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# **Political and economic factors in the evolution of North Korea's maritime connections**

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# **Political and economic factors in the evolution of North Korea's maritime connections**

## **Abstract**

This paper is an empirical attempt verifying the interplay between political change, fleet nationality, and the evolution of shipping networks. North Korea offers a good example of a socialist maritime country that experienced much contrasted geopolitical contexts during the last two decades. A database of vessel movements between North Korean ports and other ports is analyzed. Main results show differences between North Korean and foreign fleets in terms of traffic (vessel size, age, berthing time) and geographical coverage. South Korean ports tend to play a new role in the reorganization of North Korean-related flows in Northeast Asia.

*Keywords: DPRK, Maritime network, North Korea, Northeast Asia, Port system*

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## **1. INTRODUCTION: MARITIME NETWORKS AND GEOPOLITICAL CHANGE**

Contemporary globalization and regionalization processes are often said to diminish the importance of nation-states and nationality in economic and spatial change. Throughout port and maritime studies, the evolution of port and maritime systems is often studied through the economic rationale of firms. This is justified by the unprecedented importance of shipping lines, freight forwarders, and terminal operators in the transformation of transport chains in a context of increased globalization and regional integration (Ducruet and Van Der Horst, 2009). Technological and managerial revolutions in the maritime world - and in transport systems in general - have weakened the role of ports and countries in the decision process about where the cargo must be shipped to reach a given destination (Slack, 1993). Therefore, scholars have adapted to these large-scale changes by producing extensive works about the role of the so-called *global players* in port development, port competition, and port selection. Notably about East Asia, recent research on port growth and maritime systems has primarily focused on economic factors and market forces (Comtois, 1994, 1999; Robinson, 1998;

Rimmer, 2004; Rimmer and Comtois, 2005; Yap et al., 2006; Parola et al., 2006; Notteboom, 2006). In one of his major contributions entitled *The Sea and the Geostrategy of Nations*, the French geographer André Vigarié (1995) expresses an alternative viewpoint:

“A commercial operation has always a certain political significance. Commodities or economic activities for the exchange of goods are rarely neutral. They carry the print of the society where they comes from, which possesses its own rules of external relations, its forms and its domains of production; they vehicle their lingual and cultural characteristics; they are witnesses of a form of civilization; they are the expression of interests that are not totally shared by all partners; they express a policy, which means a dynamic of insertion in the outside world: liberal, socialist... Trading is thus expressing certain behavior; and the sea, with the ports, constitutes one of the most important vectors for transmitting this cultural, economical and political background.” (pp. 5-6, *translated by the authors*).

Most literature on geopolitics and shipping is often related with naval warfare, geopolitical control of seas, islands, straits and canals (Papon, 1996), implementation of coastal shipping in transport policies (Rowlinson and Wixey, 2002; Kunth and Thorez, 2005), and security issues in the transport chain (Carluet et al., 2008). Another important aspect is brought by historical studies of port development under colonial rule, notably in Asia, with special reference to diverging interests among empires, merchants, and local elites (Basu, 1985; Broeze, 1989). Contrastingly, the economic literature has largely ignored that ports and transport firms are also influenced in their evolution by geopolitical and political factors. There seem to be a contradiction in port geography between the lack of models due to the claimed importance of political factors, and the limited study of such factors (Ducruet et al., 2009). Therefore, our research opts for an intermediate position between traditional geopolitics and current economic approaches. Two main sets of recent research can be distinguished in the economic literature: the territorial embeddedness of port development (local) and the political dimension of port selection by firms (global).

The first set of research is based on the idea that ports are institutions embedded in a territorial structure where power relations are fundamental. Such views aim at balancing the dominant approach on competitive performance, notably in the case of port competition between Los Angeles and Long Beach (Jacobs, 2007). Other authors have insisted on the interplay between political culture and port performance in their comparison of Busan, Rotterdam, and Piraeus (Ng and Pallis, 2007). Accordingly, global forces encounter contrasted local forces such as urban growth, planning policies, and cross-border integration in the case of Singapore and Hong Kong hub port cities (Lee and Ducruet, 2009). Following

the collapse of the USSR, ports located in the new republics had to redefine their functions and diversify their traffic (Thorez, 1998), while the Baltic ports remained for a large part of their traffic dependent on Russian transit trade (Brodin, 2003). Finally in North Korea, port development is implemented through Chinese support due to prolonged political tensions between North and South (Ducruet and Jo, 2008), while inter-Korean trade is 90% maritime because of border blockade at the Demilitarized Zone (DMZ) in a context of war risk (Ducruet et al., 2008).

This paper is more devoted to exploring the second set of research. The latter is based on the idea that firms are *also* influenced in their decision-making process by non-economic factors. This applies particularly to port selection by carriers. For instance, Ng (2006) suggests that port competition in North Europe is to a large extent explained by the subjective criteria of ocean carriers, besides handling cost and terminal efficiency. Investment locations of global terminal operators and vertically integrated shipping lines stem from a subtle combination of geographical, financial, cultural, and political factors (Airriess, 2001; Olivier, 2006; Jacobs and Hall, 2007). The very distinct worldwide port networks of the main ocean carriers reflect long-term historical and cultural influences (Frémont and Soppé, 2004). However, horizontal integration in the maritime sector tends to delete such influences; very few carriers have reached a global coverage, and most of them remain geographically specialized within a given maritime region (Frémont and Soppé, 2005) except for the special case of Maersk (Frémont, 2007). One major contribution to this field is the one of Comtois and Wang (2003) on the shipping connections between China and Taiwan. Their analysis of the shipping networks of Coscon and Evergreen between 1990 and 2000 shows the importance of economic globalization, regional economic integration, hub-and-spoke development, and cooperation between carriers, resulting in diminishing discrepancies in the geographical spread of their ports of call in Asia and the world. Indeed, transport geography has surpassed political geography and geopolitics (Comtois and Wang, 2003), as seen in the reopening of direct Taiwan-China vessel calls despite prolonged political tensions between the two parties after 46 years of blockade. Such examples indicate the political dimension of port and maritime developments.

The goal of this paper is to examine how important is the nationality of shipping companies in their port selection process, especially under changing geopolitical backgrounds. Nationality is considered as an important factor because it expresses the territorial belonging of the firm. While shipping lines are said to operate in a borderless environment where economic priorities are dominant (Song, 2003), we hypothesize that the

nationality will become important in certain geographical areas (space) and contexts (time), but not in others, resulting in different patterns among shipping companies serving the same markets. In order to verify such hypothesis, the case of North Korea is worth analyzing because of its much contrasted evolution during the last two decades: Soviet influence, USSR collapse, isolation, trade embargo, economic decline, humanitarian support, economic reforms, foreign investments, economic cooperation, nuclear crisis, and changing relations with its main trading partners such as China, South Korea, Japan, and Russia. In addition, North Korea possesses eight international trading ports that are strategically located in Northeast Asia, one of the world's most dynamic maritime regions. However, one must not forget that the weight of maritime transport in North Korea remains limited due to:

- *Preferential border trade with China*: 80% of North Korea's exports pass through Sinuiju and Dandong (China) in the northwest, while trade with Japan has constantly declined since 1998. Although inter-Korean trade occurs mostly on sea (90%), it represents only 25% of North Korea's international trade in 2005;
- *Socialist development model*: only 15-20% of North Korea's international trade is supported by maritime transport (Ducruet and Jo, 2008) while the rest occurs by road (18%) and railway (74%) despite domestic circulation problems and energy shortages since railways in this country are 70% electrified (Tsuji, 2005);
- *Trade embargo and military control*: ports are controlled by the army whose intention is not commercial but defense-oriented, giving a priority to land transport, and resulting in excessive shipping costs, port entry fees, and the necessity for foreign ships to obtain a special permit;
- *Infrastructure limitations and lack of modern cargo handling facilities*: liner shipping, passenger, and ro-ro constitute only 2 to 5% of North Korea's port traffic on average (Ducruet et al., 2009). This is also reflected in the lack of container handling facilities while most cargo in North Korea is handled by hands at the docks using voluminous labor force, as a result of very little investment since the 1970s, except from Chinese support since 2005.

The paper is organized as follows. The first section introduces the data source on vessel movements and the methodology used for a geopolitical analysis of maritime connections, together with some general results. The second section focuses more on the

impact of fleet nationality on the geographical pattern of North Korea's maritime connections. An analysis of those connections is proposed using cartography by fleet nationality, period, and port connected. The last section concludes about the implications of the paper for further research and policy.

## **2. ANALYSING NORTH KOREA'S MARITIME CONNECTIONS**

### **2.1 Data source and methodology**

#### **2.1.1 Vessel movements calling at North Korean ports**

In this paper, we use Lloyd's Marine Intelligence Unit (LMIU) database on vessel movements. LMIU's database covers approximately 80% of the world's merchant fleet and provides daily information on vessel movements for 120,000 vessels worldwide. It has the advantage of harmonizing the wide variety of schedules in a single database, notably for countries such as North Korea (and developing countries in general) for which bulk shipping and tramping are dominant. Sources such as *Containerisation International* or *Drewry* that are used by many scholars are not usable due to the limited spread of containerization in North Korea. Indeed, most ports in this country are not well adapted for welcoming containerships in terms of cargo handling and terminal facilities: most cargoes are loaded and unloaded by hand using large labor force at the docks (Ducruet et al., 2009).

The information provided by LMIU comprises for every vessel its flag, capacity in deadweight tons (DWTs), ship operator, year of build, and type (e.g. tanker, general cargo, bulk, containership, etc.). Data has been extracted from the global database only for the vessels that called at North Korean ports between January 1985 and August 2006. It results in a database of 2,054 vessels operated by 1,069 companies. The period is justified by the necessity to compare contrasted geopolitical contexts so as to verify the impact of geopolitical change on maritime dynamics. We also know for every vessel the exact arrival and sailing date to and from each North Korean port.

Data on vessel movements has the advantage of being neutral, i.e. provided by an independent organization. This is appreciable notably for studying countries embedded in

tense and unstable geopolitical contexts<sup>2</sup>. Also, it provides information that is not available from - and even ignored by - local institutions. Ports in North Korea are managed by the army that is not willing to distribute any data about port traffic. In South Korea, the Ministry of Unification provides some data about inter-Korean shipping, but it excludes other shipments. Only broad estimations of overall North Korean maritime activity are provided in general reports and this is not enough detailed or accurate, although it requires substantial efforts for traffic forecasting based on different scenarios (Kim et al., 1998). Therefore, LMIU database is the only source allowing a study of a country's maritime relations by port and by shipping line over a long time period.

In order to analyze how diversely a country is connected to the outside world through shipping, we have restricted the study to the direct connections. It means that data is known only for the movement of ships from the previous and until the next ports of calls among other movements. For instance, we know that a vessel comes from Yokohama (Japan) before calling at Wonsan port in North Korea, and called at Shanghai (China) afterwards. The rest of the voyage is ignored. While this lack of information about the total voyage may appear as a weakness, it has the advantage of allowing a clearer study about the role of neighboring countries in connecting North Korea to the rest of the world. Since North Korea's immediate neighbors (e.g. Japan, South Korea, China, and Russia) are also its main trade partners, there may be a good correspondence between vessel movements and trade relations. Direct relations also have a geographical value to the study, because they indicate how far the different ships have traveled for connecting North Korean ports.

The methodology used in this paper consists in comparing the evolution and geographical distribution of vessels connecting North Korean ports. North Korean vessels are grouped as a specific category, while foreign vessels can be distinguished as another group or through several groups based on specific criteria. Our geopolitical approach uses fleet nationality, defined as the belonged country of a given vessel according to the location of the shipping companies' headquarters, rather than vessel flags, since the latter does not always refer to nationality because of convenience flags. Therefore, we have redistributed the data of

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<sup>2</sup> In our survey to shipping companies that called at North Korean ports during the last two decades, Maersk officials replied that North Korea "is one of the few places in the world we don't send our vessels". However, we can verify that Maersk Line has operated the *Jolly Arancione*, a containership of 30,217 DWT built in 1975 under Italian flag, from Panama Canal to the North Korean port of Nampo on January 15<sup>th</sup> 2000, and from Nampo to Incheon on March 17<sup>th</sup>. Unfortunately, our survey is not exploited in this paper due to the low response rate.

vessels according to the headquarter locations of vessel operators, notably by using online maritime directories<sup>3</sup>.

### 2.1.2 Preliminary results

One striking result is that North Korea has always been dependent on foreign ships for the largest part of its maritime traffic, i.e. between 50% and 80% (Figure 1). The crisis of the late 1980s that is related to the implosion of the USSR and the socialist block provoked a dramatic decline of foreign traffic, while North Korean capacities remained relatively stable. After 1991, with the collapse of the USSR, all capacities declined rapidly. A historical peak of activity for North Korean ships appeared in 1996-1997, which correspond to the empowerment of Kim Jong-Il in a context of food crisis. This may be explained by the usage of naval ships for commercial purposes at a time of emergency. This effort disappears from 1998 while foreign ships regain their importance.

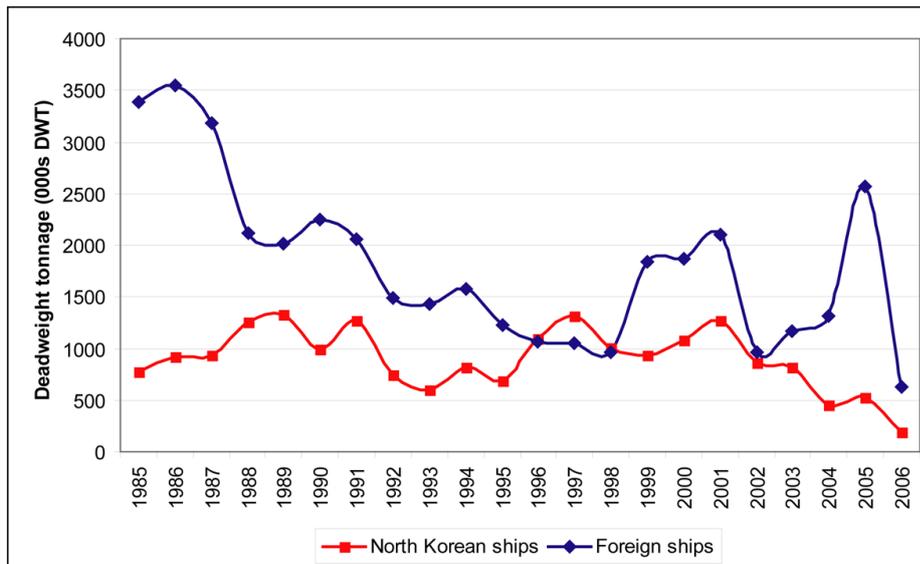
Thus, North Korea did not seek to keep a firm control on its traffic through its own fleet. Between 1999 and 2001, the peak of foreign activity at North Korean ports indicates the impact of humanitarian aid that was mostly shipped by sea. This peak can also be explained by shipments related to the KEDO<sup>4</sup> project. It is only from 2002 that traffic volumes of foreign ships grow substantially, in a context of inter-Korean cooperation, economic reforms, and increased foreign investments. The building and operation of the Gaeseong Industrial Complex, located 60km from Seoul close to the Demilitarized Zone (DMZ) between North and South, best reflects the achievements of South Korea's cooperation efforts towards the North (Ducruet, 2009). Especially, related shipments have an impact on foreign traffic from 2004, the start year of the operation of the industrial complex, and of the inter-Korean maritime agreement signed in 2004.

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<sup>3</sup> See for instance the *World Shipping Directory* of Lloyd's Register & Fairplay (<http://www.wsdonline.com>).

<sup>4</sup> The Korean Peninsula Energy Development Organization (KEDO) is an international consortium created in 1994 for allowing North Korea's peaceful access to atomic energy. The construction of two 1,000 megawatts nuclear reactors that started in 1998 was supported by the two Koreas, the United States, Japan, the European Union and other nations. However, Washington withdrew itself from the consortium in 2002, accusing Pyongyang of doing illicit activities. The project was interrupted in November 2003 and cancelled in May 2006 despite a total cost of US\$ 1.5 billion.

**Figure 1: Cargo throughput at North Korean ports, 1985-2005**



Source: realized by authors based on LMIU data

There are two possible ways analyzing more in depth the distribution of the different nationalities: geographical and political. The geographical distribution (Figure 2) allows for distinguishing between fleet having constant activity (North Korea, China, Japan, Hong Kong), fleet that realized the majority of their activity before the fall of the USSR and the socialist block (Middle East, Europe, Africa, Southeast Asia, Russia), and fleet that realized the majority of their activity in the recent period (South Korea, North America, Latin America). Following the peak of activity between 1999 and 2001 that is mostly due to humanitarian aid, only a few nationalities ensure North Korea’s port activity: North Korea, South Korea, Japan, and China, i.e. North Korea’s main trade partners. Since all these nationalities locate within Northeast Asia, they also highlight the loss of long-distance trades with other regions. Thus, the changing geography of fleet nationality closely echoes the changes in geopolitical and trade relations with the outside world.

**Figure 2: Cargo throughput at North Korean ports by fleet nationality, 1985-2006 (Unit: 000s DWT)**

1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	
76	230	106	60	52	78	78	211	87	33	58	171	57	7	77	459	269	76	292	460	650	263	ROK
23	35	19	2	29	59	92	125	76	106	19	25	95	24	26	21	78	50	30	101	652	67	JAPAN
0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	10	0	0	0	0	3	0	OCEANIA-PACIFIC
0	28	0	72	6	6	9	0	9	29	24	0	55	64	314	165	140	94	0	3	22	65	AMERICA NORTH
23	14	48	0	42	61	95	18	29	9	83	21	20	21	49	110	142	74	47	26	50	25	AMERICA LATIN
19	64	70	32	110	42	87	122	7	71	53	25	116	43	2	67	62	0	8	35	54	35	HONG KONG
561	421	302	152	283	434	322	124	158	466	419	226	484	274	330	276	229	265	294	277	646	122	CHINA
809	949	934	1264	1344	1040	1304	745	611	831	713	1127	1634	1031	940	1087	1332	872	832	457	528	186	DPRK
33	78	39	33	46	78	60	28	19	12	27	62	0	0	0	4	16	108	0	35	31	7	TAIWAN
72	128	106	137	87	32	54	10	33	74	25	76	3	115	243	0	0	41	48	3	42	0	SINGAPORE
12	39	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	AFRICA
179	233	189	235	75	68	164	232	206	120	61	48	118	55	91	83	52	31	58	9	81	0	RUSSIA
603	798	765	462	493	514	374	233	320	379	289	177	115	263	425	520	666	47	192	202	133	16	EUROPE WEST
478	404	445	266	146	231	182	186	265	134	84	12	11	58	220	58	252	91	7	65	95	20	ASIA SOUTH-EAST
341	332	340	318	312	359	193	51	10	44	5	54	0	0	8	85	92	2	44	30	46	0	EUROPE EAST
150	170	200	155	150	169	153	37	44	11	13	12	0	0	0	7	7	0	43	2	11	0	MIDDLE EAST

Source: realized by authors based on LMIU data

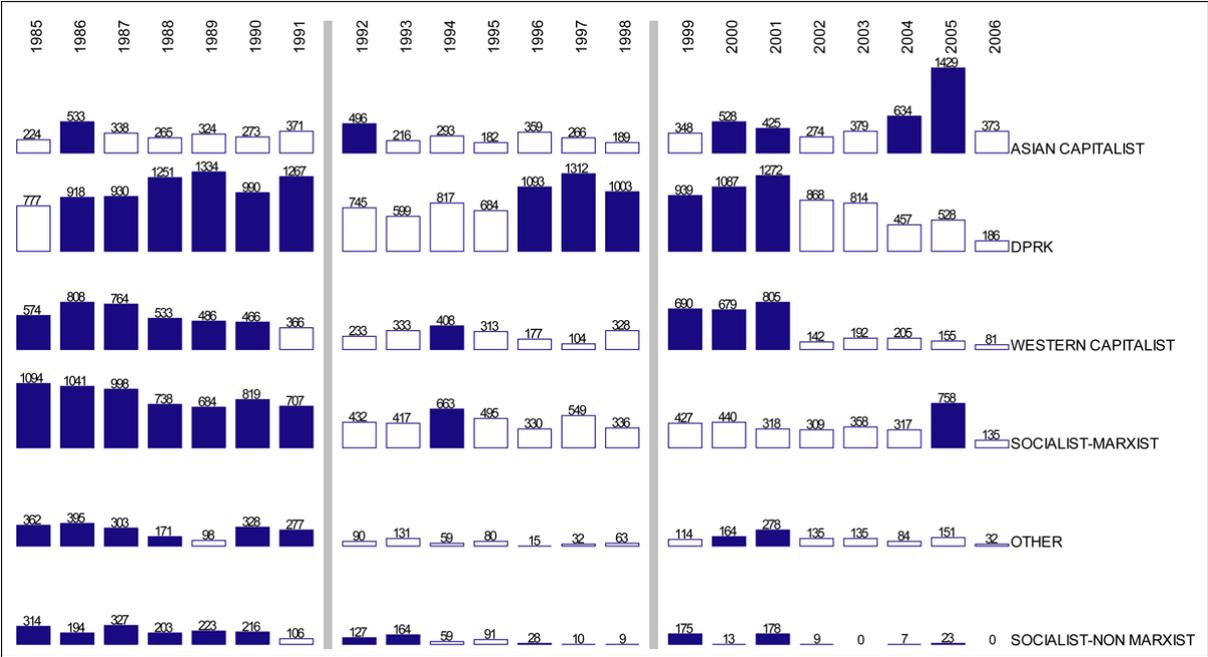
N.B. dark colors indicate values higher than row's average

The political distribution (Figure 3) is based on a conventional grouping of country nationalities into ideological families<sup>5</sup>. This distribution is considered relevant given the very specific ideological orientation of North Korea as one of the world's five remaining communist countries together with China, Cuba, Laos, and Vietnam. Although the content of such ideologies have changed dramatically over the study period, it can be hypothesized that some character of former political systems remain important even nowadays. Are those groupings relevant to study the evolving maritime activity of North Korea? Among foreign fleet, the socialist-Marxist group that was the most important until the 1990s has faced the most dramatic decline afterwards. However, this trend is not specific to this group because all other fleet have also greatly declined according to a same pattern. Yet, important differences remain between the groups. For instance, the Western capitalist fleet (Europe and America) is clearly responsible for humanitarian support between 1999 and 2001, while the socialist-Marxist group keeps declining. Another deviation is the recent and unprecedented growth of the Asian capitalist fleet (South Korea, Hong Kong, Japan, Taiwan, and Singapore), mostly due to increased inter-Korean cooperation. Based on these inputs, the rest of the paper analyzes more detailed characteristics of both North Korean and foreign fleet in terms of

<sup>5</sup> The term *socialist* describes here all vessels belonging to countries that have been at one point of their history including elements of socialism in their constitution.

shipping and in-port performance. The simple distinction between two groups (North Korean and foreign) is kept for better clarity.

**Figure 3: Cargo throughput at North Korean ports by fleet political group, 1985-2006 (Unit: 000s DWT)**



Source: realized by authors based on LMIU data  
 N.B. dark colors indicate values higher than row's average

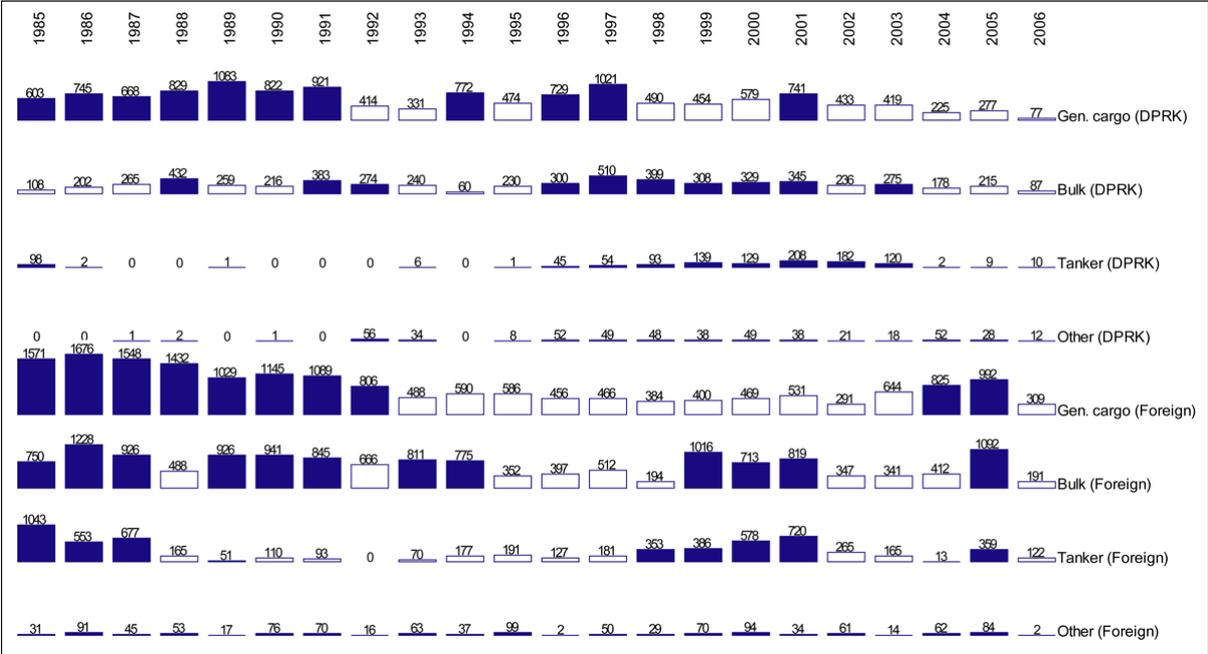
**2.2 Characteristics of North Korean port traffic by nationality**

**2.2.1 Cargo type**

Vessel traffic by main cargo type reveals interesting common trends and differences among the two groups. One common trend is the original dominance of general cargo vessels, at least until 1992. This highlights the specific role of shipping in this country. Land transport is dedicated to carry bulk products from heavy industries, agriculture and mining by road (17%) and railway (74%) (Tsuji, 2005). Maritime transport specializes in the handling of semi-finished products that are not produced locally but are imported. Another comparable trend is the increase of traffic from the late 1990s to the early 2000s, at a time of geopolitical and profound economic crisis. However, one main difference is that North Korean vessels have been used extensively during the period of isolation and internal political crisis, at a time when North Korea could not rely too much on foreign vessels for ensuring its maritime connections (1994-1998), notably for basic commodities such general cargo and bulk. Finally,

another interesting difference is the sudden disrupt of foreign tanker shipping after 1987, i.e. at a time when the USSR already started to collapse, and was not able to support North Korea's energy needs anymore. Finally, we clearly see that the increased shipping activity for all commodities from 2004 is dominantly the result of foreign fleet intervention, which confirms the increased dependence of North Korea upon foreign vessels.

**Figure 4: Vessel types at North Korean ports, 1985-2006 (Unit: 000s DWT)**



Source: realized by authors based on LMIU data  
 N.B. dark colors indicate values higher than row's average

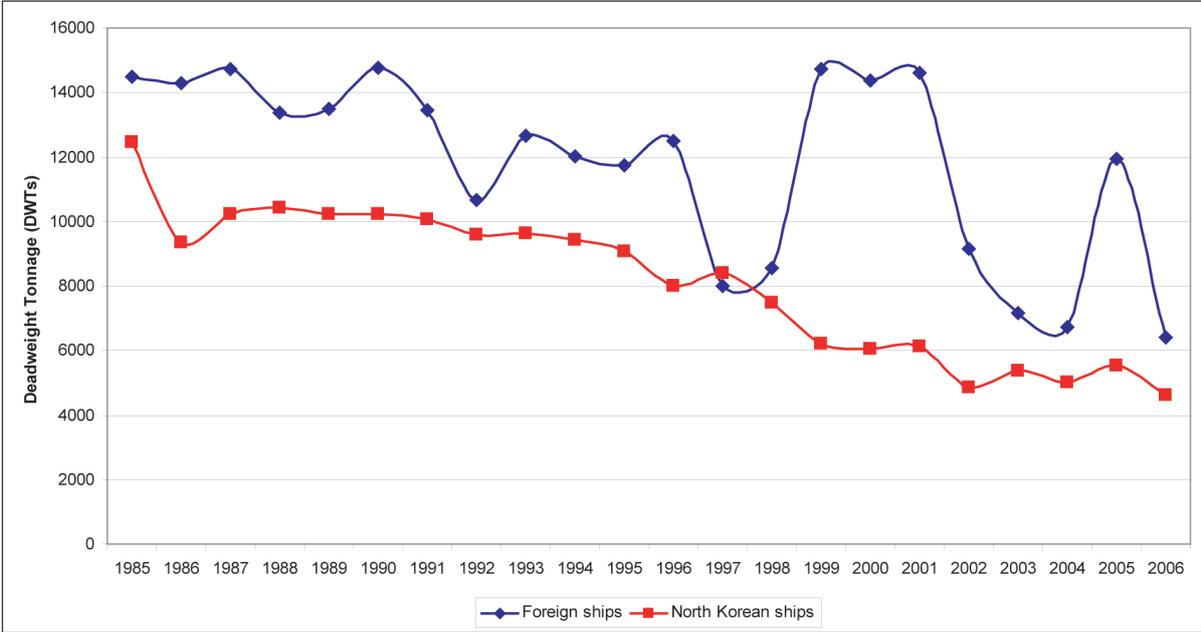
2.2.2 Average vessel size

The dominance of foreign ships is again reflected in Figure 5 with the average size of vessels calling at North Korean ports. One difference is structural since North Korean ships are always smaller than foreign ships. One common trend is the regular decrease of vessel sizes over time, except for specific peaks of oil shipments, and local projects such as Rajin-Seonbong Free-Trade Zone launched in 1991 at the border with Russia and China (Jo and Ducruet, 2007). In the case of North Korean ships, larger ships that are more costly to repair and to operate tend to disappear over time. For foreign ships, two different reasons combine: the decreased trade volumes that necessitate fewer big ships, and the reduced port capacity and nautical accessibility in North Korea due to the lack of investment in port facilities. Thus,

average vessel size is a good indicator of port performance that helps differentiating the different fleets.

In addition, vessel traffic also reflects the geopolitical evolution of the peninsula. The crisis with Japan in 1998 due to North Korean missile tests marks the lowest vessel size for foreign ships. In 1999, Washington levies some sanctions against North Korea. The sudden decline in 2002 marks the ceasing of oil shipments from United States, Japan, and European Union due to suspected uranium enrichment activities of North Korea. The new increase in 2005 may reflect the impact of the inter-Korean agreement that liberalizes Korean vessels' movements between North and South. The dramatic fall in 2006 is inevitably influenced by the missile tests in July; it is only from February 2007 that the situation has reached peaceful grounds.

**Figure 5: Average vessel size at North Korean ports, 1985-2006**



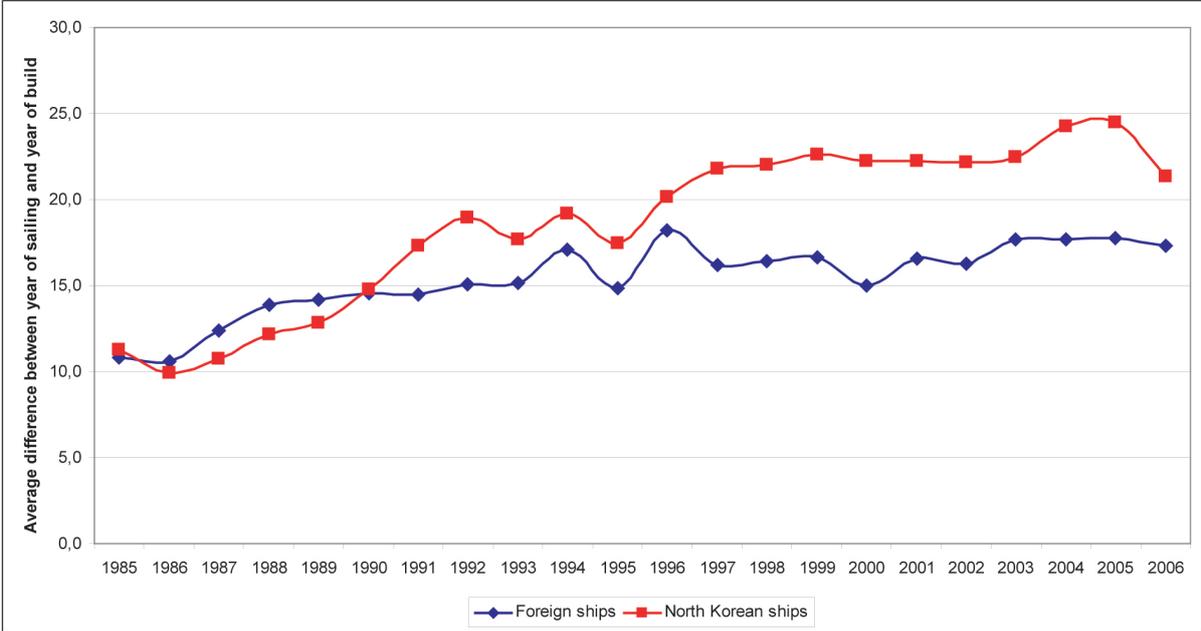
Source: realized by authors based on LMIU data

2.2.3 Average vessel age

As showed in Figure 6, North Korean ships were younger than foreign ships before 1991. After this date, both fleets follow a similar trend but from 1997 North Korean vessels tend to age more rapidly than other vessels. Although foreign ships also age gradually, their average age oscillates between 15 and 17 years, while North Korean vessels reach the age of 23 to 25 years on an average basis. This implies important gaps with the average vessel age in

developing countries, which was approximately 14 years in 2000<sup>6</sup>. As showed in Appendix 1, the dynamic of North Korean shipbuilding has slowed down since the mid-1980s: most ships have been constructed before 1984. From 1997, the relative stability of average vessel age for North Korean ships can be attributed to the necessity for North Korea to keep using its same old ships regardless of their technical difficulties in a context of crisis. Among all the reasons invoked by Japanese authorities for banning North Korean ships from their ports were the technical deficiencies and the lack of hygiene onboard (Lloyd’s Register, 2004). In order to sustain its maritime trade without investing in its fleet, North Korea has pushed the limits of its vessels beyond tolerance. This important technical factor may explain for a large part the striking importance of foreign vessels in total North Korean maritime activity (cf. Figure 1), because the country is not able to handle by itself the majority of its seaborne cargo flows by itself. The slight decrease in 2006 may correspond to the arrival of new vessels in the North Korean fleet, either through refurbishment, renovation, or shipbuilding, but there is great difficulty verifying such facts.

**Figure 6: Average vessel age at North Korean ports, 1985-2006**



Source: realized by authors based on LMIU data

2.2.4 Average berthing time

<sup>6</sup> UNCTAD, 2000, World seaborne trade continues growth in 1999, <http://www.unctad.org/Templates/webflyer.asp?docid=2656&intItemID=2023&lang=1>

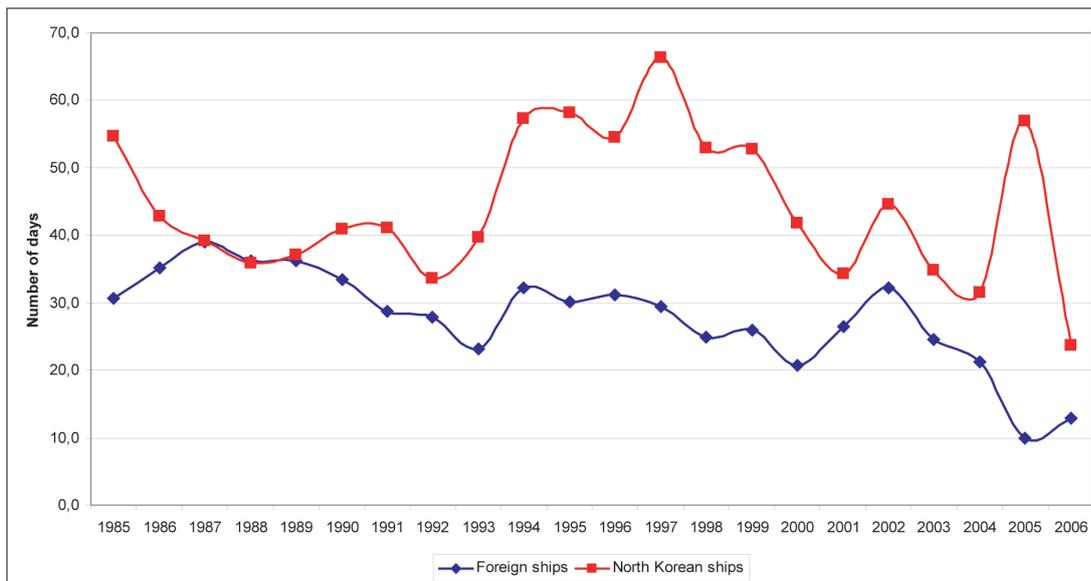
The calculation of the average berthing time (Figure 7) excludes a few vessels that spent more than one year at a North Korean port. Results show the longer berthing time of North Korean ships compared to foreign ships. This is easily explained by the fact North Korean ships anchor “at home” and may stay longer on an average basis than other ships. From the late 1990s, however, the gap between the two fleets’ average berthing time gets wider. While it slightly decreases for foreign ships, it dramatically increases for North Korean ships, at least until the early 2000s, when the two trends get closer.

The enormous gap of 20 to 30 days on average stems from the geopolitical isolation of North Korea. The reduction and disappearance of former trade routes deprived North Korean ships from their activity, which is worsened by the lack of fuel supplies. Thus, a majority of them remained anchored at their home terminals, until the situation betters from 2000 onwards. Still in 2001, important delays at North Korean ports are reported in the specialized press (Lloyd’s Register, 2000; 2001). The peak of 2005 marks North Korea’s very unstable attitude about humanitarian associations and nuclear talks with other nations.

In the case of foreign ships, the regular decrease of average berthing time also indicates increased flexibility of North Korean ports’ management. Military control over North Korean ports may have favored more rapid turnaround shifts of foreign ships through less cumbersome regulations. This may illustrate the shift from political to economical priorities given the country’s difficulties. Also, there may be an effect of port modernization that is implemented through Chinese support in the ports of Nampo and Rajin. At Nampo, new container berth and general cargo quays are reported since 2005 while there are ongoing efforts to upgrade road access and container equipments at Rajin since 1996 (Jo and Ducruet, 2006). However, it may be the case that the decreasing size of vessels calling at North Korean ports also influences the results, since less time is required for handling cargoes to and from smaller vessels.

The distinction between North Korean fleet and other foreign fleets allows understanding the contrasted trends that North Korea has faced in the last two decades. There are also common trends that relate to the internal situation of ports in the country and to the wider geopolitical context.

**Figure 7: Average berthing time at North Korean ports, 1985-2006**



Source: realized by authors based on LMIU data

### 3. A GEOGRAPHICAL PERSPECTIVE ON MARITIME CONNECTIONS

#### 3.1 The differentiation of shipping networks by fleet nationalities

In Figure 8, we compare the distribution of North Korea’s direct maritime connections within East Asia distinguishing North Korean fleet and foreign fleets. The two patterns have several similarities and differences. In terms of similarities, there is a reduction of the connections with Singapore and Hong Kong. The main role of those two global pivotal hubs is to ensure maritime trade connection between East Asia and the other economic poles of the northern hemisphere, Europe and North America. Therefore, the decline of their connectedness with North Korea indicates a retreat of North Korea from the world economy. Instead, we see the growing importance of Taiwan as a transit platform with the rest of the world. Perhaps, this shift comes from the more neutral role of Taiwan in a context of diplomatic tension. Thus, ships calling at North Korean ports may have preferred using Taiwanese ports as transit ports instead of more “politicized” ports such as Singapore, Hong Kong, and other Chinese ports. Yet, Singapore maintains more connections with foreign ships than with North Korean ships in the third period. Finally, we see an increase of connections to Russian Far-East ports (e.g. Nakhodka, Vladivostok, Vostochnyy, Posyet, and Zarubino)<sup>7</sup>.

<sup>7</sup> There are ongoing prospects on developing further Rajin-Seonbong FTZ through Russian support, by connecting the zone to Siberian oil and gas fields by pipeline in exchange of electricity, or to develop a transport

In terms of differences, we see a much contrasted role of neighboring countries in connecting North Korea with the outside world. Even in Taiwan, the ports where North Korean or foreign ships call are different: Kaohsiung is the hub for foreign ships, while North Korean ships are dominant in Taichung, Keelung, and Hualien. For other countries, their role can be differentiated as follows:

- There is a dramatic decline of Chinese and Japanese connections for foreign ships, while those connections are increasing for North Korean ships;
- Foreign ships are increasingly concentrated at South Korean ports, while those ports are totally avoided by North Korean ships;
- Foreign ships tend to concentrate along a Singapore-Taiwan-Busan axis that is reflecting economical factors (least deviation from the main routes), while North Korean ships maintain close connections with neighboring Chinese and Japanese ports (short-distance calls);
- North Korean ships show more dispersed connections over time while foreign ships show more concentrated connections. This is partly a consequence of the ageing and deficiencies of North Korean ships: the impossibility realizing economies of scale.

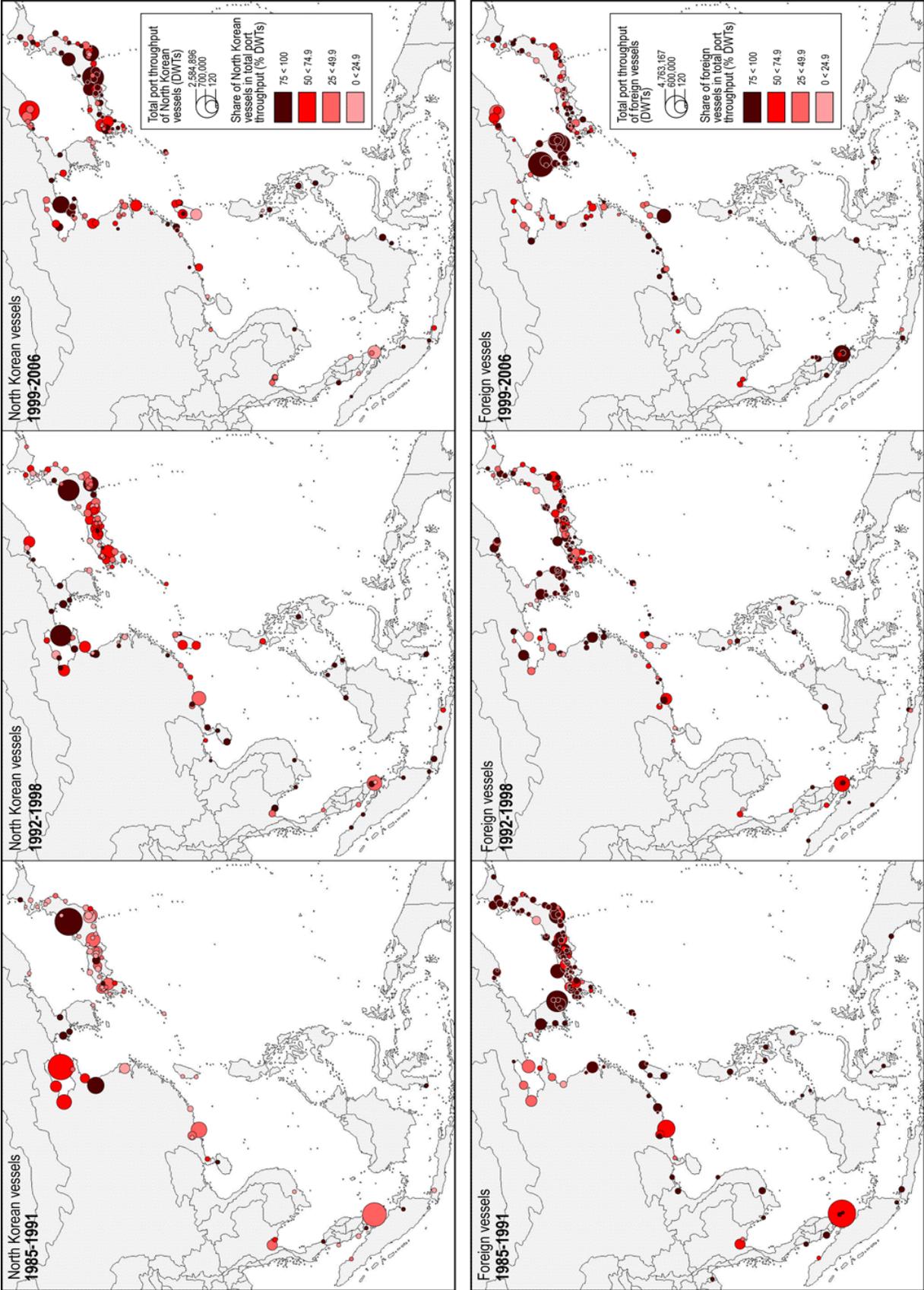
The respective hubs of North Korean and foreign ships are thus very different. The circulation pattern of North Korean ships shows some permanency in the importance of Yellow Sea Chinese ports such as Dalian, Qinhuangdao, Tianjin, Lianyungang, and Qingdao. In Japan, North Korean ships concentrate at Niigata due to the regular ferry link with the North Korean port of Wonsan, but this connection has greatly reduced due to the banning of North Korean ships from Japanese ports since 1998. In the third period, Niigata traffic was shifted to Nagoya, Maizuru, Kisarazu, Tobata, and Oita. The bulk of North Korea's transit trade increasingly uses Incheon and other South Korean ports as main pivots in recent years<sup>8</sup>.

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corridor towards Russia for distribution (Cargonews Asia, 2007) while China is securing Rajin's container terminals through 50-years concessions and building of industrial complex (Choe, 2007).

<sup>8</sup> According to Ducruet (2008), containers destined to and coming from North Korean ports have progressively concentrated at Incheon (more than 50% TEUs since 2003 and more than 25% DWTs since 2004 onwards) and South Korean ports in general (more than 50% DWTs and more than 80% TEUs since 2004 onwards). He interprets this phenomenon as a combination between three factors: local factor (infrastructure limitations and trade growth in North Korea), regional factor (inter-Korean maritime agreement and economic cooperation), and global factor (concentration of shipping services at centrally located and well-equipped ports).

Figure 8: Distribution of North Korea's direct maritime connections by fleet, port and period



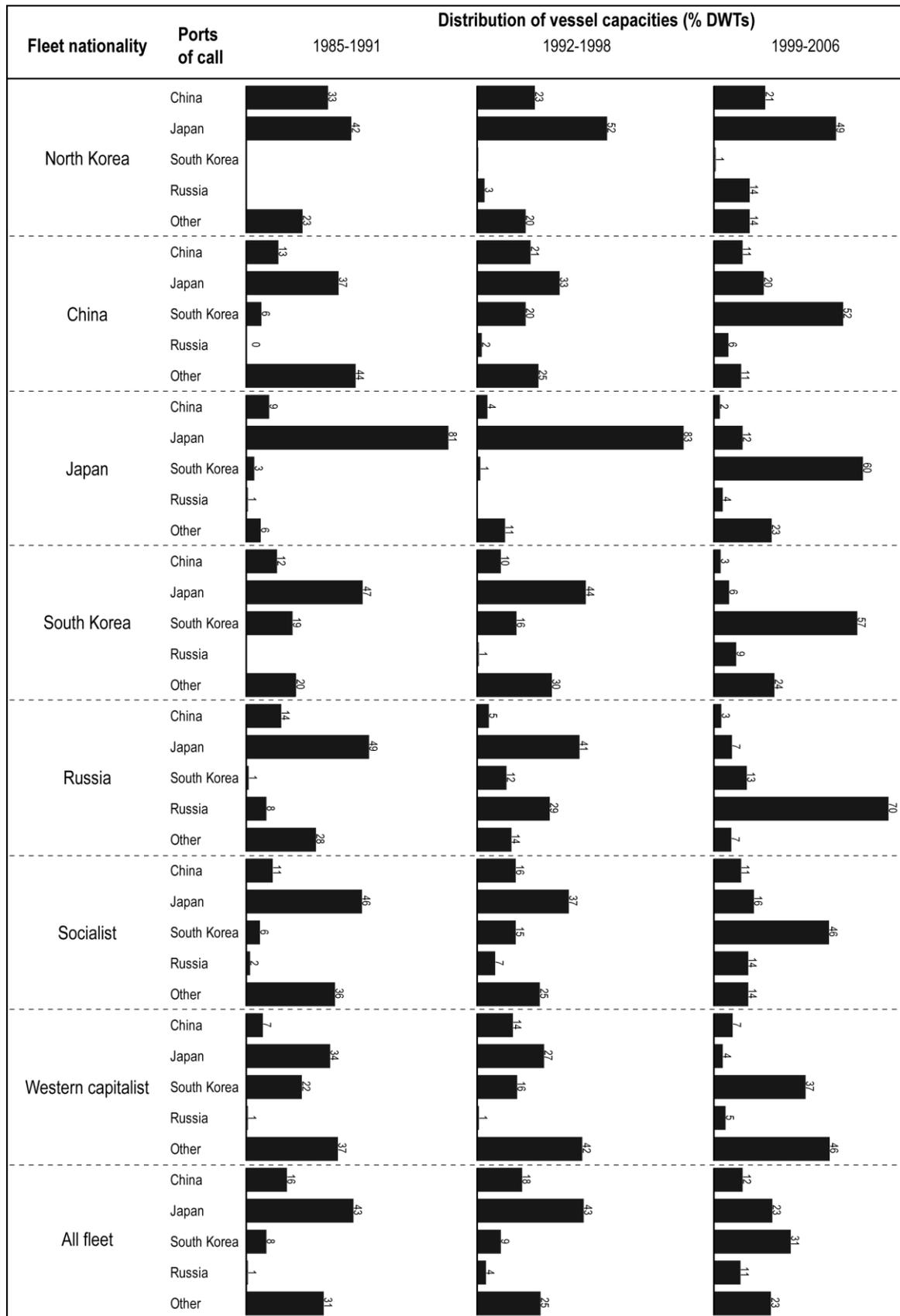
Source: realized by authors based on LMIU data

### 3.2 Hub concentration by fleet nationality

Different fleet nationalities are selected in Figure 9 as a means to highlight the influence of political factors on shipping networks. One first general trend is that most fleets follow the changing trading routes, with the increase of South Korean connections, and the decrease of Japanese connections, except for the North Korean fleet. Between 2001 and 2005, the share of North Korea's international trade with South Korea has increased from 15% to 26% while the share with Japan has decreased from 18% to 5%. Thus, it is normal that the share of South Korean ports in most fleets has increased accordingly, from 8% in the first period to 31% in the third period on average (see Figure 9 for percentages). Especially, the Japanese fleet has shifted from dominant North Korea / Japan connections (81% to 12%) to dominant North Korea / South Korea connections (3% to 60%). Conversely, South Korean ships that were connecting directly Japan and North Korea (47% to 6%) have been redirected between North and South (19% to 57%). Chinese ships as well have converged to the South Korean hub (6% to 52%), leaving Japanese connections behind (37% to 20%).

Some fleets do not follow the shift to South Korean ports. Due to political obstacles with South Korea, North Korean ships were forced to keep almost unchanged their traditional connections with Japan (42% to 49%) and China (33% to 21%). The share of Japan is quite surprising given the banning of North Korean ships from Japanese ports. As in Figure 9, South Korean ports are simply avoided by North Korean ships: they weight only 1% of their connections in the third period, following the inter-Korean maritime agreement of 2004. The loss of connections with Chinese ports was shifted to Russian ports (0% to 14%), in a context of increased cooperation across the Tumen River Delta. Another counter-example is the Russian fleet: although it has also shifted to South Korean ports (1% to 13%) and from Japanese ports (49% to 7%), the main trend is the concentration of traffic upon Russian ports (8% to 70%). This example confirms the regional preference of fleet nationalities: Russian ports are more connected by Russian ships than by other ships, and the same applies to Chinese, South Korean, Japanese, and other ports.

**Figure 9: Distribution of vessel traffic by fleet nationality and direct connection, 1985-2006**



Source: realized by authors based on LMIU data

Finally, the various weights of “other ports” – i.e. all ports located outside Northeast Asia, is a good indicator for differentiating the fleets. For instance, some fleets are more regional (circulation within Northeast Asia) while others are more international (connecting North Korea to other regions). North Korean and socialist - of which Chinese and Russian - fleets have become more regional over time, i.e. the share of other ports has dropped dramatically: 36% to 14% for socialist ships, 28% to 7% for Russian ships, 44% to 11% for Chinese ships, 23% to 14% for North Korean ships. Other fleets that are capitalist show a net increase of the share of other ports: 37% to 46% for Western ships (North America, Western Europe, and Oceania), 20% to 24% for South Korean ships, 6% to 23% for Japanese ships. Therefore, political belonging matters and has a strong influence on the way ports are connected with each other.

#### **4. CONCLUSION**

This paper has confirmed the importance of nationality in the nature and evolution of shipping networks. It reveals the strong dependence of North Korea’s port activity on foreign vessels. The North Korean fleet and ports encounter increasing technical difficulties, as seen in the evolution of vessel size, age, berthing time, and geographical reach. Indeed, the North Korean fleet has restrained most of its activity to intra-Northeast Asia, while foreign fleets maintain extra-Northeast Asia connections. In the end, this paper puts in question the reputation of North Korea as the most closed country in the world, in the light of the proportion of foreign ships calling at its ports.

The interplay between (geo)political change and ship operators’ nationalities is given interesting evidence. On the one hand, the activity of foreign vessels at North Korean ports has been strongly affected by the difficulties of North Korea (e.g. loss of socialist trades, diplomatic tensions, internal crisis), while the traffic realized by the North Korean fleet remains relatively stable over time. It means that the evolution of foreign fleet traffic is a good indicator of the evolution of North Korea as a whole. Accordingly, recent traffic growth confirms the positive impact of inter-Korean economic cooperation and of increased foreign investment. On the other hand, the results highlight important changes in the operation of shipping in general. Recent traffic shift to South Korean ports ensuring the majority of North Korea’s transit trade shows the growing importance of market forces compared to political factors. Regardless of their nationality, shipping companies seek to reduce their costs through economies of scale and technological efficiency. Except for the North Korean fleet, all others

select South Korean ports as their main connection with North Korea. North Korean and foreign fleet have evolved from geographical overlap to geographical specialization: North Korean vessels concentrate at the neighboring Chinese, Russian, and Japanese ports (short distance calls), while foreign vessels concentrate at South Korean ports and other inter-regional pivots such as Taiwan and Singapore (long distance calls). Thus, we clearly see that for North Korean vessels, the political factor remains fundamental, but for foreign fleet, the economic factor has taken increasing significance in the design of their regional port network. One exception is the Russian fleet that concentrates dominantly on the Russia – North Korea link in the recent period.

Overall, the research provides a simple methodology that can be applied to other developing and constrained economies for which accessing port-related statistics is a real challenge and, in some cases such as North Korea, rather impossible. Referring to the work of Comtois and Wang (2003) on the Taiwan Strait, there is a confirmation that globalization and regionalization processes tend to diminish the importance of geopolitical and political factors, due to the economic imperatives of shipping lines in terms of port selection. Whether the new transport geography of North Korea's maritime connections will affect its geopolitical representation of the world and its political behavior remains to be seen.

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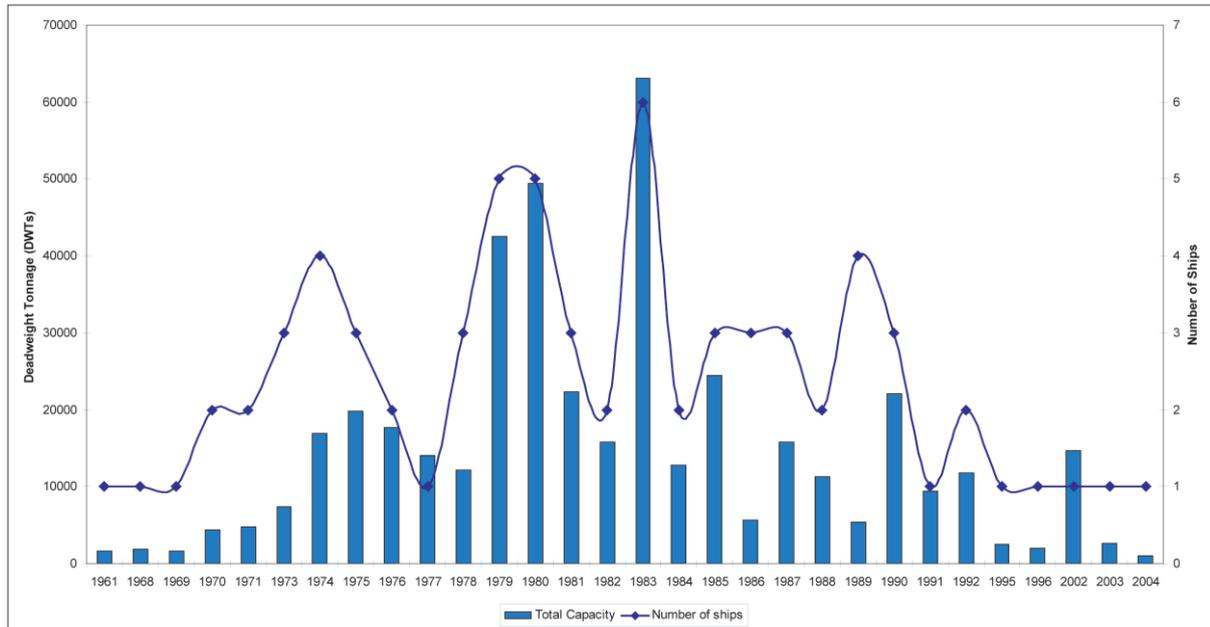
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**Appendix: Some characteristics of the North Korean fleet (Source: LMIU)**

Evolution of shipbuilding in North Korea, 1961-2004



Distribution of vessel types

Vessel type	DWT	No.
Bulk	366,422	17
Containers	18,002	2
Fishing	3,441	6
General cargo	1,075,748	152
Other	502	1
Passenger	2,014	1
Research	1,950	1
Tanker	129,052	17
<b>Total</b>	<b>1,597,131</b>	<b>197</b>

Fleet capacity by main operators

Vessel operator	DWT	No. vessels
Korea G.	408,285	48
Ocean Maritime M.	204,206	15
Taedonggang	118,419	9
Tonghae S.C.	71,660	8
Korea T.	49,466	3
Manpok	45,889	3
Opera Marine	40,999	1
Korea Daehung	22,706	1
Korea J.	20,346	2
Korea Tonghae	18,081	2
<b>Total (173 operators)</b>	<b>1,597,131</b>	<b>197</b>

North Korean vessels still operated in 2006

Vessel name	Year of build	GRT	DWT	Cargo type
Mi Rae	1978	17,656	28,973	Bulk
Mang Yong Bong 92	1992	9,672	2,014	Passenger
Chol San Bong Chong Nyon Ho	1986	6,689	5,483	Gen. cargo
Bu Hung	1977	5,386	7,720	Gen. cargo
Xoh Paek	1974	3,597	6,066	Gen. cargo
Hwang Gum San	1975	2,920	4,136	Gen. cargo
Bong Hoa San	1970	2,897	N/A	Gen. cargo
Tu Ru Bong	1990	2,716	2,978	Gen. cargo
Un San	2003	2,044	N/A	Gen. cargo
Rimsugoon	1970	2,010	3,407	Gen. cargo
Song Hoa 2	1989	1,584	2,110	Gen. cargo
Song Hoa 5	2001	1,583	N/A	Containers
Jisong-5	1993	1,580	2,232	Gen. cargo
Jisong-3	1981	1,548	1,978	Gen. cargo
Zo Kwang	1981	1,265	1,600	Gen. cargo
Pong Yue	1991	1,221	N/A	Gen. cargo
So Hung 1	1980	1,212	1,580	Gen. cargo
Dae Hung 6	1984	1,038	1,665	Tanker
Kum Un San	1988	1,023	2,070	Tanker
Ji Song 7	1984	1,018	1,171	Gen. cargo
Daesong 422	1982	946	899	Gen. cargo
Bu Yon	1986	699	2,100	Tanker
Dae Hung 12	1986	498	1,180	Tanker