

Seaport Concentration and Competition Development in the Arctic Region of Russia along the North Sea Route

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러시아 북극지역 항만의 집중 및 경쟁현상에 관한 연구-북극해 항로를 중심으로

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Abstract Russia has access to unique port locations and routes, one of them is North Sea route, which have been a major debate topic for last several decades. In order to handle any shipments along the route, an adequate and capable port system must be present. This study aims to identify development and competition patterns from 2007 to 2016 of Russian ports in the Arctic basin, concentration trends in particular. The objectives achieved through utilizing the Herfindahl-Hirschman Index (HHI), concentration ratio (CR), the Gini coefficient and Lorenz curve, and shift-share analysis. Results demonstrate concentration trend, positive overall growth and lack of real competition. Originality of this study lies in the fact that certain analysis had not been done in previous studies, but importance of it may be found in several papers. Findings of this paper may assist policy-makers, port authorities and other researchers in understanding and further study on the region.

Key Words : Russia, North Sea Route, Concentration, Deconcentration, Geographical Patterns

요 약 러시아는 북극의 항로와 항만을 소유하고 접근할 수 있는 권한을 가지고 있다. 북극항로는 지난 수십 년간 주요 논쟁의 대상이 되었다. 항로상에서 화물처리를 위하여 적합한 항만시스템은 필수적이다. 본 연구는 2007년에서 2016년 사이 북극항로에 위치한 러시아 항만의 개발 및 경쟁에 대한 현상을 분석하는 것을 목적으로 하였다. 연구 방법은 HHI, CR, Gini Coefficient, Lorenz Curve, Shift-Share Analysis를 사용하였다. 연구결과, 집중화현상과 약한 성장 및 작은 규모의 항만경쟁이 있음을 밝혔다. 본 연구는 북극항로에 위치한 항만 관련 연구가 미진한 현재 상황에서 의미가 있으며, 연구결과와 항만정책 담당자, PA 담당자 및 연구자에게 시사점을 제공한다.

주제어 : 러시아, 북극항로, 집중화, 탈집중화, 지역적 패턴

1. Introduction

North Sea Route (NSR) had been a field of interest of scholars and businesses since ices started to melt and made it possible to sail through NSR (Stroeve, 2011). Alternative to traditional South routes, NSR has

its own advantages, one of which is much shorter distance which is brings other benefits such as lower fuel consumption, lower CO₂ emissions, and lower fees as a result of competition between two routes.

In such environment with unpredictable and harsh weather conditions, adequate port system plays a big

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Received January 18, 2018
Accepted April 20, 2018

Revised March 30, 2018
Published April 28, 2018

role and this is what Russia is struggling to provide at the moment (Lasserre, 2014). Most of the ports and facilities are located on Russian territory, which makes it both easier and harder to establish a consistent network. Despite big attention drawn to it, North routes still remain a futuristic option, as they are not being used to frequently transport cargo, thus they have not become a mainstream route by far.

In the Arctic Basin, Russia has 16 sea ports, 5 of which are located around Kolsky Peninsula, 4 around Chukotka Autonomous Okrug in the East, and 7 on the coast along the North line. In this study, the biggest ports had been used: Murmansk, Archangelsk, and Varandey. Naryan-Mar and Onega ports had not been chosen due to very limited cargo volume, and, previously big port of Vitino had gone bankrupt and its future is very unclear at the present moment.

Very little research had been conducted on Russian Arctic ports in general, and port concentration analysis is absent from the available literature. Hence, this study provides empirical research on the said matter, using concentration ratio (CR), the Herfindahl-Hirschman Index (HHI), the Gini coefficient, and shift-share analysis using throughput of Russian seaports from 2003 to 2012.

2. Literature review

Most papers mostly look at feasibility of NSR at the present moment, analyzing such factors as tariffs and tolls (Lasserre, 2014)[1], fuel prices (Schøyen, 2011)[2], and other related factors. Other papers already try to build a container network (Fu, 2016)[3], or calculate risks (Huntington 2015)[4]. Cariou (2015)[5] examined fuel efficiency, price, and CO₂ emissions correlation using extended model. Numerous different simulations had been done in conjunction with previous simulation models to determine profitability. Many debates take place between scholars who try to assume profitability of NSR, which was described. Cariou pointed out

inconsistency of the results of previous studies, arguing that high CO₂ taxes will actually make NSR more competitive[6-9]. Zhang et al (2016)[10] analyzed similar kinds of shipments between NSR and SCR and concluded that SCR will probably remain competitive even if conditions of NSR will improve a lot. In this block port deconcentration isn't present and the situation with ports is described as underwhelming.

A big number of papers can be found that analyze intentions of shipowners and shipping companies (Lee 2015[11], Lasserre 2011[12], Huang 2014[13], Beveridge, 2016[14]). These papers bear mostly qualitative analysis models and work with such methodologies as interview, case study analysis, or questionnaire used qualitative methodology, surveying 142 shipping companies and drawing conclusions that provide general representation of what are the expectations and views on Arctic routes. Russian scholars are taking mainly practical approach of seeking ways to improve NSR. Using qualitative analysis and governmental data Russian scholars (Zalyvsky 2015[15], Nikolaeva 2011[16], Kondratov 2012[17], Agarkov et.al. 2015[18]) see port and infrastructure underdevelopment as a main barrier for mass use of NSR.

Literature review shows that many aspects that are being mentioned as important, do not yet have further research. Port deconcentration has been mentioned as a part of qualitative SWOT analysis (Monios, 2014[19]), but no papers focused solely on it. Summing up all the previous studies it can be said, that port concentration in the Arctic region of Russia was not explicitly addressed, but there is a sufficient amount of data to perform analysis and draw assertive conclusions to fill the gap of certain unanswered questions in this topic.

3. Methodology

For this research Concentration Ratio (CR(k)), The Herfindahl-Hirschman Index (HHI), the Lorenz Curve and the Gini coefficients, and Shift-share Analysis had

been used to identify current market state and port concentration in Russian port system along the NSR. These methodologies proved to be essential on port concentration analysis. Research framework is presented in the Fig. 1.

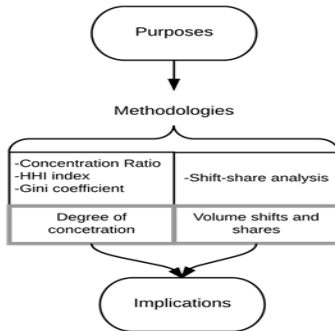


Fig. 1. Diagram of Research

The CR is one of the most used methods of calculating the concentration level. The HHI is a tool used to analyze the asymmetry of market shares. The Gini coefficient can be used to assess industry concentration and income distribution, and it can be used even when there is a different number of ports.

The shift-share used to analyze regional economic growth, as well as determining the development of port systems. Change in volume of a specific port is divided into “share” and “shift” effect. The first one indicates the throughput growth of a container port that would maintain its market share. The second one is the difference between the actual growth and its “share” effect, and shows the actual business won or lost from rivals.

4. Case Study

Fig. 2 shows location of selected ports highlighted on the map. Seventeen ports were filtered down to three for following reasons: bankruptcy (Vitino), inconsistent or extremely low throughput (Dikson), or deep in the mainland location (Igarka). Selected ports have significant annual tonnage, and also share such traits as seasonal operability limitations.



Fig. 2. Map of selected Russian ports in the Arctic basin in the Arctic basin, 2007–2016

The data used in the paper had been collected from the database of “Unified State System of Information on the Situation in the World Ocean” and presents throughput of Russian ports along the North coast. Chosen ports had been analyzed using CR1, HHI, the Gini coefficient and Lorenz curve, SSA, and BCG matrix. Other ports were ignored due to reasons mentioned before.

Table 1. Concentration ratio of chosen ports, top port and ports’ position in every year from 2007 to 2016

Year	1st Port	2nd Port	3rd Port	CR1
2007	MM	AR	VR	0.807
2008	MM	AR	VR	0.791
2009	MM	VR	AR	0.768
2010	MM	VR	AR	0.746
2011	MM	AR	VR	0.758
2012	MM	AR	VR	0.740
2013	MM	VR	AR	0.762
2014	MM	VR	AR	0.684
2015	MM	VR	AR	0.679
2016	MM	VR	AR	0.759

Results demonstrate that concentration ratio fluctuates slightly, but remains similar from year to year without dropping below 50% (0.5) which means that market can be considered to be an oligopoly, even if other ports will be taken into an account, as their throughput combined will make up only a fraction of throughput of any of presented ports. However, deconcentration trend can be seen as CR1 was steadily decreasing from year 2007 up to 2015.

Fig. 3 shows HHI of Russian Arctic ports from 2007 to 2016. Constant decrease from 2007 to 2015 can be seen with signs of rebound in 2016. Trend line is consistent up until year 2015 and slowly goes towards deconcentration. Year 2016 has a sign of rebound of 0.097 which may be either a change of a trend or natural fluctuations of current trend. Deconcentration trend may be explained by a constant competition between Varandey and Arkhangelsk ports, as their combined throughput grows, taking a bigger share of the market.

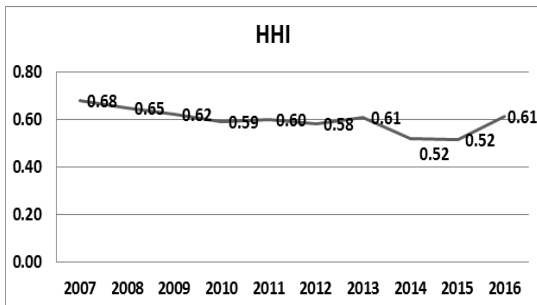


Fig. 3. HHI of selected Russian ports in the Arctic basin, 2007–2016

Gini index, visualized Lorenz curve Fig. 4, gives similar picture, showing a deconcentration trend with a rebound in the last analyzed year. On the graph, significant curve away from the equality can be seen, where 20% of market share belongs to approximately 70% of ports. At the same time there is a noticeable

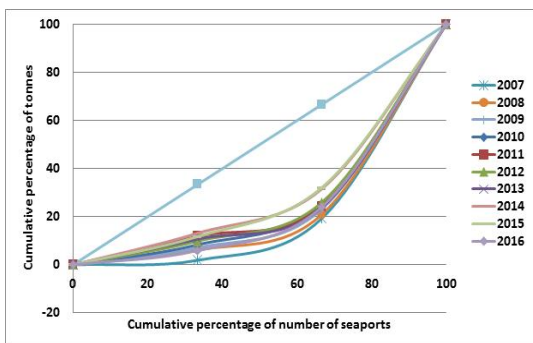


Fig. 4. Lorenz Curves for selected ports in the Arctic basin, 2007 – 2016

gap created between analyzed years, which tells about redistribution of market share from 2007 to 2016. Port of Varandey, discussed earlier, and certain competition provided by it, may explain movement of the curve towards the equality diagonal.

Table 2 present results of shift-share analysis for selected ports. Results show us, that Murmansk and Varandey experienced growth unlike Arkhangelsk. Another point, that can be deducted from the results is, that there is not much competition between ports: for every given time period, all three ports have either positive or negative shift and share effect value, despite Varandey overcoming Arkhangelsk in some years. This evidence may be a sign of ports' quality being not the main success criteria in their profitability at the present moment. Therefore shift-share analysis results show that demand for certain products or services is satisfied without taking differences between ports in consideration. Lack of real competition but positive absolute growth indicates that, at the present system, demand for Arctic port system is purely derived, as it just satisfies demand for the oil.

Table 2. Shift-share analysis

Division	Year	Varandey	Murmansk	Arkhangelsk
SHIFT	07-09	6.51	-1.78	-4.73
	10-12	-2.31	-0.18	2.49
	13-15	2.35	-2.69	0.34
	07-16	7.17	-2.11	-0.56
SHARE	07-09	0.29	12.45	2.68
	10-12	-2.05	-8.96	-1.00
	13-15	-1.15	-6.71	-0.94
	07-16	0.26	10.90	2.35
ABSRR	07-16	7.42	8.79	-2.71

5. Conclusion

Northern ports of Russia are mostly satisfying local demand for the moment and adapting only for the local needs. This study takes into account Russian ports in Arctic basin along the NSR, analyzing them using CRI, HHI, Gini coefficient, and SSA in order to look at deconcentration trends and how competition is

developing between them. For the selected period of time from 2007 to 2016, the system experienced an unusual situation where, deconcentration goes along with very weak or non-existent competition.

Competition phenomenon, as a result of this study, gives unique implications for both academics and industry workers (port authorities, policy makers, shippers, etc.). First of all, results of this study contribute to the understudied topic of Arctic shipping. According to many scholars (Lasserre, 2014. Huntington, 2015. Cariou, 2015. Liu, 2010.) ports in the Arctic basin of Russia are underdeveloped, reasons for that understudied and ports' importance is especially high, therefore making this influential in ongoing research.

As for practical implications, shippers planning to use NSR can get relevant data on Russian ports, competition between them, and their capabilities. For the policymakers, understanding current situation on the market, presented by this paper, gives a clearer perspective which will lead to more effective policies. Port authorities also gain data that can be applied to better understand and leverage their competitive advantages in a way, that counters, similar to Russian Arctic port system, situation.

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