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Case studies of shipping along Arctic routes. Analysis and profitability perspectives for the container sector

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ABSTRACT

Arctic sea routes have for long attracted interest from observers and shipping companies because of their shorter distances between the Atlantic and the Pacific. The prevalence of sea ice prevented the real development of a significant traffic, but did not prevent research from trying to assess the economic viability of these routes. With the actual present melting of sea ice in the Arctic, this effort at modeling the profitability of Arctic shipping routes received a new impetus. However, the conclusions of these studies vary widely, depending on the chosen parameters and their value. What can be said of these models, from 1991 until 2013, and to what extent can a model be drawn, capitalizing on twenty years of simulations?

1. Introduction

In the summers of 2012 and 2013, several events attracted the interest of observers regarding Arctic navigation. Transit traffic along the Northern Sea Route (NSR) was performed by 46 ships in 2012 and 71 in 2013 (official figures, NSRA 2013). In the summer of 2012, the cruise ship MS *The World* transited the Northwest Passage (NWP) with 508 passengers, and in August 2013, the coal bunker *Nordic Orion* transited the NWP as well between Vancouver and Europe.

In the frame of climate change and the melting of Arctic sea ice, now well documented, scenarios of developing Arctic shipping emerged anew, echoing the European projects of the XVIth–XIXth centuries to discover a shorter route to Asia, or more recently the *Manhattan* project to develop a commercially viable tanker route across the Northwest Passage, all ill-fated. Only in the Soviet Union, by dint of huge investments in Arctic ports and heavy icebreakers in the frame of a centrally planned economy, did Arctic shipping develop before the effects of climate change, only to collapse sharply after the demise of the Soviet Union and slowly recovering recently.

Now, every summer when the official statistics about the decline of the sea ice are published, the media repeat the oncoming age of Arctic shipping, an idea resting, often without any deeper analysis (Lasserre, 2010a), on the fact that Arctic routes are much shorter than through Suez or Panama between northern Europe and northern Asia, and that therefore they would automatically attract shipping firms. Arctic ice has been thinning for the past 25 years, an impact related to the warming of the Canadian north. The technology to navigate Arctic waters is available, but the critical question is whether on a commercial basis the Arctic passages are competitive with classical routes, the Panama Canal or the Suez Canal routes. The melting of sea ice did not merely reactivate ancient ambitions about transportation in the Arctic, but immediately

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proved to bear a political issue, as the growth of shipping in the region underlines the question of what the status of the Northwest and Northeast Passages will be (Byers, 2009; Lasserre, 2010a): international straits, as claimed by the United States or the European Union? Internal, and thus subject to their sovereignty, as claimed by Canada and Russia? Neutral, if ships navigate across the Arctic Ocean? The question of the development of Arctic shipping remains controversial as experts' analyses do not converge (Howell and Yackel, 2004; Gedeon, 2007; Loughnane, 2009; Lasserre, 2011).

It is in this context of renewed interest, from the media, the governments and the business circles that models have been designed to try and assess the economic feasibility of commercial shipping along Arctic routes. Compared to the traditional routes mentioned above, shipping through the Arctic could obviously save sailing distance. The issue proved not to be technical any more: with powerful icebreakers and, more recently, the advent of double-acting ships (DAS), navigation across ice that, on the other hand, is thinner and thinner as years go by and see multiyear ice melt, is no longer an engineering difficulty, but rather a business case problem (Niini et al., 2007; Lasserre, 2010b). Several models tried to address the following question: to what extent would shipping in these waters be profitable?

Twenty-six models, published between 1991 and 2013, have been analyzed in this paper. The study underlines the difficulty of defining credible parameters to build up a model that could assess the profitability of Arctic shipping. Capitalizing on these models, the author also tried to construct his own so as to feed the discussion. The objective of this article is to discuss the strengths and weaknesses of these models and the reliability of their assessments on the profitability of Arctic shipping, and to capitalize on their teachings to set up a new model that would take into account operational issues.

2. Several models describe the economics of Arctic shipping

Even before climate change effects were widely discussed, studies had been undertaken to assess the feasibility of developing shipping along the Northern Sea Route. Echoing Soviet attempts at revitalizing the seaway, following President Mikhail Gorbachev's Murmansk Initiative of October 1st, 1987, several research projects tried to evaluate the technical and economic feasibility of developing international commercial shipping. The idea was all the more rational as, contrary to the Northwest Passage where traffic was next to nil, the USSR had developed an series of active commercial ports and a busy seaway along the Siberian coast that rested on the escort of many powerful nuclear and diesel icebreakers. The western part of the route, between Murmansk and Dickson, was even open to year-round navigation after 1980 (Mulherin, 1996). In particular, the INSROP (International Northern Sea Route Programme) was a six-year (June 1993–March 1999) international research programme designed to assess the economics of the Northern Sea Route (NSR), a project that, besides Russia, interested Japan and Norway very much. Tor Wergeland's early studies (1991, 1992) were also early attempts at assessing the business potential of the NSR. But the collapse of the Soviet Union in 1991 led to the rapid decline of economic activity along the NSR, and no follow-up of these early research models. Some of the models analyzed are indeed reflections of research programs that were carried on since the early 1990s so as to assess the feasibility and profitability of shipping in the Arctic. These research programs include INSROP (1993–1999, mainly funded by Japan, Norway and Russia, studying the Northern Sea Route); Ice Routes - The Application of Advanced Technologies to the Routing of Ships through Sea Ice (1997–1998, European Union); ARCDEV – Arctic Demonstration and Exploratory Voyages (1997–1999, European Union, studying the western Russian Arctic seas); ARCOP – Arctic Operational Platform (2002–2006, European Union, studying the NSR); Northern Maritime Corridor (2002–2005, European Union, Norway and Russia, studying the North, Barents and Kara Seas); JANSROP (2002–2005, Japan, studying the NSR); Canadian Arctic Shipping Assessment (2005–2007, Canada, studying the Canadian Arctic waters); AMSA – Arctic Marine Shipping Assessment (2006–2008, initiated by the Arctic Council, considering the whole Arctic). Research thus largely emphasized the NSR as a potential transit route and gateway to Russian resources.

2.1. General portrait of the models: a large diversity of approaches and methods

It is climate change that renewed interest in modeling Arctic shipping. Twenty-six simulations have been identified and analyzed: 9 articles from journals; 8 technical reports; 2 book chapters; 4 conference communications and 3 Master's theses. They were published between 1991 and 2013, but 20 were published in or after 2006, attesting to the renewed interest in Arctic shipping in the climate change context. Three tackle with destinational traffic (i.e., shipping going to/from the Arctic for the exploitation of natural resources: Juurmaa, 2006; Cho 2012 and Falck, 2012), while the 23 others are interested in transit shipping. The majority displays the study of container traffic (18); 8 address bulk shipping (LNG, tanker, dry bulk), and 4 are interested in general cargo. Six studies did not consider ice-class vessels; five simulated an ice-class vessel without specifying which class. One considered a 1B ice-class vessel[1]; 6 either a 1A (PC7) or a 1AS (PC6) ice-class; one seemed to consider a PC5 vessel, and 8 envisioned a PC4 vessel or higher. Besides, 3 models considered DAS ships.

Reflecting both the early development of traffic along the NSR and the presence of infrastructure to facilitate present shipping (ports, numerous icebreakers), most tackle with the profitability of shipping in the NSR (20); 8 consider the Northwest Passage (NWP), 3 the Transpolar route across the heart of the Arctic Ocean, and one does not specify any Arctic route. When they establish comparisons, the articles compare these Arctic sea lanes with the Suez route (19), Panama (5) and the Trans-Siberian rail link (1) (Table 1).

[1] In the Baltic ice-class system; for equivalences, see Annex 1.