not the best option for non-Arctic states to participate in Arctic governance. There are many roads to Arctic such as UNLOS, FAO, IMO and the Spitsbergen Treaty that offer many opportunities and strong platforms for non-Arctic states participating in Arctic issues. As a result of these new criteria, the Arctic Council is faced with challenges from non-Arctic states. Only when both Arctic and non-Arctic states find the balance based on mutual respect and mutual understanding, will there be a prospect of a settlement of Arctic governance.

**Key words** : Arctic; Arctic Council; Permanent Observer; China.

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\* School of Law and Political Science, Ocean University of China, 238 Songling Road, Qingdao, 266100, PR China. E-mail address: gpq1226@yahoo.com.cn

## 1. Introduction

On 16 September 2012, Arctic sea ice reached the lowest extent ever recorded,<sup>1</sup> which will bring profound changes in geopolitics and international economics. Many non-Arctic countries including China and Brazil are increasing their attention to Arctic governance.

People consider that permanent observer status in the Arctic Council (AC) is the most effective way for non-Arctic states to take part in Arctic governance. Some non-Arctic states look to permanent observer status as a symbol of an important and valuable position in international Arctic affairs, and as a way to affect Arctic issues through engaging in activities of the AC's six working groups. The European Union, China, Japan and South Korea submitted applications for permanent observer status in 2013.<sup>2</sup> However, the relationship between permanent observer (PO) status and Arctic governance is not as straightforward as it appears.

On 12 May 2011, the Senior Arctic Officials (SAO) Report issued in the Seventh Ministerial Meeting of the Arctic Council in Nuuk, Greenland, set up new Criteria for admitting permanent observers and outlined a role for their participation in the Arctic Council. Those countries that applied for this status must meet very demanding requirements, which includes recognition of "sovereignty, sovereign rights and jurisdiction" of the Arctic countries (hereinafter "new criteria"). The criteria are outlined as follows:

"In the determination by the Council of the general suitability of an applicant for observer status the Council will, inter alia, take into account the extent to which observers:<sup>3</sup>

- Accept and support the objectives of the Arctic Council defined in the Ottawa declaration.
- Recognize Arctic States' sovereignty, sovereign rights and jurisdiction in the

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1 Sea ice extent for September 17 was 3.41 million square kilometers (1.32 million square miles), "Arctic sea ice extent near the minimum," <http://nsidc.org/arcticseaicenews/2012/09/arctic-sea-ice-extent-near-minimum/17-September-2012>.

2 About South Korean Option, see "Korea seeks a bigger role in Arctic," <http://view.koreaherald.com/kh/view.php?ud=20120515001396&cpv=0>.

As far as Japanese policy toward Arctic Council, see "Written Statement by the Delegation of Japan at the Second Meeting of Deputy Ministers of the Arctic Council," 15 May 2012, Stockholm, Sweden.

Decision by EU, see "Joint Communication to the European Parliament and the Council: Developing a European Union Policy towards the Arctic Region: progress since 2008 and next steps," p. 2.

[http://www.eeas.europa.eu/arctic\\_region/docs/join\\_2012\\_19.pdf](http://www.eeas.europa.eu/arctic_region/docs/join_2012_19.pdf).

For Chinese application, see Linda Jakobson, "Northeast Asia Turns Its Attention to the Arctic." Analysis Brief, the National Bureau of Asian Research, December 17, 2012.

3 Annex, "The criteria for admitting observers and role for their participation in the Arctic Council," Senior Arctic Officials (SAO) Report to Ministers, Nuuk, Greenland, May 2011, p. 50.

Arctic.

- Recognize that an extensive legal framework applies to the Arctic Ocean including, notably, the Law of the Sea, and that this framework provides a solid foundation for responsible management of this ocean.
- Respect the values, interests, culture and traditions of Arctic indigenous peoples and other Arctic inhabitants.
- Have demonstrated a political willingness as well as financial ability to contribute to the work of the Permanent Participants and other Arctic indigenous peoples.
- Have demonstrated their Arctic interests and expertise relevant to the work of the Arctic Council.
- Have demonstrated a concrete interest and ability to support the work of the Arctic Council, including through partnerships with member states and Permanent Participants bringing Arctic concerns to global decision making bodies.

Do new criteria make sense logically and legally? What influence do new criteria have on non-Arctic states' interest and rights in the long term if they are an observer of the Arctic Council? Is there another choice available besides permanent observer? It is necessary to weigh advantage and disadvantages before making their final decision of non-Arctic states. The purpose of this paper is to answer these questions.

## 2. Interpretation of the new criteria

New criteria can be ranked as a rigorous and harsh requirement that is unprecedented in the history of international organizations. The observer system came from the practices of the United Nations (UN), instead of actual provisions of the UN Charter. This system evolved since then, and has been used widely by more and more international organizations.<sup>4</sup> However, having investigated other international organizations, we can find no match with the Arctic Council in this respect. Except for the resolution on non-government organization (NGO) observer, set previously by the Economic and Social Council–ECOSOC, have other international organizations not prescribed the obligations and responsibilities of observers. Even if so, this resolution is very simple that includes: NGO observers must refer a progress report to ECOSOC every four years and encouraged NGO observers to expand their activity to more regions around the world. In the meantime, the ECOSOC resolution stipulated the withdraw mechanism that observer status will be

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<sup>4</sup> Henry G. Schermers, *International Institutional Law*, 3 rd ed., Alphen and den Rijn, Sijthoff & Noordhoff, 1980, p. 98.

suspended or withdrawn in some cases.<sup>5</sup>

Generally, most international organizations require observers to meet two basic requirements: 1) immediate connection with the given international organization and 2) the capability to participate in and cooperate with it.

We should clarify new criteria of Arctic Council before going further. Firstly, “Sovereignty, sovereign rights and jurisdiction” should be understood as single sovereignty, sovereign rights and jurisdiction claimed by a single nation, instead of the collective Arctic Eight states. It is generally accepted that sovereignty is exclusive, indivisible and irreplaceable; it not something that can be shared.

Secondly, the “three recognitions” principle also calls on POs to recognize sovereignty and jurisdiction that is not yet settled. The principle does not specify what aspects of disputed sovereignty or jurisdiction POs are recognizing’ or whether this implies recognition of settled boundaries in the future. This is problematic because the principle is also all-encompassing. By agreeing, Permanent Observers are implicitly recognizing the legitimacy of both parties’ claims to a contested area, which is illogical. These logic problems are illustrated below.

### 3. The logic problems of new criteria

#### 3.1 *Hans Islands dispute*

A country’s territory consists of territorial land, territorial water (inland water and sea), territorial space and territorial subsoil. Recognizing territorial land is the core of mutual respecting sovereignty among different countries. However, the dispute over Hans Island between Canadian Ellesmere Island and Greenland has not been settled. Whose sovereignty are non-Arctic states expected to recognize? Does it belong to Canada or Denmark? Undoubtedly, two countries are not able to give an exact answer. No doubt, neither position of non-Arctic states is correct if complying with new criteria.

#### 3.2 *Maritime delimitation disputes*

The delimitation disputes of the United States (US) and Canada in Beaufort Sea and US vs. Russia in the Bering Sea also undermine the new criteria. These disputed waters are closely related to territorial water, continental shelf and EEZ. In these cases, which side should Arctic states require non-Arctic states to take? Whose sovereign rights do

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<sup>5</sup> Article 57, *ECOSOC Resolution 1296, and Resolution 1996/ 31*, 49th plenary meeting, 25 July 1996, p. 58.

non-arctic states recognize? Recognizing one's sovereignty is tantamount to denying another's, which is at odds with the spirit of the new criteria.

Most Arctic states have declared an extension of their outer continental shelf. What attitude should non-Arctic states take before these applications are approved by Commission on the Limits of the Continental Shelf (CLCS)? Should non-Arctic states take no position on a vast piece of sea bed before CLCS recommendation? However, it is contradictory to new criteria, which requires that non-Arctic states must say "YES" or "NO". Ironically, even Arctic states can't recognize each other's sovereign rights. Five countries including the United States expressed its opposition of Russian prolongation in Arctic Ocean in 2001. United States asserted that Russian "submission has major flaws as it relates to the continental shelf claim in the Arctic."<sup>6</sup>

It is curious that Arctic states do not necessarily recognize each other's maritime claims, but some of them demand non-Arctic states to recognize their sovereignty rights and jurisdiction.

### 3.3 *The unresolved scope of Spitsbergen Treaty application*

If the purpose of the new criteria is to prevent non-Arctic states from interfering in the "internal affairs" of Arctic states, they may be insufficient. The Spitsbergen Treaty gives undeniable equal rights of economic and scientific activities to all parties. In 1920 when the Spitsbergen Treaty was signed, it stipulates treaty application to "both on land and in territorial waters" of Spitsbergen Islands (Article 3). But there has been disagreement over the legal status of EEZ and continental shelf around the Spitsbergen Islands. A few Arctic states such as Russia, Iceland and Denmark maintain that the Spitsbergen Treaty be applicable to EEZ and continental shelf, even as well as outer continental shelf. But Norway, supported by Finland and Canada, insists the treaty be restricted on the Spitsbergen Islands and territorial waters.<sup>7</sup> Which perspective should non-arctic state recognize? Can we say it still has nothing to do with non-arctic states? Many non-Arctic states including China are parties of the treaty, and are given equal rights to engage in commercial activities (article 2) on the islands and in the related waters. The legal status of the EEZ and continental shelf including outer continental shelf has an important bearing with the interest and right of non-Arctic states.

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6 United States of America: Notification Regarding the Submission Made by the Russian Federation to the *Commission on the Limits of the Continental Shelf*, Ref. No. CLCS.01.2001.LOS/USA (Mar. 18, 2002) (attaching the U.S. submission dated February 28). Also, [http://www.un.org/Depts/los/clcs\\_new/submissions\\_files/rus01/CLCS\\_01\\_2001\\_LOS\\_USA](http://www.un.org/Depts/los/clcs_new/submissions_files/rus01/CLCS_01_2001_LOS_USA)

7 Alex, G. Oude Elferink, *the Law of Maritime Boundary Delimitation: A Case Study of the Russian Federation*. Martinus Nijhoff, 1994, pp. 230-231.

### 3.4 *The United States and UNCLOS*

Another awkward aspect reflected in the SAO report is that United States is not a party to UNCLOS. Because US has not ratified UNLOS and declared its baseline in Arctic, it is one problem for non-arctic states to define the size or scope of US sovereign rights over the Continental shelf. A 1958 Convention on the Continental Shelf, to which the US is a party, did not specify the extent of the continental shelf.<sup>8</sup> According to the Truman proclamation of 1945 and customary law, the US has the sovereign rights of continental shelf within 200 nautical miles (nm) with no disputes, but the prolongation of outer continental shelf must be “recommended” by CLCS for legitimacy. However, CLCS has never accepted one application from a non contracting party, so it is thus unclear what size non-Arctic states are expected to recognize exactly in relation to a future US extended continental shelf as long as the latter remains a non-contractor of UNCLOS.<sup>9</sup>

Therefore, the new criteria are illogical and self-defeating. The above analysis focuses on logic problems. More than that, there are many problems in terms of law of the sea.

## 4. The disputed sovereign rights

### 4.1 *Disputed historic title applied in Arctic waters*

Both Canada and Russia have claimed historical title in Arctic waters, and take it as part of a legitimate basis to internalize the relevant waters. However, both the 1958 Geneva Convention on Law of the Sea and the 1982 UNCLOS only mentions “Historical Bay” or “Historical Waters”, but have not clarified the definition of “Historical rights”, as well “Historical Bay” and “Historical Waters”. The reasonable legal basis is customary law principle reflected in the 1951 British-Norway Fishery Case by the International Court of Justice (ICJ).<sup>10</sup> This case contains three basic principles: 1) exclusive national jurisdiction, 2) long term control, and 3) the acquiescence by interested stakeholders. It remains to be proved if Russia and Canada fill all three principles exactly and completely. The European Community (EC) clearly disproved these historical waters, and reserved their rights.<sup>11</sup> United

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8 Article 1, “...areas adjacent to the coast but outside the area of the territorial sea, to a depth of 200 metres or, beyond that limit, to where the depth of the superjacent waters admits of the exploitation of the natural resources of the said areas.” See 1958 *Convention on the Continental Shelf*.

9 Editorial, “Should Observer Participation in Arctic Ocean Governance be Enhanced ?” *Canadian Naval Review*, Vo.7, No. 4 (Winter 2012), pp. 2-3.

10 Fisheries Case (United Kingdom vs. Norway), *ICJ Reports*, 1951, Judgment of 18 December.

States also did not recognized historical waters claimed by former Soviet Union.<sup>12</sup>

For a long time, most non-Arctic states have taken no position on these questions, but new criteria are forcing them to take a stand.

#### 4.2 *Disputed over-length straight baselines*

Apart from historic waters, many over-length straight baselines in the Arctic are another concern. Russia and Canada drew straight baselines along their Arctic Islands, and some of over-length straight baselines have changed previous high sea and territorial waters into internal waters. The question is if these straight baselines are legitimate and the length is in line with international law, which is closely related to attributes of the Northeast Passage and Northwest Passage. In 1985 Russia and Canada drew straight baselines around their respective islands in the Arctic. The United States refused to acknowledge the legitimacy of the Canadian Archipelago as soon as Canada proclaimed it.<sup>13</sup> The straight baselines met the same opposition as Russia in 1985.<sup>14</sup>

The length of straight baseline makes more disputes. Both Canada and Russia are not archipelagic states. Articles 46 and 47 of “Archipelagic Baselines” of UNCLOS are not applicable to both countries.<sup>15</sup> However, neither the 1958 Geneva Convention on Law of the Sea nor 1982 UNCLOS gave a clear answer for the length of straight baselines except for that archipelagic states shall not exceed 100 nautical miles. The reasonable criteria in the Arctic are still the 1951 British-Norway Fishery Case. The International Court of Justice justified that the longest straight baseline drawn by Norway is not beyond 54 nm, but the longest one in Canadian Archipelago exceed 90 nm,<sup>16</sup> while in Russia the straight baselines are more than twice the length of territorial waters, especially Vilikitskogo Strait.<sup>17</sup>

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11 Office of Ocean Affairs, Bureau of Oceans and International Environmental and Scientific Affairs, USA, Limits in the Seas, *United States Responses to Excessive National Maritime Claims*, No. 112, 9 March 1992, pp. 29-30. 12 members of States of the European Community (EC) that opposed Canada declaration, are Belgium, Denmark, France, Germany, Greece, Ireland, Italy, Luxembourg, Portugal, Spain, Holand and United Kingdom.

12 J. Ashely Roach and Robert W. Smith, *United States Responses to Excessive Maritime Claims*, 2nd ed., The Hague, Martinus Nijhoff Publishers, 1996, pp. 202, 216.

13 Ronald Purver, “Aspects of Sovereignty and Security in the Arctic,” in Donald McRae and Gordon Munro, eds., *Canadian Oceans Policy: National Strategies and the New Law of the Sea*, Vancouver: University of British Columbia Press, 1989, p. 175. Also Donald R. Rothwell, “The Candian-U.S. Northwest Passage Dispute: A Reassessment,” *Cornell International Law Journal*, Vol. 26, No. 2, 1993, p. 360

14 Donald R. Rothwell, *the Polar Regions and the Development of International Law*, Cambridge University Press, 1996, p. 186.

15 Article 46 and 47, UNCLOS.

16 M.R. Freeman eds., *Report: Inuit Land Use and Occupancy Project*, Canada Government Cat. No. R2-46 1976.

17 R. Douglas Brubaker, “The Legal Status of the Russian Baselines in the Arctic”, *INSROP working paper*, Fridtjof Nansen Institute, 1996, pp. 207-211. 212-213. Also Erik Franckx, *Maritime Claims in the Arctic: Canadian and Russian Perspectives*, Dordrecht/Boston/London: Martinus Nijhoff Publishers, 1993, p. 181.

There are many uncertainties over historical waters and straight baselines. The validity of these waters will likely meet more challenges, and so will the outer continental shelf and EEZ because the latter two are established based on baselines. Non-Arctic states must recognize all these historical waters and straight baselines before they step into the Arctic club while some other Arctic states will be denied entry.

#### *4.3 Contentious prolongation of outer continental shelf*

The larger question is the sovereign rights in the Arctic covering outer continental shelf and EEZ. Under UNCLOS, the prolongation beyond 200 nm must be approved on its technical merits by the CLCS to receive legitimacy. The problem is that there is no consensus on the criterion of “oceanic ridge,” “submarine ridge” and “submarine elevation,” which are important criteria for coastal states to delimitate a continental shelf beyond 200 nm. The interested countries always interpret them based on their respective national interest. Supposing an Arctic states’ claim is rejected, what position shall non-arctic states take? The outer continental shelf of delimitation may bring contentious debates.

#### *4.4 Unclear residual rights of EEZ*

An equally troublesome question is the clarification of sovereign rights within the EEZ. A large number of “residual rights” have not been defined clearly, such as remaining fishery rights and the legality of military uses of the EEZ. UNCLOS does not give a clear answer to the residual rights to which country they should belong to, but it is universally recognized that the coastal state shall not take full residual rights in the EEZ. The sovereign rights of the coastal state in its EEZ are listed in article 56 of UNCLOS. In principle, interested parties are not allowed to exercise the rights prohibited by international law apart from rights not prohibited because the EEZ’s legal status is different from both territorial water and high seas. The article 59 of UNCLOS stipulated that disputes “should be resolved on the basis of equity and in light of all the relevant circumstances, taking into account the respective importance of the interests involved to the parties as well as the international community as a whole.” As a result of the uncertainty of sovereign rights within EEZ in the Arctic, there is much implementation flexibility and many significant differences concerning jurisdiction among the countries. The residual rights within the EEZ are strongly related to non-Arctic states’ interest in Arctic. It is impossible that Arctic states oblige non-Arctic states to give up all potential residual rights gained earlier through the new criteria.

It is generally known that sovereignty is exclusive, not divisible and unshared, but sovereign right is different, and can be divisible. With globalization and international

cooperation, every sovereign state has to share part of its sovereign rights with other stakeholders to maximize its national interest, which is a general trend. However, the Arctic Council surprisingly requires non-Arctic states to recognize early Arctic states' sovereign rights before the delimitation of ownership is cleared.

## 5. Jurisdiction problems

It is of no doubt that jurisdiction will be problematic if sovereignty and sovereign rights are not clarified, particularly because jurisdiction comes from the former two. It should be noted that the interpretation and implementation of sovereignty shows differences between countries because they are subject to domestic laws.

The most likely disputes are management of Arctic shipping. UNCLOS empowers that "...coastal States adopt and enforce non-discriminatory laws and regulations for ..." in article 234, which consists of so many ambiguous terms. In sum, they include "non-discriminatory" (what criteria to measure?), "severe climatic conditions" (are evaluative criteria subjective?), "exceptional hazards to navigation" (what kind of hazard can be categorized as "exceptional"?), and "irreversible disturbance of the ecological balance" and "the best available scientific evidence" as well. In addition, as far as "most of the year," how long should it be, eight months or ten months? With the rapid melting rapidly of sea ice, this term will bring more disputes in the future.

All these interpretation depend on subjective judgement. These numerous interpretational uncertainties and underlying rationales to "Article 234 is to allow the coastal state to take relatively broad unilateral action..."<sup>18</sup> It is unrealistic to oblige non-Arctic states to meet new criteria before these uncertainties are clarified. The international community has every reason to be suspicious of a creeping jurisdiction in Arctic Ocean that uses step stones to affect the freedom of navigation.

All these questions in the new criteria remain to be clarified. The Arctic council needs to do more to clarify the right of interpretation, and especially if the new criteria can be interpreted as Arctic states' unilateral interpretation and implementation or not. Otherwise, the Arctic Council will be challenged with its legitimacy, authority and effectiveness.

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18 Kristin Bartenstein, "The 'Arctic Exception' in the Law of the Sea Convention: A Contribution to Safer Navigation in the Northwest Passage?" *Ocean Development & International Law*, Vol.42, Issue 1-2, 2011, p. 46.

## 6. Weighing advantages and disadvantages

What are the benefits to non-Arctic states from permanent observer status? What will they suffer from new criteria? These should be carefully calculated.

### 6.1 *Advantages*

The primary privilege for permanent observers is sitting in at the back of the conference, and receiving some documents, as well learning some information “in advance.” Observers, under authorization of the chair, may make statements, present written statements, submit relevant documents and provide views, and take part in the activities of working groups of the Arctic Council. Perhaps they may get the opportunity to exchange ideas with representatives from Arctic states in the Ministerial meeting.<sup>19</sup>

Non-Arctic states regard the observer status as “a more secure position” for “watching how the meetings go,” and “discussing cooperation with stakeholders,” as well “information gathering.”<sup>20</sup> Since six existing observers have not shown any protest to new criteria, why do the latter make much of it? New criteria seem not necessarily to mean that non-Arctic states must acknowledge every claim by Arctic states unilaterally or jointly. A combination of crowd psychology and worry over loose opportunities will inspire questions for non-Arctic states after application.

### 6.2 *Disadvantages*

Concerning information published by the Arctic Council, non-Arctic states can obtain them publicly from the website of the Arctic Council. One concern is whether it is possible for the efficiency of communication with Arctic states that some non-Arctic state dream it to be? It should be noted that The 2011 SAO report stipulates that any presentation by observers must be at the discretion of the Chair, and after Arctic states and Permanent Participants give approval.<sup>21</sup> Actually, “representatives of the observer states are seldom allowed to speak in meetings of the Arctic Council managed by the Chair of the Senior Arctic Officials, much less in the biennial ministerial meetings of the council. Nor do they have access to discussions among the Senior Arctic Officials themselves or in meetings of the deputy ministers, a recent innovation in the practice of the council.”<sup>22</sup>

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19 Senior Arctic Officials (SAO) Report to Ministers, Nuuk, Greenland, May 201, p. 51.

20 Shin Hyon-hee, “South Korea seeks bigger role in Arctic.”

<http://www.asianewsnet.net/home/news.php?id=30743>. And “Japan needs to gain voice in Arctic ocean development.” <http://www.yomiuri.co.jp/dy/editorial/T120827002806.htm>

21 SAO Report to Ministers, Nuuk, Greenland, May 201, p. 51.

Does attendance at the scientific activity of working groups make sense? Actually, “...activities of the working groups do not provide an effective venue for real dialogue regarding issues on the new Arctic policy agenda.”<sup>23</sup>

Facts prove that the six current permanent observers are not satisfied with their observer status. Germany is “unhappy with what it perceives as a new approach and rules emerging from the Nuuk Ministerial Meeting last spring (2011 Spring-present author), putting various new limitations on Observers.”<sup>24</sup> Many realities experienced by existing six observers have proved it is wishful thinking to profit from observer status.<sup>25</sup>

### *6.3 Balancing the pros and cons of the situation*

Non-Arctic states are not very likely to obtain what they wish as an Arctic permanent observer being that they participate in Arctic governance with contribution and dignity, while taking due responsibility for decisions. To make matters worse, they will likely lose the initiative and flexibility of diplomacy in the future because they have recognized arctic states’ “sovereignty, sovereign rights and jurisdiction” in advance as a package deal. In the coming international negotiations, non-Arctic states will be put at a serious disadvantage because they have given up and remised entire current and potential residual rights in the Arctic Ocean by virtue of the new criteria. Rather, as illustrated above, adopting these criteria has forced non-Arctic states to surrender important user state entitlements to the Arctic Ocean. Some of these rights are being renewed life with the development of science, technology and social progress.

Interestingly, the rights and interests that non-Arctic states seek through permanent observer status can be obtained on existing international instruments at a lower political cost. In a word, the permanent observer status will bring non-Arctic states more obligations than rights and benefits. In conclusion, new criteria make permanent observer status in the Arctic Council a suboptimal choice for non-Arctic states.

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22 Oran Young, “Listening to the Voices of Non-Arctic States in Arctic Ocean Governance”, by Oran Young, Research Professor, Bren School of Environmental Science and Management, University of California (Santa Barbara), 2012 North Pacific Arctic Conference, August 9, 2012, p.17.

23 Oran Young, “Listening to the Voices of Non-Arctic States in Arctic Ocean Governance”, p. 18.

24 Back Ground Brief, “Interests and Roles of Non-Arctic states in the Arctic,” Seminar presented by the National Capital Branch of the Canadian International Council and the Munk-Gordon Arctic Security Program. October 2011, p. 8

25 Conference Concept Note, “2011 EWC/KOTI International Conference on Opening the Northern Sea Route and Dynamic Changes in North Pacific Logistics and Resource Security,” Honolulu, Hawaii, August 8-10, 2011, p. 4.

#### *6.4 Evaluation of the negative impact of China staying out of Arctic Council*

Some argue that China should take the long view that staying out of Arctic negatively will affect Chinese future interests. The ministerial meeting of the Arctic Council in Nuuk Greenland enacted the first legally binding document in the 15 year history of the Arctic Council, a Search and Rescue Agreement. In addition, it is agreed that the Arctic Council has had a permanent secretariat located in Tromsø. As a result, the Arctic Council is believed to be changed into a legally valid international body instead of a loosely organized forum as was previously the case. It seems that the Arctic Council is evolving to be the central authority in Arctic governance.

There is a need to clarify the role and function of the Arctic Council. In the beginning, the Arctic Council was to be a high-level forum, focusing on the protection of the Arctic environment and sustainable development, which “should not deal with matters related to military security.”<sup>26</sup> These principles remain unchanged until today even though some suggested that defense collaboration should be integrated into agenda of the Arctic Council.<sup>27</sup> If issues touch resource distribution and military security, Arctic Council could slide into anarchy unless it has authority over these matters.

However, the role and function of the Arctic Council is very limited. Its role and function can be replaced by many existing international instruments and organizations. For instance, Arctic fisheries are managed by FAO or regional fishery management organization, and navigation is controlled by the IMO, and outer continental shelf extension will be recommended by the CLCS. The Arctic Council is limited to environmental protection and search and rescue. Its most prominent function is the work of its six working groups, but the involvement in the working groups doesn't need permanent observer status. For non-Arctic states, staying outside the Arctic Council may create diplomatic leverage that can be used in tradeoffs with Arctic States in the future.

It is noticeable from China's unique international status that China is different from EU, South Korea and Japan in the minds of Arctic states. In the most of international organizations involving China, some nations usually work hard to control China's influence on rulemaking and implementation. On one hand, they demand China take more responsibilities; on the other hand, they prevent China's status from rising to the level that probably challenges their dominance. The new criteria place a high cost on China's entry into the Arctic club. China gains few practical benefits and gains little prestige by joining the Arctic Council.

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26 Declaration on the Establishment of the Arctic Council, 1996.

27 Rob Huebert, Heather Exner-Pirot, Adam Lajeunesse and Jay Gullede, “Climate Change & International Security: The Arctic as a Bellwether.” Prepared for Center for Climate and Energy Solution, May 2012.

## 7. Other roads for non-Arctic states' participation in Arctic affairs

One legally binding treaty following the example of the Antarctic Treaty that includes major non-Arctic stakeholders, is good for non-Arctic states' participation in Arctic governance. But both poles are different in geopolitics, and the Ilulissat Declaration brought an end to the discussion over the suitability of an Arctic Treaty.<sup>28</sup> How can non-Arctic states find their roads to the Arctic?

The Arctic is not a without governance. Up to now, there have been lots of international instruments and organizations covering the Arctic which ensure Arctic governance following recognized rules that will create more opportunities for Non-Arctic states in the Arctic other than the Arctic Council. Actually, new criteria are building an environment of forcing non-Arctic states to look elsewhere to pursue their Arctic interests.

### 7.1 UNCLOS

The Arctic is not something completely unique compared to other waters,<sup>29</sup> and UNCLOS has been widely applied in the Arctic Ocean, some clauses of which are designed purposely for Arctic Ocean. In the meanwhile, many bilateral or multilateral agreements are affected strongly by UNCLOS. For instance, The Arctic Environmental Protection Strategy (AEPS) was established with reference to UNCLOS.<sup>30</sup> The core position of UNCLOS as the legal framework in Arctic governance has been acknowledged by five major Arctic states. The Ilulissat Declaration points out, "the law of the sea provides for important rights and obligations concerning the delineation of the outer limits of the continental shelf, the protection of the marine environment, including ice-covered areas, freedom of navigation, marine scientific research, and other uses of the sea."<sup>31</sup> There is not much the Arctic Council can do to address these issues. On March, Sergei Lavrov, Foreign Minister of the Russian Federation, reasserted that "everything (in Arctic) must be and should be on the basis of the international convention of the law of the sea and it's a common position of the members of the Arctic Council, including Russia and the US."<sup>32</sup>

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28 *The Ilulissat Declaration*, Arctic Ocean Conference, Ilulissat, Greenland, 27–29 May 2008.

29 Norway's New Foreign Minister, "Exploitation of Arctic Resources Will Happen," <http://www.spiegel.de/international/world/interview-norway-s-foreign-minister-espen-barth-eide-on-arctic-drilling-a-863558.html>

30 "7. PROTECTION OF THE ARCTIC MARINE ENVIRONMENT," *The Arctic Environmental Protection Strategy (AEPS): DECLARATION ON THE PROTECTION OF ARCTIC ENVIRONMENT*, p. 33, ROVANIEMI, FINLAND, JUNE14, 1991.

31 *The Ilulissat Declaration*, Arctic Ocean Conference, Ilulissat, Greenland, 27–29 May 2008

32 "Exclusive Interview of Sergei Lavrov to the Voice of Russia." Jul 13, 2011  
<http://english.ruvr.ru/2011/07/13/53141058.html>

Most of non-Arctic states are parties of UNCLOS that grants their legitimate rights and freedom in the Arctic Ocean, especially in the central Arctic of high sea. Their rights and freedom is unaffected by prolongation of the continental shelf.

## 7.2 Resolutions set up by IMO

Most non-Arctic states are members of the IMO that manages navigation safety, prevention of maritime pollution and seaman training. Lots of regulations issued by IMO can apply to Arctic shipping. Due to the special environment in the Arctic, the IMO has been committed to unify different navigation standards of Classification Societies. IMO issued “The IMO Guidelines for Ships Operating in Arctic Ice-covered Waters” in 2002. However, it is not mandatory, but voluntary. The international community urged the IMO to make a mandatory law to regulate ice navigation in Arctic.<sup>33</sup> The IMO has started the development of a mandatory code. It is said the new code will be completed after 2015 due to a variety of reasons.<sup>34</sup> The IMO provides a forum for non-Arctic states to take part in Arctic affairs. Predictably, the future mandatory guidelines will necessarily reflect ideas of not only of Arctic, but non-Arctic states as well.

## 7.3 Agreements and Conventions set up by Food and Agriculture Organization of the United Nations (FAO)

Global warming is changing the Arctic Ocean into a world-class fishery ground,<sup>35</sup> and Arctic fisheries have attracted much attention around the world. However, the central Arctic Ocean is high sea beyond any national jurisdiction.<sup>36</sup> These international waters at present are not governed by any specific international fisheries agreements or regulations. The management of Arctic fishery is being mentioned in many international occasions. Now is the time for the international community to create a precautionary management system for central Arctic Ocean fisheries because this region is no more remote from major fishing ports and fishing fleets than many areas of the world to which pelagic fleets travel since ice has melted significantly in the past three decades.<sup>37</sup> Which organization should

33 Øystein Jensen, “The IMO Guidelines for Ships Operating in Arctic Ice-covered Waters: From Voluntary to Mandatory Tool for Navigation Safety and Environmental Protection?” FNI Report 2/2007.

34 Rolf Stange, “IMO: polar code not before 2015,” <http://www.spitsbergen-svalbard.com/2012/03/01/imo-polar-code-not-before-2015.html>

35 “Ocean warming affecting fish populations,”

[http://www.upi.com/Science\\_News/2009/11/03/Ocean-warming-affecting-fish-populations/UPI-17961257275663/#ixzz1nm0TvsQH](http://www.upi.com/Science_News/2009/11/03/Ocean-warming-affecting-fish-populations/UPI-17961257275663/#ixzz1nm0TvsQH)

36 *Communication from the Commission to the European Parliament and the Council: The European Union and the Arctic Region*, Brussels, November 20, 2008, COM (2008) 763 final, p.9.

37 “An Open Letter from International Scientists,” <http://oceansnorth.org/support-international-arctic-fish->

take legal and rightful management responsibility? One of options is to extend the fishery management organizations of North Atlantic Ocean or North Pacific Ocean to Central Arctic Ocean. Some Atlantic Regional Fishery Management Organizations (RFMOs) covering high sea, such as North East Atlantic Fisheries Commission (NEAFC) and North East Atlantic Fisheries Commission (NEAFC), can regulate fisheries in the Regulatory Area (RA) beyond national jurisdiction, but must operate with the consent of interested states.<sup>38</sup> The dominant management international organization usually is the Food and Agriculture Organization of the United Nations. Article 88 of UNCLOS stipulates that states shall cooperate to establish sub regional or regional fisheries organizations, but any RFMOs not including non-Arctic states are not legally binding forces on non-Arctic states. In particular, China has made statements while signing an “Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks (the Fish Stocks Agreement)” in 1995, that any inspection and enforcement relating to Article 21(7) and Article 22 (1) f must be authorized by flagship state.<sup>39</sup>

#### 7.4 *Spitsbergen Treaty*

The Spitsbergen Treaty gives non-Arctic states a strong foothold in Arctic, which justifies their economic and scientific activities in Spitsbergen Islands and adjacent waters. Compared with the Spitsbergen Treaty, a hard law, any recommendations or agreements issued by the Arctic Council is only categorized as soft law.

#### 7.5 *More effective bilateral diplomacy*

Apart from existing international instruments, Korea, Japan and China are trying to create opportunities to set and strengthen bilateral relationship with Arctic states. China has made some progress of cooperation with Nordic countries including Sweden, Iceland, Denmark and Norway. Korea is “striving to bolster cooperation with state agencies, think tanks and businesses”<sup>40</sup> in the Arctic countries including Russia, Norway, Finland and

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eries-agreement

38 “What is NEAFC?” <http://www.neafc.org/fishing-licence-guide/121>

Article XIX, *Convention on Future Multilateral Cooperation in the Northwest Atlantic Fisheries*, Northwest Atlantic Fisheries Organization, July 2004.

39 Statement of the Government of PRC on Relevant Provisions of the Fish Stocks Agreement (in Chinese), August 4, 1995.

“中华人民共和国政府关于《执行1982年12月10日（联合国海洋法公约）有关养护和管理跨界鱼类种群和高度洄游鱼类种群的规定的协定》的有关规定的声明,” [http://www.110.com/fagui/law\\_13285.html](http://www.110.com/fagui/law_13285.html).

English version of this statement, *Law of the Sea Bulletin* 33, 1997, p. 30.

40 “Seeking a bigger role,” <http://thestar.com.my/news/story.asp?file=/2012/5/20/asia/11312163> May 20, 2012.

Denmark in 2012, and will concentrate on the cooperation with Canada and United states in Beaufort Sea in 2013. Korea has made substantive progress that Korean Gas Corp (KOGAS) finalized her first energy deal in North America on December 2010.<sup>41</sup> What is more, Korea and Greenland signed four memorandums of understanding calling for cooperation in resources development, geological survey and Arctic science and technology on September 2012.<sup>42</sup> Japan is also intensifying the ties with Norway, focusing on energy field and science, and both sides have institutionalized a Japan-Norway Polar Seminar. Due to earthquake and tsunami disaster on March 2012, Japan has to increase its importation of energy.<sup>43</sup> Needless to say, Arctic energy provides more alternatives. These bilateral diplomacies have proven practical, and more effective than one permanent observer that is at a huge cost.

## 8. Outlook of Arctic governance

What is clear is that the Arctic region can't go its own way, carving out a developmental path independent of global forces. Many of the existing impacts in the Arctic originate from outside the region, so the Arctic is the major responder to global climate change. Because of this, climate warming is a global problem requiring international consensus to reduce CO2 emissions from industrialized and major developing countries. In a similar vein, shipping is an international sector that requires consensus on the development and implementation of instruments to reduce environmental impacts, guarantee safety of navigation and develop economically efficient activities.<sup>44</sup>

In the meanwhile, Arctic change is the driving force of the global climate change by affecting exterior weather. For instance, the Arctic Oscillation affects seriously climate in Middle-latitude ranging to China, Korea and Japan through Western Europe countries. It is necessary to find the mechanism of atmospheric circulation and ocean current relationship between Arctic and mid-latitude. Secretary of State Hillary Rodham Clinton said to her counterparts in Nuuk, "This region matters deeply – not just to our citizens, but also to people across the region and the world."<sup>45</sup> The impacts of climate change and

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41 Mia Bennett, "South Korea's growing role in Arctic economic development."

<http://foreignpolicyblogs.com/2011/04/20/south-koreas-growing-role-in-arctic-economic-development/>  
April 20th, 2011

42 Chang Jae-soon, "(2nd LD) S. Korea, Greenland agree to cooperate in green growth, resources development," <http://english.yonhapnews.co.kr/national/2012/09/10/8/0301000000AEN20120910001600315F.HTML>  
September 10, 2012.

43 Japan's 2012 LNG imports at record high on nuclear woes, <http://www.reuters.com/article/2013/01/24/e-nergy-japan-mof-idUSL4N0AT00Y20130124> Jan 23, 2013

44 Clive Schofield and Tavis Potts, "Across the Top of the World? Emerging Arctic Navigational Opportunities and Arctic Governance," CCLR 4, 2009, p. 479.

globalization have intensified interactions between the Arctic and the rest of our planet. As a result, external actors are moving from the periphery to the centre of Arctic affairs. Only through cooperation between inside and outside Arctic, can Arctic issues be expected to be resolved.

Even though it is difficult to set up one comprehensive treaty like the Antarctic Treaty, it does not mean that it is impossible to establish an agreement concerning with one certain issue area, such as Arctic fisheries. A plausible scenario appears to be one where Arctic and non Arctic states negotiate to address gaps in the Arctic regime on an issue-by-issue basis, sector-by-sector. Many agreements including fishery management and shipping regulation have to include stakeholders outside Arctic region.

Due to misconceptions, Arctic States keep vigilant of non-Arctic presence, especially China.<sup>46</sup> For example, the deal of Chinese billionaire Huang Nubo bidding on one piece of land in northern Iceland was cancelled time after time by the government in Reykjavik over “suspicions that the land would eventually be converted into an Arctic port to further Chinese shipping interests.”<sup>47</sup> Even the size of Chinese embassy in Iceland becomes the target hyped up by some media. They hold that cooperation should be limited within the Arctic group, with differences for outsiders.<sup>48</sup> As a result, “the Arctic Council is in danger of being perceived as an exclusive club, taking major decisions about the Arctic with little regard for the concerns and interests of non-Arctic states.”<sup>49</sup> What will happen if Arctic states stick stiffly to exclusivity with regard to non-Arctic states? If so, “...whereby non-Arctic states could simply disregard the arrangements, rules and codes of conduct that the Arctic Council creates for the Arctic and instead work outside existing frameworks.”<sup>50</sup> Moreover, the challenges now facing the Arctic Council may mean that the Arctic Council will gradually be supplanted by sector governance regimes evolving in a piecemeal manner, at last marginalized in Arctic governance.

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45 “The Arctic Council’s Historic Nuuk Ministerial,” *The Circle*, 2011, No.2, p.22.

46 Linda Jakobson, “Northeast Asia Turns Its Attention to the Arctic.” *Analysis Brief*, the National Bureau of Asian Research, December 17, 2012.

47 Zachary Fillingham, “Arctic ownership claims.” <http://www.geopoliticalmonitor.com/arctic-ownership-claims>. April 21, 2012. Simon Parry, “Fears over China’s Arctic ambitions as tycoon makes £100 million move on Iceland.” <http://www.dailymail.co.uk/news/article-2033509/Fears-China-s-Arctic-ambitions-tycoon-makes-100-million-Iceland.html>.

48 III. POLICY, article 4, “Strengthen institutions for cooperation among the eight Arctic nations (the United States, Canada, Denmark, Finland, Iceland, Norway, the Russian Federation, and Sweden);” National Security / Homeland Security Presidential Directive on Arctic Region Policy. January 9, 2009. Also, Interview record, “The Arctic states – cooperation or competition?” [http://russiancouncil.ru/en/inner/?id\\_4=1127#top](http://russiancouncil.ru/en/inner/?id_4=1127#top)

49 Kristofer Bergh, “Arctic cooperation must become more inclusive,” July/Aug 11, SIPRI, <http://www.sipri.org/media/newsletter/essay/julyaugust11>

50 Kristofer Bergh, “Arctic cooperation must become more inclusive,” July/Aug 11, SIPRI, <http://www.sipri.org/media/newsletter/essay/julyaugust11>

## 9. Conclusion

The Arctic Council had intended originally to solidify its status as one exclusive club by issuing new criteria. However, due to flaws in logic and international laws, the new criteria are weakening the role and function of the Arctic Council in Arctic governance. The new criteria are impracticable and need to be redefined.

Obviously, Arctic states have “stronger interests and a greater say in the future of the Arctic.”<sup>51</sup> It is said that some scholars from non-Arctic states have the misconception that Arctic should be treated as a common heritage of mankind.<sup>52</sup> Exactly speaking, only the central Arctic Ocean beyond national jurisdiction belongs to human kinds, and a large part of the Arctic Ocean in reality is under jurisdiction of coastal states. Non-Arctic countries need to understand the reasonable concerns of Arctic states and respect their sovereignty, sovereign rights and jurisdiction on basis of recognized international treaties and dialogues. But In the meantime, Arctic states need to face the realities, and take into account the legitimate interests of non-Arctic states, and adopt a practical and open policy. Nonetheless, only when both Arctic and non-Arctic states find the balance based on mutual respect and mutual understanding, will there be a prospect of a settlement of Arctic governance.

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51 Kristofer Bergh, “Arctic cooperation must become more inclusive,” July/Aug 11, SIPRI, <http://www.sipri.org/media/newsletter/essay/julyaugust11>

52 “China’s Arctic Play: An admiral stakes a territorial claim—and it looks like there’s more to come,” <http://thediplomat.com/2010/03/09/china%E2%80%99s-arctic-play/>. According to communication with Admiral Yin Zhuo, he claimed that he had never asserted “Arctic belongs to all the people around the world.” His original speech was “According to UNCLOS, North pole and vicinity does not belong to any country, but common heritage of mankind.” See also Chinese news report, “尹卓委员：中国不可缺席北冰洋开发.” [http://www.cas.cn/zt/hyzt/2010lianghui/2010lhrdht/201003/t20100306\\_2792772.html](http://www.cas.cn/zt/hyzt/2010lianghui/2010lhrdht/201003/t20100306_2792772.html). Therefore, it is evident that media misread his original meaning.

The German position, see Christian Schwägerl and Christoph Seidler, “Berlin Enters the Scramble for the Arctic,”

<http://www.spiegel.de/international/world/final-frontier-berlin-enters-the-scramble-for-the-arctic-a-751240.html>

# Clusters Initiatives in Port Hinterlands

Chan-Young Jun\*

Jong-kyoung Kim\*\*

## ABSTRACT

For the effective use of port hinterlands, the concept of supply chain logistics should be applied. Port hinterlands have a geographical advantage and an important infrastructure nearby. However, these merits of port hinterlands are not very significant from the point of view of supply chain logistics. In this respect, clustering can emerge as an alternative to develop port hinterlands. Small and medium enterprises (SMEs) that are related with specialized industries in relevant regions can be clustered into a port hinterland to improve the competitiveness of supply chain logistics. In addition to the synergy effect it creates, clustering is expected to meet the construction objectives of port hinterlands thanks to its export-oriented nature. Types of businesses that would create synergy effects through clustering should be selected among regionally specialized industries adjacent to a port hinterland. The characteristics of selected businesses among candidates should also accord with the successful factors of clustering, technology accumulation, the likelihood to secure skilled labor, innovation and R&D capacities. As an illustration, locating a packaging cluster near a port can lead to a better connection between manufacturing to logistics. The “total logistics service with packaging” is not a new concept, but this could be a more cost efficient business model in port hinterlands.

**Key words:** Clustering, Port hinterlands, Supply Chain Logistics, SMEs, Packaging clusters.

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\* Research Fellow, Port Research Division, Korea Maritime Institute. Maebongsanro Mapo-Gu Seoul, 121-915, Korea, E-mail : cyjun@kmi.re.kr

\*\* National Standard Coordinator for Smart Logistics, Korean Agency for Technology & Standards. 98-Gyoyukwon-ro, Gwacheon-si, Gyeonggi-do, Korea, E-mail : logiscodi@ksa.or.kr

## 1. Why clusters?

Recently, to attract port cargoes and create added values, the role of port hinterlands becomes increasingly important. The Korean government is aiming to enhance the competitiveness of the nation's logistics industry by developing port hinterlands as backup areas for ports. The government is also trying to maximize spillover effects by linking ports and hinterland industries to attract high value added industries. In 2006, the "National Master Plan for the Development of Port Hinterlands" was established and eight ports - Pusan, Kwangyang, Incheon, Pyeongtaek-Dangjin, Ulsan, Mokpo, Pohang, and Masan Ports - were designated to be developed. According to the phased plan, the development of the hinterlands of these ports started, and a number of enterprises have already settled into some areas. In 2011, 19 enterprises among 30 qualified entrants started their business in the Pusan New Port hinterland, and 12 among 20 selected startups were established in the Kwangyang Port hinterland.

But, the occupancy rates of the port hinterlands and the amount of value they have created still remain poor. In addition, most companies in the port hinterlands are doing "storage businesses" and lack the capability to create additional throughput. Moreover, it requires a long period for adjustment to make their business on track.

It is because that the occupant companies have little overseas networks to create added values and lack competitiveness due to the absence of advanced management skills. In general, their business activities are focused primarily on the existing throughputs rather than making new demands. A range of measures designed to overcome such problems have been proposed by many studies, which have alleged that improvements in the fields of legislation and system that are related with occupancy requirements, such as designation criteria, designation processes, the minimum amount of investment, import and export volumes and proportions, should be fulfilled. In addition, they have insisted that core port hinterlands should be designated as a free trade zone and that various incentives including tax credits, affordable rents should be given to the occupants. Given the possible conflicts with the existing laws, the lack of equities and the necessity for big financial aids, however, the practicality of such approaches seems doubtful. Even if these measures would be accepted, their real effects would be still dubious.

This study suggests other kinds of alternatives that are based on the concept of supply chain management (SCM). There are as many definitions as literatures about SCM. Hugos (2003)<sup>1</sup> gave a simple definition: "SCM is the coordination of production, inventory, location, and transportation among the participants in a supply chain to achieve the best mix of responsiveness and efficiency for the market being served". Logistics is also concerned with the physical and information flows and storage forms of raw material until

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<sup>1</sup> Hugos M (2003), *Essentials of supply chain management*. Wiley, Hoboken, NJ

the final distribution of the finished products<sup>2</sup>. A certain area, trying to induce financial investment or enterprises, should hold a dominant position in supply chain logistics. Port hinterlands have a geographical advantage and an important infrastructure nearby. However, these merits of port hinterlands are not very significant from the viewpoint of supply chain logistics. Although the favorable condition of port hinterlands itself is not sufficient to attract many new businesses, it is a necessary condition for that purpose, which can be accomplished only when port hinterlands hold a superior position as an industrial location by strengthening regional characteristics and improving the competitiveness of supply chains.

The original plan of the government, which was designed to attract multi-national logistics or major companies that would take large throughputs into port hinterlands, has been not successful. Despite the government's continuous endeavoring, it seems difficult to obtain any result because the location of such major companies depends on their own management strategies or reasons, and in some cases needs an exceptional decision of top management.

Then, what kinds of problems are in the government's efforts to vitalize port hinterlands? First of all, it is pointed out that the strategy of vitalization is too abstract. It merely focuses on the surface meaning of environmental conditions and systems with no concrete action plans. The government's strategy missed the right direction and lacked consistency from the beginning. Now the strategy has lost many of its original features. Also, there is no difference among ports in strategies to attract new businesses into their hinterlands. Each port needs different approaches on which industries are the best fit.

In this respect, clustering is emerging as an alternative to develop port hinterlands. Small and medium enterprises (SMEs) that are related with specialized industries in relevant regions can be clustered into a port hinterland to improve the competitiveness of supply chain logistics. Pertinent support and proper intervention of the government will make it easier to bring in desirable businesses. In addition to the synergy effect it creates, clustering is expected to meet the construction objectives of port hinterlands thanks to its export-oriented nature. It is also noticeable that if clustering works, attracting additional investment and inducing new businesses can be easily achieved as well as securing the competitiveness of relevant regional industries. These are the points asserted in this literature.

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2 Baker ARPCP(2006), *Handbook of logistics and distribution management*, 3rd ed. Kogan page, London

## 2. Previous Researches

There are so many previous researches about port hinterlands. They are mainly focused on the fields of legislation and system for the promotion of port hinterland use. The competitive status of port hinterlands are highlighted in attracting business but the broad concept of supply chain logistics was not used and concrete action planning was also not addressed enough. In this respect, this literature has superiority in that it suggests clustering initiatives as an alternative of action plan to boost the utility of port hinterlands based on the concept of supply chain logistics.

Gil(2003)<sup>3</sup> presented the improvable way about the port hinterland development and management through comparative analysis for the legal systems. There are some results from the study. The concept of the port hinterland should be included among port facilities to make it possible to develop the port law applicable to port hinterland. For the continuous management, it needs to add provisions of port hinterland to existing port laws. He also emphasized government should concern about the port hinterland development with the positive support besides leading private business.

Lee(2007)<sup>4</sup> provided policy directions for enhancing the competitiveness of port distriparks in Korea by analyzing the various patterns of logistics business models. His study identified Korean four leading industries in Northeast Asia with respect to technology and trade volume, which would facilitate international specialization of distriparks. He addressed several policies should be pursued to enhance the competitiveness of Korea's logistics industry through distriparks at ports. They were to maximize spillover effects by linking ports and hinterland industries to attract high value added industry, to enjoy the benefits of FTAs (Free Trade Agreements), and to develop business models related to international specialization.

Kim(2005)<sup>5</sup> analyzed the Korean port labor market to accomplish the following purposes : (1) comparing the labor market structures of Korea, China and Japan in port-backup areas, (2) suggest some ways how to standardize the Korean labor market , focusing on port-back up area, and (3) suggest some ways to improve the port labor system overall. He emphasized some key points: (1) amending the Employment Security Law and its enforcement ordinance in order to abolish the Union's exclusive right and open market, (2) expand the labor outsourcing system to ports and back-up areas, (3) try to develop a peaceful environment of labor relations between labor and management, and

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3 Gil, Kwangsoo(2003), *Comparative study of laws and institutions related to the construction of port hinterland*, Korea Maritime Institute.

4 Lee, Sungwoo(2007), *A study for the inducement of enterprises into the port hinterland for the era of international labor division*, Korea maritime Institute.

5 Kim, Hyungtae(2005), *Comparative study for the labor market of ports and back-up area in Korea, Japan, China*, Korea Maritime Institute,

simplifying the dismissal processes.

Kim (2008)<sup>6</sup> studied the necessity of hinterland in port of Kwangyang and related policy directions. He analyzed AHP for the construction of port hinterland and derived the amount of financial assistance from the government. He also calculated the regional economic impact by using the input-output analysis and suggested the desirable policy direction the basis of the studied results.

### 3. What is Clusters?

#### 3.1 Definition and features

There is no precise definition for clusters. A cluster is generally accepted to be a geographically proximate group of interconnected companies and associated institutions in a particular field linked by commonalities and complementarities. Clusters encompass an array of linked industries and other entities important to competition including governmental organizations and other institutions – such as universities, standard setting agencies, think tanks, vocational training providers and trade associations. UNIDO<sup>7</sup> also define clusters as sectoral and geographical concentrations of enterprises that produce and sell a range of related or complementary products and thus, face common challenges and opportunities (UNIDO 2001). Another definition points out that an industry cluster is “a group of business enterprises and non-business organizations for whom membership with the group is an important element of each member firm’s individual competitiveness. Binding the cluster together are buyer- supplier relationships, or common technologies, common buyers or distribution channels, or common labor pools”(Bergman and Feaser (1999)).<sup>8</sup>

Most of the above definitions focus on the geographic scope of clusters. Based on this concept, clusters can be divided in two categories of “deep” and “shallow” clusters. A cluster’s depth refers to the number of firms in a specific geographic area. Where there is a large concentration of firms in a particular area, the cluster is said to be “deep” and, conversely, where there is a low concentration of firms, the cluster is said to be “shallow”.

Nowadays we can see a lot of cluster’s features in many countries. Clusters are inter-related industries and institutions that mutually reinforce and enhance competitive

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6 Kim, Hakso(2008), *A study for the improvement of laws and institutions to boost the occupied firms in the port hinterland*, MOMAF.

7 United Nations Industrial Development Organization.

8 Bergman EM, Feaser EJ (1999), *Industrial and regional clusters: concepts and comparative applications*. West Virginia University.

advantage by acting as each other's consumers, competitors, partners, suppliers and sources of research and development, relying on collaboration and cooperation between public and private sectors, breaking down barriers and promoting the intangible assets of synergy, trust and social capital. Clusters give an industry a stronger collective voice on R&D funding, skill development, legislation and regulations.

It is also necessary to distinguish between clusters and networks. Networks are groups of firms that cooperate on a joint development project, complementing each other and specializing in order to overcome common problems, and achieve collective efficiency and penetrate markets beyond their individual reach. But as networking intensifies and more and more enterprises get involved, the territorial, or cluster, dimension starts to emerge with the involvement of business development service providers, associations of enterprises and government institutions. Therefore, a large number of different institutions are required to be involved to construct a cluster.

### *3.2 Backward and forward approach*

Cluster initiative has a strong component of export promotion as of their commercial objectives. The opportunities clusters offer firms to significantly increase the quantity and quality of export has been well established through experiences in many countries. Particularly, in smaller and developing countries, export promotion tends to be a primary focus of cluster initiatives. Establishing a successful presence in foreign markets is considerably more difficult for an SME<sup>9</sup> than for a large enterprise, particularly in developing countries. Minimum volume requirements, quality controls, complex export processes, and limited financial resources are the main barriers for a less experienced and smaller enterprise.

It can be inferred from the successful export clusters in the world that there are two approaches for developing export clusters, which can be referred to as backward and forward development of clusters, similar to the well known backward and forward integration strategy of firms. The basic definition of cluster dictates the geographic proximity of the cluster's entity : however, as global supply chains become more integrated, there are more and more examples where this integration led to additional investments and activities that ultimately strengthened the exporting cluster. For example<sup>10</sup>, in Caldas, Columbia, Nespresso has established relationships with local cooperatives to produce "specialty coffee" as a buyer. This initiative includes joint activities in area such as specialized technical education, tasting, quality control, infrastructure upgrading, logistics,

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<sup>9</sup> Small and Medium Sized Enterprise

<sup>10</sup> Reza Zanjirani Farahani and Nasrin Asgari and Hoda Davarzani, Supply Chain and Logistics in national Integration, International and Governmental Environment, Springer Dordrecht Heidelberg London New York, 2009, pp. 161-162.

and traceability. This has contributed to the Columbia's ability to compete successfully in the "specialty and gourmet" coffee segment, where increased and consistent quality strongly influence the market price of the product. This type of cluster development can be called backward development in which the international buyers cooperate with local (usually small) producer due to some regional advantages of producers. In other type of cluster development, forward approach, which is a common industrial cluster initiative: firms cooperate with each other to take advantage from collective actions. This type of cluster development is mostly what we seek to achieve in port hinterland. From this, we can consider the advantages of clustering as follows ;:

- Collective efficiency,
- Opportunities to access market information more expeditiously,
- Ability to obtain specialized inputs and technical support more easily and cost effectively
- Ability to participate in 'consortiums' to fulfill large orders,
- Ability to leverage market development and promotional expenses,
- Group shipments to minimize transportation costs

### 3.3 *Success factors*

There are different descriptions of success factors for export cluster. Department of trade and industry(DTI 2003)<sup>11</sup> of England in a report as "a practical guide to Cluster Development", expresses these factors as following three critical issues : network and partnerships, strong skill base, innovation and R&D capacity.

#### 3.3.1 Networks and Partnerships

Some networks generate formal and informal flows of knowledge and information through a cluster. These networks are the basement for success over time. Collective learning and more competitive performance could be carried by the access to tacit knowledge. Many cluster evolution activities are delivered by the networks way.

Prosperous clusters are prone to have powerful embedded networks and relationship systems. Trust and inter-personal relationships are favorably progressed, supplying the cluster with a high rate of social capital. The improvement of these relationships and connections needs time. Networks may be supported through strong organizational structures, or through shared cultural values and a common purpose.

Face to face links or remote technologies such as the web could be the tools to sharing knowledge through networks and partnerships. Technology has advanced considerably in this field and cluster practitioners are using interactive cluster portals to

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<sup>11</sup> Department of Trade and Industry(DTI)(2003), *A practical guide to cluster development*. London, England

aid networking, share information about the cluster as well as using them for actual business to business interactions. The key is that a flow of knowledge occurs in more complex networks in which active collaboration is encouraged.

### 3.3.2 The presence of a strong skill base

There is a consensus<sup>12</sup> across the literature that the successful clusters are those that have a great base of skills, in higher levels and in management skills, and also have an appropriate and qualified force in general. For drawing the companies toward a cluster and keep them with a cluster, and also to keep on with a prosperous development of companies in a cluster, labor force should be taken highly into consideration. So considering all of these factors and as a reasonable component we could say that the quantity and quality of labor force is a highly vital element in the development of successful clusters.

A range of adequate skills and abilities are required for successful clusters. The kinds of business skills that are pursued in successful clusters are those associated with global business such as strategic management skills for business leaders, entrepreneurship for graduates, management and production techniques, leadership skills, mentoring/coaching and personal development skills, etc.

The quality and availability of training can also be a factor contributing to the progress of successful clusters. This can apply to the existing workforce as well as to the new and potential entrants to the labor market. The capacity of the available training infrastructure to respond to employer needs and provide relevant training is a key factor. The cluster can have an influence on the provider side in terms of encouraging appropriate provision that is flexible and meets the needs of employers.

### 3.3.3 Innovation and R&D capacity

The evidence shows that product evolution and well developed research structures, with other forms of innovation, are essential for a dynamic cluster<sup>13</sup>. Innovation keeps the cluster at the head of the market whilst a strong R&D base would be able to give the ideas and products for future development. The advancement of innovation and R&D are two separate but inter-related activities. Innovation in general applies to product or process development, but what is meant by R&D is the development of new knowledge. In the best cases successful innovation is the outcome of the R&D process. Innovation can be incremental so that existing products and procedures are built upon little by little, or may be more radical by introducing a completely new product or approach. Successful

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12 Reza Zanjirani Farahani and Nasrin Asgari and Hoda Davarzani, Supply Chain and Logistics in national Integration, International and Governmental Environment, Springer Dordrecht Heidelberg London New York, 2009, pp. 159-160.

13 Department of Trade and Industry(DTI)(2003), *A practical guide to cluster development*. London, England

clusters are inherently innovative and practitioners can support the innovation process through encouraging networking and sharing of ideas. The development of networks outside the cluster could also be beneficial as often innovative ideas are the ones that work well in one setting and are being applied for the first time to another idea. The benefits of information and intelligence services in this area are often worth exploring.

Constitution based on research activities, as for universities, non-profit foundations and for-profit R&D could function greatly as catalysts for research and innovation. They are able to provide the foundation for developing new ideas and applications, besides that, they could also play an essential and critical role in nourishing high technology entrepreneurialism. Looking from this point of view it could be said that, public and private research tools and resources are the key drivers for clusters.

#### 4. Can clusters boost the port hinterland?

Port hinterland possibly accommodates a cheap and large factory area equipped with necessary infrastructure which is required in clustering since port hinterland is to be established according to its prearranged development plan by government. Clusters are regarded as kinds of organic wholes formed with dispersed SMEs in a special zone. The equipment of infrastructure makes it easy to build the networks and partnerships, one of successful factors of clusters. The fact that most of port hinterlands are located within easy access of densely populated area such as Pusan, Incheon, Pyoungtaek, Ulsan is another merit. If clustering in port hinterland is connected to the specialized industry of each region, the presence of strong skill base can be possible utilizing the skillful labor force and cumulated knowledge of each area. If then, can clusters boost the port hinterland with its superior geographical merits? It may be answered 'yes'. Although, clustering is not the only alternative to vitalize the port hinterland, it, cooperating complementarily with existing strategies, takes a role of breakthrough to overcome the pendent difficulties in Korea. The reasons are as follows:

First of all, the nature of clusters coincides well with the purpose of constructing port hinterlands, creating additional cargo demand of port. As discussed earlier, most of studied cluster had a strong component of export promotion as part of their commercial objectives. It has already been approved that the opportunities with which clusters offer firms increase the export of product significantly. Particularly, in smaller and developing countries, export promotion tends to be a primary focus of cluster initiatives. Establishing a successful presence in foreign markets is considerably more difficult to a small or medium company than a large enterprise.

Second, cluster strengthens the practical environment attractable to the internal

or external investments and enterprises with the improvement of competitiveness of supply chain logistics. Geographical advantages of port hinterland discussed earlier such as cost reduction of transportation, low-cost and large-scaled area equipped with complete infrastructure, are only part of successful business factors from the viewpoint of supply chain management. Port hinterlands successfully achieve its expected role only if geographical merits should be connected to the intensification of competitiveness in supply chain management. In that respect, clustering has an important contribution to reinforce the competitiveness of supply chain of enterprises.

Third, Clustering is suitable strategy to foster SMEs. Practically, it is not easy to accommodate large enterprises on port hinterland because most of them are already in mature stage and foundation of a new factory or its extension is carried out on the long term basis of entrepreneur resource strategy. As local production (in foreign country) becomes a general trend, attraction of large company often confines to the case of entry to new business of existing firms. As an alternative to this, clustering stands out and forms a part of national strategy of promoting SMEs. Many of the constraints faced by SMEs are related to SMEs isolation rather than their limited size. SMEs in a cluster could benefit from the cluster's advertisement impact and the possibility of meeting the requirements of large-scale orders through networking. Moreover cluster members benefit from collective action such as joint marketing, purchasing, technology management, training, facilities, testing, etc. which are all factors leading to the achievement of economies of scale. Therefore, the key feature of this type of SMEs grouping is cluster dynamics which leads to SMEs growth.

Fourth, the desirable role of government and its policy direction for boosting the port hinterlands can be inferred from analyzing the case of clustering because the role of government as a catalyst is clear in a cluster. To develop a successful cluster, the existence of a catalyst, a coordinator and a leader is almost essential. However, in a developing or developed countries this catalyst can be a public or private entity or a mixture of both. Singh (2003)<sup>14</sup> has investigated the government's role as a cluster catalyst and indicated the key government functions, actions and impact on selected clusters along with areas for governments to support clusters with several examples of government's intervention in different parts of the world. In addition to the three basic roles of government in providing suitable macroeconomic conditions, improving microeconomic capacity and, establishing a supportive and progressive regulatory environment, Porter (1998)<sup>15</sup> argues that government's role should also include facilitating and upgrading cluster development and creating opportunities for productive dialogue to bring cluster participants together.

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14 Singh (2003), Can government catalyze clusters?, Examples of Government Actions, The Sixth Annual International Conference of the Competitive Institute (CTI) on innovation system and clusters, Gothenburg, Sweden, September, p. 17-19

15 Porter (1998), *Clusters and the new economics competition*. Harvard Bus Rev Nov-Dec, 77-90

## 5. Case studies

We provide many case studies in this section. These case studies include some successful experiences in developing and developed countries. The construction plan of Foodpolis as Korean national food cluster is also referred.

### 5.1 Tirupur in India<sup>16</sup>

Indian industrial clusters have acted as nucleus that develops surrounding urban societies. One of these clusters is centered in Tirupur city in southern and works on hosiery exports. In 1999, this cluster was accountable for more than 90% of Indian exports to Western Europe, USA, and Japan. During the last decade, Pressures of local international standards in textile wet processing, forced dyestuff manufacturers and hosiery clusters to act under eco-textile standards, both in individual and industry group activities.

The main characteristic of India's individual states is their clusters of small and medium size industries that drive local economic development process. Clusters in some zones are homogeneous and in some others are heterogeneous. Each cluster has created its own urban centers, which are penetrated in traditional rural areas. These rural ecosystems are expected to share their natural resources with industrial and urban areas, and accept industrial wastes. But, rapid growth of industrial and urban areas, is eradicating rural parts. Tirupur is a classic example of this model.

Because of the rapid and unplanned migration of population from rural areas to urban areas and negligence in proper town planning, sanitation and other basic amenities are inadequate in these new urban areas. To move toward a sustainable developing state, Tirupur should develop a cohesive strategy in which both the hosiery cluster and rural areas should be taken account. This strategy should be based on the availability of local knowledge and skills. In this strategy, clusters and urban areas should be thought as resource productive centers, especially shared natural resources like water, land and energy. This ensures a sustainable resource from rural environment for a long time. Some pricing policies must be taken into account to persuade industries to use resources more productively. An appropriate GIS on clusters and rural-urban interdependencies would be helpful in zoning clusters to achieve sustainability.

The leader of Tirupur Exporters Association (TEA) discovered the potential impact of globalization in the early 1990s, when the association was formed. As TEA's focus was on exports, its approach was global. India decided to welcome open market economic

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16 Subramanaism RM (2005), Developing and maintaining a competitive export cluster : what's best practice the experience of Tirpur export cluster. Competitiveness through export clustering : strategic considerations, ITC, Tirupur, India, 11-13 April

policies, but TEA decided as well beforehand. Like founding any other clusters, the first step in developing an export cluster is to evaluate any internal and external developments that is probable to influence the performance of the cluster.

## 5.2 *Greater Boston*<sup>17</sup>

Greater Boston is known as economic engine of Massachusetts and also as one of the most developed and innovative regions in the world. This region includes all of Suffolk County, a large share of Middlesex and Norfolk counties, and portions of Plymouth and Essex Counties.

Based on the Bureau of economic analysis, the personal income of Suffolk, Norfolk, and Middlesex counties is more than 50% of the total state's income. Six large export industry clusters are known as the component of export sectors. These clusters could be divided into two types: the first type of these clusters includes Information Technology, Health Care, Financial Services and Knowledge Creation. The other type, itself is divided into two main categories of clusters: "Travel and Tourism" and Traditional Manufacturing (such as paper, plastics and rubber and metal working companies).

The knowledge-intensive export clusters that drive the larger economy of State are concentrated in Greater Boston. These export clusters are: Knowledge creation, information technology, financial services, care health, traditional manufacturing and travel and tourism. The gains that were achieved in the Knowledge Creation includes gains of research and testing, engineering and architectural services, and the management, public relations, advertising, and accounting industries. The most balanced growth of clusters belongs to knowledge creation and also most of clusters in knowledge creation grew close to their state wide. The most effective export cluster in term of employment in this region is the Information Technology export cluster, in a way that growth of it was more faster than average(60% vs. 21%) Some of the factors that caused this rate of growth could be listed as the availability of land for development, ready access to professional services firms, the cultural amenities their employees desired.

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17 Swift J (2002), Toward a new prosperity : building regional competitiveness across the common wealth. A collaborative effort between the Department of Economic Development and University of Massachusetts (UMASS).

### 5.3 *Chemicals in central Germany : New potential awaiting launch*<sup>18</sup>

The Chemicals industry cluster in Central Germany has undergone an exhaustive, difficult, yet successful transformation from the standards of the former East Germany to those of EU. This transformation has enabled the cluster to develop world-class expertise in several fields, from redevelopment of contaminated industrial sites, to implementation of EU and national regulations, to the identification and needs assessment of chemical sites. Yet the cluster has not yet capitalised on these opportunities to take a leading role in new markets for such expertise.

#### A structural and political transformation

The chemical industry in Central Germany has undergone 17 years of structural transformation and a radical shift in its political environment since re-unification in 1990, moving from a climate in which business were hardly able to act independently and through which resources were procured by political means, to a relatively free and competitive market that nevertheless imposed far stricter environmental, safety and other regulations. The industry employed some 26,000 people in the “chemical triangle” in the state of Saxony-Anhalt, yet productivity was low, and sales and marketing functions non-existent. It faced two basic choices: a steady decline in productivity and perhaps failure, or a radical re-adjustment and modernization. Although the region had one of the most modern transportation and telecom infrastructures in the world, the region had little entrepreneurial experience, little equity and venture capital, small market share, and only one significant trans-regional urban centre, Halle-Leipzig. Maintaining a strong chemical industry would require development of new competencies and incentives for skilled workers to prevent mass migration to western Germany and the rest of Europe.

There is no doubt that the clustering efforts of the “Mitteldeutschland Industrial Initiative”, a success in terms of building up productivity and innovation capability. Yet, these efforts have not yet led to the development of new lead markets for chemical applications, alternative sources of research, or greater mobility of knowledge and people among the industries.

#### Building the potential for market innovation

In meeting the challenges of the past decades’ restructuring, the cluster has developed excellent know-how in the following areas:

- Renovating contaminated industrial sites (clearance and redevelopment):

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<sup>18</sup> European Commission (2008), Case studies of clustering efforts in Europe : Analysis of their potential for promoting innovation and competitiveness, Preliminary draft version for distribution in the European Presidential Conference on Innovation and Clusters, Stockholm 22-23 January.

registering, evaluation, planning and implementation and creation of clean settlement areas

- Demolition: project management for the redevelopment and the disposal of old chemical sites
- Environment protection (air, water, soil, noise, waste): organization of environment management and the ongoing monitoring of working processes
- Support in developing chemical sites: identifying, systematizing and describing existing or needed expertise and outlining the technical, organizational, financial and promotional potential for the development of chemical sites.

Despite the fact that this outstanding know-how could be an important source of cost reductions and improved efficiency for chemical sites all over the world, no successful product or service has been launched from the Central Germany cluster to benefit from this specific competitive advantage. The Chemical industry has benefited at home, however, achieving world-class productivity levels.

The cluster is well poised to become a strong service-based industry as the core industry seeking efficiency through outsourcing and splitting of the value chain, as has occurred in the manufacturing of cosmetics and pharmaceuticals. This trend is accompanied by the trend of the establishment of a new industrial segment for broad services as well as site-related industrial infrastructure. This is of particular importance for the SMEs in context of intensification and diversification of their activities, extended market access and business establishment.

#### Help in focusing R&D&I resources

The main focus of the Central German cluster initiative has been increasing production capacity and in supporting R&D projects. Additionally, the rise of outsourcing agreements from multi-nationals have provided impulses for the development of innovation infrastructures. Several technology and innovation centres are operating in the region, which enjoys a relatively high level of public support for research. The region has recently been promoted as a national centre for chemical research. Perhaps most noteworthy is the Fraunhofer pilot plan, which aims at lowering the barriers to innovation and piloting new products. Notwithstanding those achievements, the clustering efforts have not favored a shift from traditional research funds-seekers to new ones that could bring completely new approaches to traditional industries (for example the mini-plants being developed in other areas of Germany.)

The clustering efforts have helped in creating a dialog between industry and policy makers of the different landers, on such topics as innovation, investment support, new enterprises, innovation centres, or the improvement of general framework conditions.

### Contribution to an increased mobility of people and knowledge

The Chemicals cluster has engaged in a significant expansion of inter-industry cooperation since the mid-1990s, when the chemical industry associations covered all the three states, but their initiatives were focused on industry, not involving other parts of the value chain such as suppliers or customers. Such cooperation was sparked by multinational executives such as Bart Groot of Dow, who made use of his personal networks. When BMW decided to locate a major new factory outside Leipzig in 2001, the leaders of Dow and BMW got together. Today, the regional industry as a whole is in fact represented in the cluster organization by the networks, which are involved in such fields as lobby work focusing on future clusters; deepening regional cooperation of the chemistry/plastics cluster with science and research institutes in order to strengthen innovation capacity, and development of synergies with other Central German Clusters, in particular automotive, biotech and environment.

### Remaining challenges

The cluster has extended relationships across the value chain between chemicals and plastics clusters, but has yet to link with the regional automobile cluster. The cluster initiative is planning to invest in a new plant dealing with issues related to buildings insulation in order to respond to the future challenges in the industry, the only company in the region specialized in insulation, Philippina, is not a member of the cluster and therefore not “inside” the process. Another peculiarity is that local car manufacturers are not buying plastics pellets from local producers. In coming years as many of the older generation of skilled labor retires, the cluster will face manpower and training challenges, particularly in export oriented and technology intensive enterprises. The cluster will require greater competency in knowledge management as the dynamics of high turnover in an extended value chain make themselves felt

## 5.4 *Plastics and Packaging clusters in Saudi Arabia*<sup>19</sup>

The Kingdom of Saudi Arabia (KSA) is rich in oil and gas, the key natural resources used to manufacture petrochemicals products, the feedstock for plastics and packaging. KSA has up to 25% of the world’s proven oil reserves, more than any other country. Saudi Arabia has some 265 billion barrels of proven and recoverable oil, accounting for a fifth to a quarter of global oil reserves. It also has up to 258 trillion cubic feet of natural gases, giving KSA the fourth-largest reserves in the world. The country’s huge exports of oil and gas help to give it an annual current account surplus of \$75 billion,

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<sup>19</sup> <http://www.ic.gov.sa/en/industrial.cluster/plastic>;

or 22.9% of GDP. KSA is the largest exporter in Middle East-North Africa (MENA), and the 16th largest in the world. The largest market in MENA, KSA offers: easy, tariff-free access to Gulf Cooperation Council and Greater Arab Free Trade Area markets; access to over 400 million consumers in the wider MENA area; the abundant energy needed for large-scale production; and close industrial-academic ties.

Furthermore, KSA offers significant government commitment, support and incentives. The Ministry of Commerce & Industry and Ministry of Petroleum and Minerals Resources are particularly closely involved, using its targeted Industrial Clusters program, to develop the plastics and packaging sector.

Industrial clusters aims to :

- Make KSA the service hub for consumer packaged goods (CPG) companies to export plastics and packaging worldwide
- Encourage and support further Saudi Arabian and foreign investment in the sector
- Reduce imports and increase exports
- Create and sustain employment
- Assist with national economic diversification

Industrial Clusters is also developing KSA's Automotive, Solar Energy and home Appliances clusters, all certain to benefit from a strong plastics and packaging sector.

### *5.5 Foodpolis, the Korea National Food Cluster<sup>20</sup>*

The global food market is expected to grow from around 5 trillion dollars in 2009 to 604 trillion dollars in 2020. The center of the food market is shifting to the Asia Pacific of which the share is 36% in 2009, being predicted to increase up to 40% by 2020. Korea has many advantages as the strategic hub of food industry in Northeast Asia such as: Access to 60 major cities with 1 million population within a 2-hour flight: Complete 1-day travel transportation connection to China, Hong Kong and Japan: Rapidly emerges as a major logistics zone in the world along with Europe and North America: Incheon International Airport ranked 2 in cargo handling: All area is regarded to be safe from natural disaster. In addition, government policy of borderless trade environment brings new market opportunities. Korean government concluded FTA with 44 countries that represent EFTAs, ASEAN, EU and FTA implementation and negotiation are underway with major countries around the world such as U.S, New Zealand and China. Also, Korea became a member of GATT in 1967, a member of WTO, and a member of OECD in 1996.

Taking advantage of these merits, Foodpolis, Korea's national food cluster is

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20 Foodpolis (2011), Foodpolis and Food Packaging Center, Conference on Critical Research Needs in Food and Packaging Industry, Michigan State University, 14 November.

planned to be established in Iksan, North-Jeolla province. The plan is to build a 2,400,000 m<sup>2</sup> national industrial complex specializing in food by 2015, attracting some 150 global food companies and research institutes. In the complex, 6 government-support facilities such as 3 major R&D centers will reside. Iksan is easy access to transportation network and cultural heritage. That's the reason for selecting Iksan as food cluster.

Foodpolis, agency for Korea national food cluster, has the role of encouraging the involvement of internal and external innovators in the form of industry-academia-research institutions' partnership and joint research development initiatives, equipment sharing, and training programs. Korean government initiates a project to give direct & indirect incentives to enterprises and residents in clusters.

## 6. What kind of cluster strategy should it be?

### *6.1 Implications*

One question that should be asked before discussing a proper cluster strategy is what kinds of implications and common knowledge can be drawn from these case studies. Firstly, although there is no clear difference between developed and developing countries in terms of the successful factors of clustering, countries in the both categories have a few things in common: In developing countries, a stable business environment, suitable policy intervention, and large firms acting as catalysts are clear factors that have introduced themselves as significant and extremely relevant in certain contexts. In developed countries, important common factors shown in the Greater Boston case study included low taxes, sufficient venture capital, risk-taking startup culture, a flexible flow of skilled labor and intellectual properties, local academic and research institutes, the presence of role models, etc.

Secondly, in setting the strategies, the necessity to build a sustainable competitive advantage for a new lead market is very well known but the traditional industry representatives would hardly accept it: rather, they would press for the status quo. Therefore, it is important to define the strategies to build sustainable competitive advantages not with the existing, established companies but with innovative ones.

Thirdly, most successful clusters have a strong and respectful facilitator. He or she should have detailed knowledge on clustering and a powerful network of contracts and enjoy the respect of cluster members.

Fourthly, in developing countries, a majority of clusters are tactically made to expedite exports. In contrast, clusters in developed countries are primarily established spontaneously to improve the competitiveness of industry in a certain region on the basis

of its abundant human and intellectual capitals. In the latter case, the existing clusters are sometimes renovated or recreated to upgrade the accumulated skills and to attract financial investment necessary to manufacture new products in preparation for the future. Like Greater Boston, clusters are made by the gathering of similar IT enterprises and their backgrounds consist of plentiful labor force, research and training institutes and creative enterprise culture. But generally, success is in fact the mixture, combination, arrangement and order in which the ingredients come into play, and how the factors settle beside each other, the environment-both local and global, the opportunities and timing (Singh 2005).

Fifthly, it can be inferred from the case studies that clustering is related to the geographic or resource advantages of each region. Clustering of the plastic packaging industry in Saudi Arabia is associated to its raw material, petroleum gas (Saudi Arabia is the world's largest producer of petroleum gas) and clustering Tirupur is based on the cheap labor force, a core successful factor of the textile industry. In the cases of Germany and Italy, clustering aims at specialized regional industries. Taking advantage of regional strengths for the success of clustering is the common feature, despite differences in causing factors and clustering processes.

## *6.2. The proper approach to clustering strategies in port hinterlands*

In this literature, the approach to the clustering strategy is based on the following criteria: the type of businesses that would create synergy through clustering should be selected among regionally specialized industries adjacent to a port hinterland. For example, mechanic, metal and assembling part industries that are related with car manufacturing, packaging for car assembling parts, vessel storage or supply industries are target businesses in the hinterland of Pusan New Port. In the case of Kwangyang Port, petrochemical and relevant industries such as mechanic, metal and assembling part industries that are related with car manufacturing and nonferrous industries conform to this kind of businesses.

It should be confirmed that the characteristics of selected businesses among candidates should accord with the successful factors of clustering, technology accumulation, the likelihood to secure skilled labor, innovation and R&D capacities. Judging whether exchanges and cooperation can be realized through networks and partnerships in chosen businesses is another task.

It is notable that the competitiveness of selected enterprises can be improved if they reside in the port hinterland. It means that the attracted businesses should be in specific kinds of industries that are capable of improving the competitiveness of supply chain management by utilizing the geographical or economical advantages of each relevant region. Of course they should correspond to the objectives of the port hinterland

To establish a concrete strategy to select target enterprises that are suitable for clustering into a port hinterland, the types of industries should be more segmented. If

necessary, a field survey and on-site researches should be conducted to collect detailed data on target businesses in the region.

Among enterprises that meet all of the four criteria discussed earlier, the most proper ones are those that correspond to the effective use of port hinterlands. In selecting them, their intention of occupancy should be considered and necessary prior conditions or obstacles to their occupancy also accurately analyzed. If possible, synergy effects they would create should be taken into account and their input and output should be analyzed, as it is desirable to select ones that have stronger positive influence on the local economy.

In the following section, as an example of application, the effect of clustering will be analyzed on the assumption that packaging enterprises for car manufacturing, which are dispersed in the Ulsan region, are clustered into the hinterland of Pusan New Port.

## 7. An Example of Application : The Effect of Packaging clusters in Pusan port hinterland.

### *Packaging cluster in the port hinterland*

Packaging becomes a crucial logistics function in today's complex logistics industry. Packaging not only protects the product from physical damage, but affects the cost of every logistical activity, such as transportation, freight handling, warehousing, waste disposal, and information management. Packaging also plays a critical role in the total cost management and sustainability of the supply chain. Efficient packaging can reduce significant supply chain costs, product damages and environmental burdens. Without any doubt, packaging is a highly value added logistics activity and matches very well with goals of the port hinterland development.

Before we discuss about the possibility of packaging cluster in the port hinterland, it is necessary to understand the nature and value of the packaging industry. Packaging is highly cross-linked to other industries and technologies. The customers are nearly every industry, ranging from automotive (including automotive part and service) to food industry. Overall packaging industry size (US \$19.3 billion in 2007<sup>21</sup>) in Korea is smaller than major industries such as automotive and semi-conductor industry because packaging companies are mostly small and medium size companies and heavily rely on the business with domestic customers. However, the impact and value of packaging industry cannot be explained with the size of the economy.

The basic logistical functions of packaging are

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21 Report on development of Korea Food Packaging Center, 2010, Institute of Korea Packaging Systems, p.2

- creating and/or increasing value of the products
- increasing logistical standardization and cost efficiency of goods
- protecting and preserving goods during supply chain processes
- providing easy handling and safety features
- increasing visibility and traceability of products throughout the supply chain.

### *Packaging clustering efforts around world*

Many European countries such as Germany and Austria are running packaging clusters successfully. For example, the Czech Republic has been very active in clustering SMEs since 2001 and established the Czech National Cluster Program. Among active clusters in the Czech Republic, the packaging cluster in Jaromer, in the Hradec Kralove region, is the most advanced and unique cluster<sup>22</sup>. The packaging cluster, branded as “Omnipack,” groups a number of packaging companies focusing on the automotive industry. The Czech Republic realized that packaging has become a globalized market and needs better technical and creative approach in order to sustain their small and medium size packaging companies. The Omnipack is embracing various challenges from very sophisticated customers such as automotive industry. The automotive industry requires a wide range packaging materials (e.g. wood, paper, metal and plastics) and deep knowledge on product handling and cost management. By collaboration with various packaging companies in the cluster, the Omnipack is gaining strong competitive edges in the cost and quality against their global rivals. The Czech Republic utilizes the Omnipack as a cooperative packaging technology development and testing center for all packaging industry providing exceptional service to their clients such as Toyota, Kia, Volkswagen, Peugeot and General motors.

Similar cases can be found from the Distriparks at the port of Rotterdam, Asian Logistics Centre at the port of Singapore, etc<sup>23</sup>. Successful packaging clusters in Europe are characterized as

- a highly integrated collaboration and communication center with other cluster participants such as universities, companies, local technology centers, research institutes and governments
- a productivity improvement and HR management center with being closer to main production and logistics centers
- a strategic marketing partner for market expansion and market creation

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22 Case studies of clustering efforts in Europe: Analysis of their potential for promoting innovation and competitiveness, Preliminary draft version for distribution in the European Presidential Conference on Innovation and Clusters, Stockholm, 22-23 January, 2008

23 ‘UNESCAP’ Commercial Development of Regional Ports as Logistics Centres, Transport Division, 2002, pp. 41-52

### *A Case Study: Packaging and automotive industry in Korea*

Highly specialized packaging manufacturing and related service can help a port hinterland improve its relative competitiveness of the logistical service. One of the possible opportunities would be a packaging service sector related to the automotive part industry. For the last ten years, the Korea's automotive industry has made a huge leap and is currently the fifth largest in unit production and the sixth largest by export volume in the world. According to the KAICA (Korea Auto Industries Cooperation Association) data, the total amount of automotive parts exported was 12,128.5 billion Korean Won or US\$10.1 billion in 2010. In 2011, according to the data from the KAMA(Korea Automobile Manufacturers Association) and the Auto Herald<sup>24</sup>, the amount of automobile exports (including parts, service, and knock-downs) were US\$55.9 billion. Automotive parts alone were US\$19.3 billion, which account for 52.6% of finished car exports.

**Table 1.** Automotive parts sales in Korea

| Year | Annual sales (100 Million Won) |               |         |         | Variance (%) |
|------|--------------------------------|---------------|---------|---------|--------------|
|      | OEM                            | After service | Export  | Total   |              |
| 2006 | 360,004                        | 23,400        | 76,704  | 460,108 | 10.3         |
| 2007 | 386,409                        | 23,185        | 92,306  | 501,900 | 9.1          |
| 2008 | 368,486                        | 22,109        | 105,271 | 495,866 | -1.2         |
| 2009 | 342,236                        | 20,533        | 82,689  | 445,458 | -10.2        |
| 2010 | 440,794                        | 26,448        | 121,285 | 588,527 | 32.1         |

**Note :** 1) Data from after service sales are collected and estimated from 1st tiers only.

2) For export data, parts from finished vehicle companies and KD (Knock down) were excluded.

**Source :** KAICA(Korea Auto Industries Cooperation Association) 2011.

With this promising export outlook, many exporters ignore that automotive part packaging costs take huge part of total logistics costs. The recent report by the Korea Railroad Institute revealed that packaging costs account for 2.4% of total automotive part sales, which is about US\$ 463 million or 509.3 billion Korean Won if converted to the annual total exports. Total volume seems small considering overall size of automotive part industry, but the packaging cost takes up 37% of the total logistics cost according to the study.

24 <http://www.autoherald.co.kr/news/articleView.html?idxno=1608>

**Table 2.** Compression of Logistics and Packaging costs on Automotive Parts

| Automotive parts     | Logistics costs<br>(A, %) | Packaging costs<br>(B, %) | Logistics vs. Packaging costs<br>(B/A*100) |
|----------------------|---------------------------|---------------------------|--|
| Fuel tank valves     | 7.0                       | 1.0                       | 14.0                                       |
| Pipe tube assemblies | 12.0                      | 3.0                       | 25.0                                       |
| Brackets             | 7.0                       | 2.0                       | 29.0                                       |
| Engine mounts        | 7.0                       | 2.0                       | 29.0                                       |
| Antennas             | 1.0                       | 0.0                       | 30.0                                       |
| Seat belts           | 10.0                      | 5.0                       | 50.0                                       |
| Belts                | 1.0                       | 1.0                       | 100.0                                      |
| Retainers            | 2.0                       | 2.0                       | 100.0                                      |
| batteries            | 5.0                       | 5.0                       | 100.0                                      |
| Handles              | 2.0                       | 5.0                       | 250.0                                      |

**Source :** Development of Packaging Standardization for the Intermodal Transportation and Unit Load Systems, Korea Railroad Institute, 2009

### *Benefits of the packaging cluster in the hinterland*

The current export packaging process in Korea does not fit well in terms of the logistical efficiency. Most packaging activities happen at the manufacturing sites in Korea. Hence, packaging companies have to send their workers, tools and packaging materials to the customer's manufacturing sites to work. Packaging at the manufacturing sites only increases overall packaging and logistics costs because this will require additional labor and logistics activities. In Japan, most exporting goods are delivered from the manufacturers to the packaging companies which are located in or near ports, and shipped at the port.

**Table 3.** Comparison between Korea and Japan automotive part packaging flow for export

| Korea | Manufacturer     |                                     |                                    | Transporter                | Port             |
|-------|------------------|-------------------------------------|------------------------------------|----------------------------|------------------|
|       | Product produced | Packagers go to manufacturing sites | Packing at the manufacturing sites | Packaged goods to the port | Shipping process |
| Japan | Manufacturer     |                                     | Port                               |                            |                  |
|       | Product produced | products to packagers               | Packing at the packager's sites    | Packaged goods to the port | Shipping process |

### *The export packaging paradox: the local packaging for the export goods*

The export packaging business is labor intensive mixed with material converting, structural design and logistics service. A packaging is viewed as a product when it is sold, but it is not considered as a part of the goods anymore once the goods are packaged and shipped. This is where the paradox begins. In fact, packaging contributes to exporting products tremendously because packaging a product is virtually essential process to ship. However, the current hinterland policies (or any free trade zone and free economy zone laws and policies) in Korea do not reflect or recognize the essence of the export packaging business.

In order to receive a resident (or business) permit at a hinterland in Korea, a company needs to be qualified by one of following conditions<sup>25</sup>.

#### 1. For logistics business

- A person who intends to run 1) a logistics business such as loading/unloading, transport, storage, display, 2) international logistics services such as international transportation assistance, international vessel trade, packaging, repairing, converting, assembling, etc., falling under the Article 10, clause 1, item 3 of the “Act on Designation and Management of Free Trade Zone” and the Article 7, clause 4, item 1 of the Decree
- A foreign investor who intends to run a manufacturing business or a business falling under the Article 2, clause 1, item 1 of the “Foreign Investment Promotion Act”
- Manufacturing business
  - Falling under the Article 10, clause 1, item 1 or 2, and the Article 7, clause 1, item 2 of Decree of the “Act on Designation and Management of Free Trade Zone”, a manufacturing business primarily for export purposes and has achieved exports that correspond to 50 percent or more of the total sales amount for not less than one consecutive year within three years prior to the request date of a residence permit (in the case of a resident company, the relevant business day)
  - A foreign investor (including planed person) who intends to run a manufacturing business or a business falling under the Article 2, clause 1, item 4 of the “Foreign Investment Promotion Act”
  - Manufacturing business which helps to increase the value of Pusan New Port should be prioritized

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25 The public tender notice made by Pusan New Port, October 18, 2010, Pusan Port Authority

According to these conditions, not many packaging companies can bid for a spot at the Pusan Port hinterland. The export packaging industry is essentially regarded as a manufacturing business, but it would be very difficult to satisfy any requirement of the “exports that correspond to 50 percent or more of the total sales amount” because most of them do not export their “packaging products and services” directly to foreign countries. A common practice for the export packaging business would be providing packaging goods and services to the customers who are ultimately going to export their products.

Besides, most Korean export packaging companies are not owned or invested by foreigners due to the nature of the business. Individual export packaging companies are dispersed and consisted of small to medium enterprises with no or very little research ability to improve the quality of the export packaging. It would be more applicable if a packaging company provides “international logistical packaging service for exporting goods” which includes both international logistics and packaging services. Under the current policy and laws, it is almost impossible to take an advantage of the port hinterland<sup>26</sup> for most export packaging companies.

### *Clustering effects for moving up the value chain*

The packaging cluster can increase the value chain in logistics, significantly. Locating a packaging cluster near the port can easily connect manufacturing activities to logistics. The “total logistics service with packaging” is not a new concept, but this could be a more cost efficient business model in the port hinterland.

The packaging cluster also creates new value for the existing companies and clusters. The Free Trade Agreements (FTA) with Europe, the US, and other countries will create new value chains and continue to demand more value added services at the port. The existence of the packaging cluster with logistical functions can provide the one-stop service that specializes in all aspects of material handling, packaging, and shipping.

A similar example is the New Vehicle Kit Export Center in Incheon port by GM Daewoo Auto and Technology Co. This company established the largest complete knocked down (CKD) export facility in Korea and partnered with logistics companies such as Hanjin Shipping and Korea Express. This plant can assemble automotive parts into the packaged kits, and then the kits are shipped to Asia, Europe, Latin America, and other countries. Although GM Daewoo Auto and Technology Co. is neither a packaging company nor a small-medium company, this type of the dynamic and productive business can make the port hinterland much more competitive.

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26 Hyungbin Kim, <http://www.packnet.co.kr/news/print.html?newsid=6074>, Monthly Packaging, September 17, 2007

In conclusion, a main barrier to the design and implementation of the packaging cluster in the port hinterland in Korea is current policies and laws. Policy makers, port authorities and government officers for the port hinterland have very limited knowledge of the business structure of export packaging industry.

The key challenges for developing a packaging cluster in the hinterland remain the following:

- initiating the changes of port hinterland related laws and policies to help export packaging manufacturers and related service companies facilitate to run their business in the port hinterland
- reinforcing the business support system for small and medium packaging companies which provide export related goods and services
- expanding the business scope of the existing logistics business that does not have packaging service functions
- Improving cooperative interactions between product manufacturers and export packagers to seek more cost effective total packaging solutions.

Since current laws and policies is the key barrier for export packaging companies, the criteria and process for selecting eligible companies for the hinterland should be reviewed and re-evaluated by the port authorities and government. The packaging is like the land that everyone claims to know, but no one really knows because most people are only searching on the surface. The responsible authority should find a proper shovel and find the hidden treasure soon.

## 8. Conclusion

In this literature, with an aim to build up a concrete action plan for the effective use of port hinterlands, the concept of supply chain logistics is introduced. Port hinterlands have a geographical advantage and an important infrastructure nearby. However, these merits of port hinterlands are not very significant from the viewpoint of supply chain logistics. Although the favorable condition of port hinterlands itself is not sufficient to attract enterprises, it is a necessary condition for that purpose. Port hinterlands need to have a dominant position in the supply chain to achieve their goal.

In this respect, clustering is emerging as an alternative to develop port hinterlands. Small and medium enterprises that are related with specialized industries in relevant regions can be clustered into a port hinterland to improve the competitiveness of supply chain logistics. In addition to the synergy effect it creates, clustering is expected to meet the construction objectives of port hinterlands thanks to its export-oriented nature. Although clustering is not the only alternative to vitalize port hinterlands, it would serve as a tool

to get over the difficulties that Korea is suffering, through complementary cooperation with the existing strategies. This study has examined what the proper cluster strategy would be based on a range of criteria. The types of businesses that would create synergy through clustering are suggested to select proper ones among regionally specialized industries near port hinterlands. It should be confirmed that the characteristics of selected businesses among candidates should accord with the successful factors of clustering and the competitiveness of selected enterprises can be improved if they reside in the port hinterland. To establish a concrete strategy to select target businesses that are suitable for clustering into a port hinterland, the types of industries should be more segmented.

As an illustration of applicable case studies, the effect of clustering and prerequisites for success are analyzed on the assumption that packaging enterprises are clustered into the hinterland of Pusan New Port.

This case study reveals that we still have a long way to go. Without a series of detailed planning processes from a practical strategy to concrete action plans and target businesses, all the laws and policies would be in vain. We may have searched on the surface as shown in the case of clustering of the packaging industry. The criteria and processes for selecting suitable companies for hinterlands should be reviewed and re-evaluated based on in-depth studies by port authorities and the government.

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<http://www.autoherald.co.kr/news/articleView.html?idxno=1608>

# Notes to Contributors

**Manuscript.** Submissions should be clear and concise. Manuscripts will be accepted with the understanding that their content is unpublished and not being submitted for publication elsewhere. All parts of the manuscript, including the title page, abstract, tables and legends should be typed in English. Allow margins of at least 3cm on all sides of typed pages. Pages must be numbered consecutively throughout the paper.

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**Data and Documentation.** Data sources, models and estimation procedures are expected to be documented to permit replication by other researchers. Data used in the analyses should be made available to other researchers for replication purposes. Submission of appendices, model documentation and other supporting materials is encouraged to facilitate the review process.

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Tel : +82 2 2105 2894 e-mail : [kwhan@kmi.re.kr](mailto:kwhan@kmi.re.kr)

## ***Editing Manager(Administrative)***

*Won-keun Song*, Specialized Staff, Korea Maritime Institute, Korea

Tel : +82 2 2105 2734 e-mail : [wksong7@kmi.re.kr](mailto:wksong7@kmi.re.kr)

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*Jung-ho Nam*, Research Fellow, Korea Maritime Institute, Korea

Tel : +82 2 2105 2772 e-mail : [jhnam@kmi.re.kr](mailto:jhnam@kmi.re.kr)



KBS Media Center Bldg., 45, Maebongsanro, Mapo-gu, Seoul 121-915, Korea  
Tel: +82 2 2105 2700 Fax: +82 2 2105 2800 [www.kmi.re.kr](http://www.kmi.re.kr)