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The influence of spatial change on operational strategies in early-modern Dutch maritime shipping: a case-study on Dutch maritime shipping in the Gulf of Finland and on Archangel, 1703-1740

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ABSTRACT

A fundamental discrepancy between neoclassical and institutional research approaches lies at the core of contrasting results in historical studies about maritime shipping and trade. However, there is one point on which both contrasting approaches agree: both of them see maritime shipping as a spin-off effect and even more often as an illustration of trade. Thus, the mere fact that maritime transportation is an economic activity in its own right is ignored. In this paper, I claim that in order to understand the foundation of St. Petersburg in function of its influence on Dutch maritime shipping an evolutionary theory and methodology need to be applied, since they can overcome the limitations of neoclassical and institutional approaches to economic history. The goal of this case-study is to understand the how spatial change affects maritime shipping. This goal serves a double purpose. Firstly, it makes an activity commonly seen as a spin-off effect of trade central to the analysis. Secondly, it makes the interaction between land and sea a core analytical issue. I carry out the study of the influence of spatial change on maritime shipping in a historical context, thus subscribing to Paul David's claim to use the past as "a museum of interesting cases" that provides a better empirical basis than the present.

1. Introduction

Until the beginning of the eighteenth century Dutch trade relations with Russia were almost fully concentrated in Archangel, the only Russian port where foreigners could trade directly with Russians[1]. To a lesser degree, Narva, Vyborg and Nyen – three Swedish towns in the eastern Gulf of Finland – were of some importance for Dutch (transit) trade with Russia at the end of the seventeenth century[2].

In historiography, there is a strong tendency to describe the foundation of St. Petersburg in 1703 as a mythological event. Citations of scholars referring to Peter the Great's extraordinary idea to build his empire's new capital "in the swampy desert of the Neva delta" are countless[3]. It is often forgotten that Nyen and Narva became a growing threat for Russian export trade via Arkhangel'sk in the closing decades of the seventeenth century. Peter the Great's war against Sweden was aimed directly towards the province of Ingermanland, in which both Narva and Nyen were located[4]. The conquest of Nyen was immediately followed by the foundation of St. Petersburg; a clear sign of the economic goals that ruled Russia's war against Sweden.

In 1703, St. Petersburg was founded in the Neva delta, only at a small distance from the former Swedish town Nyen. Commonly known numeric data about the growth of the number of inhabitants, the number of manufactures, the relocation of governmental functions and the increase in the number of foreign merchants active in St. Petersburg convincingly underwrite the assumption that the foundation and rapid development of the Russian city of St. Petersburg must have provoked a fundamental change in the patterns of Dutch maritime shipping in the Gulf of Finland and in Archangel. Since the attractiveness of St. Petersburg and the efficiency of the "special treatment"

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[1] See: J.W. Veluwenkamp, *Archangel: Nederlandse Ondernemers in Rusland 1550-1785* (Amsterdam, 2000); J.T. Kotilaine, *Russia's Foreign Trade and Economic Expansion in the seventeenth Century: Windows on the World*, (Leiden, 2005).

[2] See: Kotilaine, *Russia's Foreign Trade*, 95 ff.

[3] See, for example: Jurij Michajlovič Lotman, *Semiotika goroda i gorodskoj kultury: Peterburg* (Tartu, 1984); A.M. Burovskij, *Peterburg kak geografičeskij fenomen* (Sankt-Peterburg, 2003), 30-74; Maks Ėngman, *Finljandcy v Peterburge* (Sankt-Peterburg, 2005), 70-75; Rolf Hellebust, "The Real St. Petersburg," *The Russian Review*, LXII (2003), 495-507.

[4] A vast amount of literature that has been devoted to the study of the Swedish province of Ingermandland and its cities and settlements is most of the time ignored in studies on Russian trade. Notable exception is Kotilaine's work devoted to Russian trade in the seventeenth century: J.T. Kotilaine, *Russia's Foreign Trade*; J.T. Kotilaine, "Competing Claims: Russian Foreign Trade via Arkhangel'sk and the Eastern Baltic Ports in the 17th Century," *Kritika: Explorations in Russian and Eurasian History*, IV (2003), 281 ff. Additional literature includes, but is in no way limited to: Andrej Iogann Gipping, *Vvedenie v istoriju Sankt-Peterburga, ili Neva i Nienšanc* (Sankt-Peterburg, 2003) [reprint 1909]; P.E. Sorokin, *Landskrona – Nevskoe Ust'e – Nienšanc: 700 let selenija na Neve* (Sankt-Peterburg, 2001); Aleksandr Matveevič Šarymov, *Predystorija Sankt-Peterburga / 1703 god: kniga issledovanij* (Sankt-Peterburg, 2004). Ibidem, "Istorija Landskrony," *Avrora*, V (1993), 41-45.

orchestrated by Peter the Great (1672-1725) had such a large impact on all levels of society that they had led to the rapid development of the city, it can be assumed that the foundation and growth of St. Petersburg must also have had a profound impact on Dutch maritime shipping in the first decades of the eighteenth century, with noticeable shifts towards the new "central point" as a result.

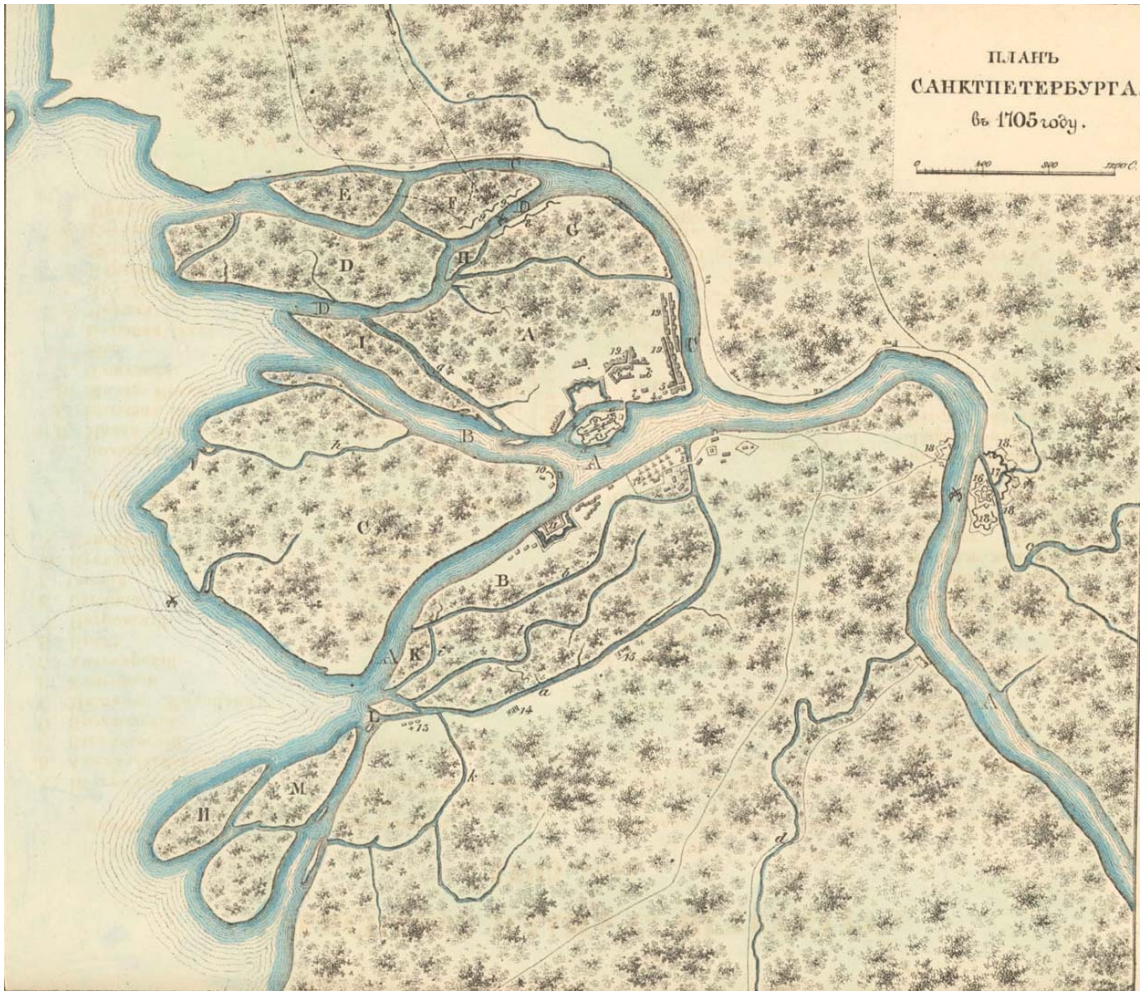

illustration 1: Map of St. Petersburg in 1705. Source: Plany S. Peterburga v 1700, 1705, 1725, 1738, 1756, 1777, 1799, 1840 I 1849 godach s priloženiem planov 13 častej stolicy v 1853 godu, sostavleny N. Cylovym, Sanktpeterburg, 1853.

In the historiography of Dutch maritime shipping and trade with Russia in the eighteenth century, the influence of the foundation of St. Petersburg is treated ambiguously. Quantitative researchers deny St. Petersburg's position as Russia's major port in the eighteenth century, pointing out the small number of Dutch ships that visited Russia's new capital, the small ship size and small tonnage of cargo that was exported from St. Petersburg[5]. On the basis of vast amounts of numerical data, the

[5] Simon van Brakel, "Statistische en andere gegevens betreffende onzen handel en scheepvaart op Rusland gedurende de 18e eeuw," *Bijdragen en mededeelingen van het historisch genootschap*, XXXIV (1913), 350-405; Jake Th. Knoppers. *Dutch trade with Russia from the time of Peter I to Alexander I : a quantitative study in eighteenth century shipping* (Montréal, 1976), 3

conclusion is reached that St. Petersburg never replaced Archangel during the eighteenth century, neither in terms of the number of ships, nor in terms of cargo carried. Qualitative historical research on international shipping and trade with Russia reaches the exact opposite conclusion: "What was lost by Archangel, was won by St. Petersburg" is a recurrent formulation in such studies[6].

A fundamental discrepancy between neoclassical and institutional research approaches lies at the core of the contrasting results mentioned above. However, there is one point on which both contrasting approaches agree: both of them see maritime shipping as a spin-off effect and even more often as an illustration of trade. Thus, the mere fact that maritime transportation is an economic activity in its own right is ignored. In this paper, I claim that in order to understand the foundation of St. Petersburg in function of its influence on Dutch maritime shipping an evolutionary theory and methodology need to be applied, since they can overcome the limitations of neoclassical and institutional approaches to economic history. In a broader sense, this statement contains a claim for more attention towards economic-theoretical research as supplier of explanatory mechanisms of economic-historical phenomena. As such, this paper subscribes to a tradition in economic history, which explicitly looks for advice from economic theory for the construction of an analytical framework[7].

The goal of this paper is to understand the how spatial change affects maritime shipping. This goal serves a double purpose. Firstly, it makes an activity commonly seen as a spin-off effect of trade central to the analysis. Secondly, it makes the interaction between land and sea a core analytical issue. I carry out the study of the influence of spatial change on maritime shipping in a historical context, thus subscribing to Paul David's claim to use the past as "a museum of interesting cases" that provides a better empirical basis than the present[8].

3. Theory & Method

3.1. Evolutionary economics

In an evolutionary model, humans are defined as *homo sapiens oeconomicus* (HSO). Humans are embedded in an economic environment in which they create new ideas or

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vol.

[6] N.N. Repin, "Izmenenie ob''ema i struktury ėksporta Archangel'skogo i Peterburgskogo portov v pervoj polovine XVIII v.," *Promyšlennost' i torgovlja Rossii XVII-XVIII vv.: sbornik statej* (Moskva, 1983), 175; Veluwenkamp, *Archangel*, 179-180.

[7] Cf. the following quotation: "(…) [the economic historian's object] is the same as that of studying present-day economic life "in being", with one extremely important qualification, i.e., the addition of social change", in: Eli Heckscher, "Quantitative Measurement in Economic History," *The Quarterly Journal of Economics* (February 1939), 168. More recently, David and Thomas have held a plea for what they call *historical economics*. See: Paul David, Mark Thomas, "Introduction: Thinking historically about Challenging economic Issues," P.A. David, M.Thomas (red.), *The Economic Future in Historical Perspective* (Oxford, 2003), 10-15.

[8] David, Thomas, "Introduction," 10-15.

follow them. Humans can solve problems by initiating novelty (*generic level*), just as they can decide to follow or ignore the novelty introduced by other humans (*operant level*)[9]. When novelty is introduced to the environment of HSO (*origination*), it can be adopted by other individuals (*adoption*). Following, the adopted novelty can become a behavioral habit or a routine. Many individuals have the opportunity to use the adopted habit recurrently (*retention*)[10]. Thus, HSO is the basic unit of *microeconomics*.

In order to underpin the processes by which *many individuals* recurrently use certain behavioral habits or routines, evolutionary economics turns to *population thinking*[11]. Population thinking is a non-conventional type of aggregation, denoted in evolutionary economics by the term *mesoeconomics*. The same trajectory of *origination-adoption-retention* is now applied to many individuals, i.e. a population. The agent is free to choose and adopt from a variety of habits and routines, thus giving shape to *dynamic populations* of economic actors. What is crucial here is that the recurrent adoption of a certain novelty by many individuals can be associated with the notion of institution and, thus, with the existence of organizational routines[12]. For an institution to remain effective, a regular supply of new *rule followers* is necessary. When a certain routine does no longer attract new *rule followers*, it stagnates and will be left by its population next. The necessity of "new supply" is therefore a key element in the analysis of populations of economic actors.

Using an evolutionary model of economics, it is possible to identify dynamic processes of change in organization on individual (*microscopic*) and population (*macroscopic*) levels, while avoiding the main shortcomings of the traditional typological research program: (1) the reduction of individual agents to "representative agents" (*homo oeconomicus*) and (2) the aggregation of individual behavior on the basis of uniform laws and mathematical procedures. By conceptualizing the activities of individual economic agents and of populations of economic agents as a continuous process evolving in time and space, an evolutionary approach is designed well to understand (1) how populations that are confronted with change react by introducing novelty and (2) how change influences the populations themselves. Additionally, thanks to the recent *evolutionary turn* in economic geography, valuable insights about spatial change can also be linked to the core principles of evolutionary thinking, thus providing a more explicit spatio-temporal framework for the analysis of the creation and diffusion of new

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[9] Kurt Dopfer, "An evolutionary framework of economics," K. Dopfer (ed.), *The Evolutionary Foundations of Economics* (Cambridge, 2005), 29-31. See also: Kurt Dopfer, John Foster, Jason Potts, "Micro-meso-macro," *Journal of Evolutionary Economics*, XIV (2004), 263-279; Kurt Dopfer, Jason Potts, "Evolutionary Realism: an new ontology for economics," *Journal of Economic Methodology*, XI, Nr. 2 (2004), 199-200; Kurt Dopfer, "The economic agent as rule maker and rule user: Homo Sapiens Oeconomicus," *Journal of Evolutionary Economics*, XIV (2004), 177-195.

[10] Dopfer, "An evolutionary framework of economics," 30-31.

[11] Ibidem, 15; 41.

[12] Ibideml, 41-44.

routines and of mechanisms that enhance the diffusion of 'superior' routines over others[13].

From a theoretical point of view the insights of evolutionary economics are very appealing. The question remains, however, how this type of thinking can be applied to historical practice. It is clear that, in order to carry out an empirical study in an evolutionary fashion, we would need to process sources that allow us to study human behavior on both micro- and mesolevels of analysis. Following, we would need to address them in such a way that both individual economic agents and populations of economic agents can be studied as dynamic, evolving entities. Prior to the analysis of early-modern maritime shipping as an integral economic activity, a process of assessment and selection of sources suited for the study of Dutch maritime shipping in the Gulf of Finland and Archangel was completed. Based on their temporal and geographical scope, and their complementarity, the *Danish Sound toll registers*, the *Dutch Sound toll tables*, the *galjootsgeldregisters* of the Directory Boards of Baltic and Muscovite Trade in Amsterdam and the so-called *schipgeldregisters* were selected[14]. Following, a relational database for the input of data from these sources was constructued. Then, a number of steps to prepare the data for nominal record linkage was executed, using a strategy that was based on that of contemporary automated record linkage systems[15]. This whole process served one goal: the development of an information system that allows studying spatial change in an evolutionary manner.

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[13] Ron A. Boschma, Koen Frenken, "Why is Economic Geography not an Evolutionary Science? Towards an evolutionary economic geography," *Journal of Economic Geography*, VI, No. 3 (2006), 273-302.

[14] See: K. Labahn, S. Kroll, "Die "niederländischen Sundregister" als Quelle für den Fernhandel der Hafenstädte des Ostseeraums während des 18. Jahrhunderts," F. Braun, S. Kroll (red.), *Städtesystem und Urbanisierung im Ostseeraum in der Frühen Neuzeit: Wirtschaft, Baukultur und Historische Informationssysteme* (Münster, 2004), 299-301. Descriptions of the characteristics of Dutch Sound Toll Tables, Gajootsgeldregisters and Danish Sound Toll Registers can be found in: Werner Scheltjens, "Sources for the study of Dutch trade in the Gulf of Finland, 1558-1780," *Stadt und Meer im Ostseeraum während des 17. und 18. Jahrhunderts. Seehandel, Sozialstruktur und Haubau – dagestellt in historischen Informationssystemen*. (forthcoming 2009). An on-lineversion of part of the Dutch Sound Toll Tables can be found at: http://esf.niwi.knaw.nl/esf1998/projects/sont/html/search.cfm. The original sources (or copies on microfilm) are kept in the following archives. A copy of the *Danish Sound toll registers* is kept at Tresoar in Leeuwarden. The *galjootsgeldregisters* in: Amsterdam Municipal Archives (GAA), Archief van de Directie van de Oostersche Handel en Reederijen (DOH), inv.no. 78 and GAA, Archief van de Directie van de Moscovische Handel (DMH), inv.no. 6. The *schipgeldregisters* in: GAA, DMH, inv. no. 123. The Dutch Sound toll tables in: Dutch National Archives (NA), Archief der Staten-Generaal, 1.01.04, Liassen Denemarken, inv. nos. 7267 t/m 7293.

[15] Lifang Gu, Rohan Baxter, Deanne Vickers and Chris Rainsford, *Record Linkage: Current Practice and Future Directions*. Technical Report 03/83, April 2003, CSIRO Mathematical and Information Sciences; Mohamed G. Elfeky, Vassilios S. Verykios, Ahmed K. Elmagarmid, "TAILOR: A Record Linkage Toolbox," *Proceedings of the 18th International Conference on Data Engineering*. (2002); Vassilios S. Verykios; Ahmed K. Elmagarmid, *Automating the Approximate Record Matching Process*, (1999), 3.

Below, I will highlight a number of features of this evolutionary information system. These features all serve one or more stages of the evolutionary empirical analysis. Next to a number of common aggregations like annual numbers of shipmasters, breakdowns of the origin of shipmasters, average ship sizes and others a number of features has been created in which population thinking becomes explicit. These features are the main analytical tools of this study. Each of the four of them covers a specific aspect of the behavior of dynamic populations of Dutch shipmasters active in maritime shipping in the Gulf of Finland and Archangel.

The first analytical tool is the *repetitiveness tool* and the *consecutiveness rate* that is a part of it. The *repetitiveness tool* provides breakdowns of the individual behavioral patterns that Dutch shipmasters adopted in their activities on one route. The *consecutiveness rate* (CR) is a calculation of the average time frame of a particular pattern divided by the number of shipmasters that follow this pattern. The closer the consecutiveness rate comes to one, the smaller the time frame in which the shipmaster carried out his voyages. The consecutiveness rate can be read as the number of years one shipmaster needs to carry out one journey to a certain destination. In the empirical analysis, I have distinguished between repetitive patterns with a scattered character (CR>2) and patterns with a strong consecutiveness rate (CR<2), meaning that all journeys were carried out within a limited period of time. Within this group, a further distinction can be made between CR<1 and 1<CR<2. When CR is smaller than one, this means that the shipmasters carried out multiple voyages in the course of one year.

The second analytical tool is the *changing population tool*. The *changing population tool* contains information about the internal behavior of the populations of shipmasters active on one route. Starting point is the assumption that a route continuously needs new supply in order to develop and avoid stagnation. However, a route cannot survive without stability (i.e. supply certified for a number of consecutive years). Through comparison of the share of new supply and the share of “known participants” on a certain route at a certain point in time, the *changing population tool* allows to distinguish between stable and unstable populations. It allows determining when stagnation becomes a problem.

The third tool in the evolutionary information system is the *spatial change tool*. This tool is based on the *changing population tool*. It provides details about the shipmasters that appeared to be members of more than one population in the period under study. These shipmasters carried out journeys to various ports. Their identification directly served the analysis of spatial change and how shipmasters reacted to it. The *spatial change tool* allows discerning when shipmasters changed routes, while also providing the necessary information to establish whether or not such changes occurred in the patterns of many shipmasters at the same time. Moreover, the spatial change tool allows establishing the long term effects of spatial shifts, making it possible to separate permanent from temporary shifts, while also making evolutions towards the establishment of patterns with greater complexity visible.

Finally, a more complex feature of the evolutionary information system is the possibility to reconstruct individual shipmasters' activities. The *individual career tool* can be seen as an elaboration of the *spatial change tool*, in the sense that the changes that occurred in the shipmasters' activities were now compiled for each individual shipmaster. The elaboration of the *individual career tool* involves a process that starts with the use of selection criteria in the queries based on the source tables. A standard name and standard first name have to be entered as criteria. Following, the data from the four different sources can be compared, matched and compiled into one *meta*file. Minor differences between data items in the various sources are denoted in order to complete the underlying match scoring process.

4. Results: polarization and specialization

Empirical analysis made it clear that the evolution of Dutch maritime shipping in the Gulf of Finland and Archangel in the first half of the eighteenth century was marked by the interplay of two complex processes: *polarization* and *specialization*. The process of *polarization* was a *land-based* process, while that of *specialization* was *sea-based*. *Polarization* was a process that took shape in Russia, while *specialization* was a process that evolved in the organizational structure of the Dutch maritime shipping population active in the Gulf of Finland and Archangel. It was observed that both processes reached a culmination point in 1724, after which they continued to exist in the form of a new order, marked by growing complexity. In this paper, I will focus primarily on the process of specialization. In order to fully understand this process, a brief description of polarization is necessary.

4.1. Polarization

Polarization is a term that I have chosen to denote the cumulative effect of a variety of land-based changes that shared a common goal: making St. Petersburg a "New Amsterdam". As became clear studying Russia's economic policy under the reign of Peter the Great (1689-1725), the changes that were part of *polarization* affected: (1) the Russian Empire's governmental structure, (2) distant regions in Russia's interior, (3) Novgorod and Pskov and in a broader sense North-West Russia as a whole and (4) the hinterlands of ports in the eastern part of the Gulf of Finland and of the port of Archangel. In brief, *polarization* affected all possible geographical levels. The process of *polarization* in the first decades of the eighteenth century cannot be separated from two related motives: *dominium maris baltici* and *nation building*. *Dominium maris baltici* stands for domination in the Baltic Sea, a wish that occupied many of the powers surrounding the Baltic Sea for several centuries[16]. From the seventeenth century, when

[16] Nikolaj Petersen, "Denmark as an International Actor 706-2006," *World Political Science Review*, II, No. 3 (2006), 210-211.

Sweden became a dominant power in the Baltic, the meaning of *dominium maris baltici* became related to the expansion politics of maritime powers[17]. It is in this same sense that Russia's motivation to strive for *dominium* needs to be understood. Russia wanted to become a maritime power. The reforms that were necessary to achieve this goal had a scope that went far beyond the political level. The establishment of a Russian navy, merchant marine and a dedicated, self-conscious economic policy were indispensable ingredients for the successful control of the Baltic. *Nation building* was the second key concept in the first decades of the eighteenth century; it is a term that can have various meanings, depending on the angle chosen. In all cases, however, *nation building* stands for a whole of institutions, rules and (power) relations that manifests itself in a distinct territory[18]. The *polarization* process was a gradual process that consisted of a number of different phases. A constant that can be observed throughout these different periods is that of the *polarization* process gradually getting a more and more limited geographical focus. While the first measures, like conquering new territory, affected roughly speaking the entire State, later measures had a more local character.

4.2. Specialization

Under the umbrella of *specialization* a process could be found that was already present in the organizational structure of Dutch maritime shipping in the Gulf of Finland and in Archangel before the beginning of the eighteenth century (i.e. exceeding the time frame of this study). What I have observed in my case-study is a process in which this already internally existent specialization took a radically new form after the foundation of St. Petersburg with its accompanying political, geographical and economic changes. On the basis of the empirical analysis, the *specialization* process could be explained as the interplay of a number of combined features: port of destination, origin of the shipmasters, cargo carried and size of the ship. Dependent on the relative weight of either of these variables in the shipmaster's decision making, a continuous trade-off between cargoes and routes could be observed, resulting in a prevalence of either flexibility or repetitiveness in the operational and organizational structures of the shipmasters' activities.

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[17] Ibidem, 211.

[18] Jan Glete, "Cities, state formation and the protection of trade in Northern Europe, 1200-1700," Hanno Brand, Paul Holm, Leos Muller (eds.), *The Dynamics of Economic Culture in the Northsea and Baltic Region (ca. 1200-1700)* (Hilversum, 2007). Een bondige definitie is terug te vinden in: Francis Fukuyama, *State-Building: Governance and World Order in the Twenty-First Century*, (London, 2005), xvii: "State-building is the creation of new government institutions and the strengthening of existing ones".

Routes/cargoes	Flexible	Repetitive
Flexible	Various cargoes, various routes	Various cargoes, one route
Repetitive	One cargo, various routes	One cargo, one route

Table 1: trade-off between repetitiveness and flexibility in the choice of cargo and routes.

The interplay of port of destination, cargo, origin of the shipmaster and size of the ship must be understood as a parameterization of a complex of underlying business relations between merchants and other merchants, merchants and shipmasters, shipmasters and charterers, mutually between shipmasters, etc. Reconstruction of these relations would require in-depth research into the characteristics and the behavior of each of these groups of economic actors, which falls outside the scope and aims of this research. That the denoted parameters port of destination, cargo, origin of the shipmaster and size of the ship do indeed represent these complex relations appeared from a non-exhaustive study of the contents of correspondence between shipmasters and merchants and mutually between shipmasters[19].

(1) disorder

In the beginning of the eighteenth century, the existing organizational structure of Dutch maritime shipping in the Gulf of Finland and Archangel suffered from disorder.

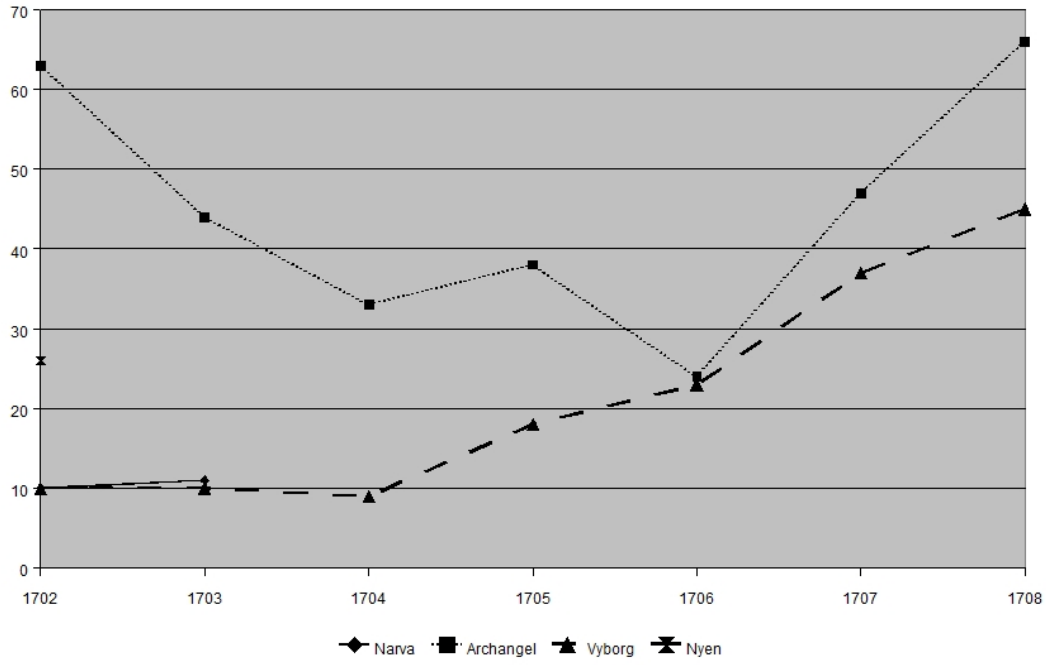

Chart 1: annual shipping numbers, 1702-1708.

[19] The following documents were studied as examples: Amsterdam Municipal Archives, no. 88: Archief van de familie Brant en aanverwante families, inv. nos. 950, 979, 983, 999.

The political changes that succeeded each other at great pace in the opening years of the eighteenth century caused a shock in the organizational structure of Dutch maritime shipping in the Gulf of Finland and Archangel. In 1702 sixty three Dutch shipmasters sailed to Archangel and forty six others made a return journey to one of the ports in the eastern part of the Gulf of Finland, which at that time was already a war zone[20]. Ten of them visited the ports of Narva and Vyborg; twenty six returned to Amsterdam from Nyen. As we have already observed in the analysis of the polarization process, Nyen was a popular destination for timber exports to the Netherlands at that time[21]. Following the conquest and consecutive destruction of Nyen in 1703 and Narva in 1704, the existing relationships between the Dutch maritime shipping population and the geographical area of the Gulf of Finland would undergo profound changes.
Narva and Nyen disappeared as possible destination for maritime shipping. Vyborg, on the other hand, which was located opposite of Narva on the northern border of the Gulf of Finland and would not be conquered by the Russians until 1710, became increasingly popular with Dutch maritime shipmasters from 1705. Partly this is the result of a shift towards Vyborg of Dutch shipmasters that were former members of the Narva and Nyen populations. This shift coincided with a less intensive shift towards Archangel. For the most part, the Vyborg population was “new” in the early eighteenth century. This population showed its first signs of routinization as early as 1705.

	1702	1703	1704	1705	1706	1707	1708	1709
TOTAL	10	10	9	18	23	37	45	21
NEW	n/r	8	8	13	14	24	25	7
% of TOT	n/r	80%	89%	72%	61%	65%	56%	33%
KNOWN	n/r	2	1	5	9	13	20	14
% of TOT	n/r	20%	11%	28%	39%	35%	44%	67%
same	n/r	2	1	2	5	11	19	13
again	n/r	0	0	3	4	2	1	1
once	n/r	4	4	4	7	15	8	3
once %	n/r	40%	44%	50%	30%	24%	38%	19%

Table 2: Evolution of the Vyborg population, 1702-1709.

This evolution could be related to a shift in the composition of Vyborg’s export in the first decade of the eighteenth century. Vyborg’s formerly popular exports of tar and

[20] For reasons of clarity, the year 1702 was arbitrarily chosen as the starting point of the empirical analysis. Doing so, it was possible to touch upon the role of Nyen at the beginning of the eighteenth century, while avoiding to be distracted too much by the organizational structure of Dutch maritime shipping under Swedish rule.
[21] Evidence of this popularity can be found in the Amsterdam Notarial Archives, where Jake Th. Knoppers has localized at least twenty four charterparties with mention of Nyen as port of destination in the years 1701-1703. See: Knoppers, *Dutch trade with Russia*, I, 171.

pitch were gradually replaced by exports of timber products like balks, deals and (to a lesser degree) planks[22], which in turn could be related to the diffusion of the Dutch fine-blade sawmills across the borders of the Gulf of Finland. That this increase could take place despite the uncertainty in the Gulf of Finland, is evidence of the very high demand for timber products in the Netherlands at that time.
In Archangel, a decrease in the number of Dutch shipmasters could be observed until 1706. Mainly, this decrease was a consequence of the lack of new supply to the Dutch maritime shipping population.

	1697	1698	1699	1700	1701	1702	1703	1704	1705	1706	1707	1708	1709
TOTAL	30	35	34	33	53	63	44	33	38	24	47	66	33
NEW	n/r	25	17	16	24	28	9	15	14	7	21	32	12
% of TOT	n/r	71%	50%	48%	45%	44%	20%	45%	37%	29%	45%	48%	36%
KNOWN	n/r	10	17	17	29	35	35	18	24	17	26	34	21
% of TOT	n/r	29%	50%	52%	55%	56%	80%	55%	63%	71%	55%	52%	64%
same	n/r	10	13	14	21	30	24	15	12	14	14	18	18
again	n/r	0	4	3	8	5	11	3	12	3	12	16	3
once	9	14	9	6	6	16	7	12	7	3	13	18	6
once %	30%	40%	26%	18%	11%	25%	16%	36%	18%	13%	28%	27%	18%

Table 3: Evolution of the Archangel population, 1697-1709.

In 1707 and 1708, the Archangel population grew significantly, thus paralleling the increase in the number of Dutch shipmasters active on the Vyborg route. Despite the lack of sufficient information to actually prove it, I am inclined to believe that there is a relation between decrease in export value[23], the growth in Dutch shipping and the construction of the first Dutch fine-blade sawmill in the area around Archangel in 1706[24]. However, this novelty would not immediately be followed by its further development; warfare – again – interrupted the course of Dutch maritime shipping in the Gulf of Finland and Archangel.

(2) monopoly

The disturbances of war in the Baltic Sea eventually led to a near monopoly position of Archangel in Russian trade in the years 1709-1717.
This near monopoly found expression in a continuous positive trend in the number of Dutch shipmasters that realized return journeys to Russia's White Sea port. Initially, Peter the Great's attempts to promote trade via St. Petersburg instead of via Archangel seemed to have had little effect. Only in 1717, three years after Peter's first attempts, a transformation took shape. Novgorodian and Pskovian merchants, who back in 1701

[22] Sven-Erik Åström, "Technology and timber exports from the Gulf of Finland 1661-1740," *Scandinavian Economic History Review*, XXIII, No. 1 (1975), 3-4.
[23] For evidence of this decrease, see: Repin, 'Izmenenie'.
[24] For details, see: Ian M. Matley, "Defense Manufactures of St. Petersburg 1703-1730," *Geographical Review*, LXXI, No. 4 (1981), 416.

were forced to redirect their good streams to Archangel[25], would play a decisive role in this transformation.

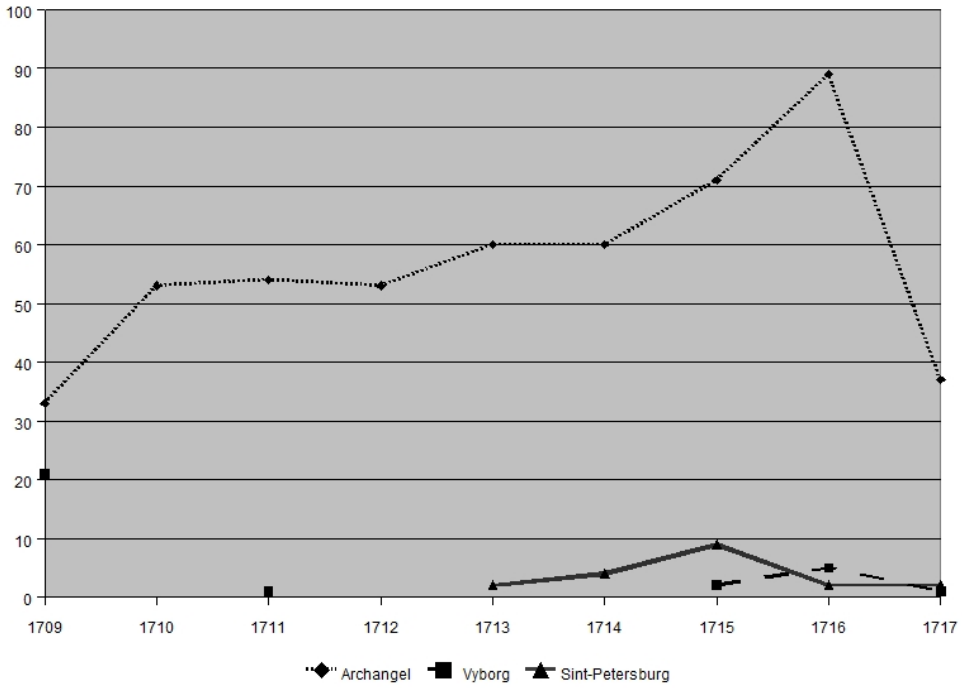

Chart 2: Annual shipping numbers, 1709-1717.

The population of Dutch shipmasters active on the Archangel route consisted of 436 members in the first two decades of the eighteenth century. These 436 shipmasters accounted for a total of 1003 ship movements between 1697 and 1717. The average number of shipmasters that made only one return journey in the course of these 21 years was 23 percent. In absolute numbers, this meant that 258 out of 436 shipmasters, or 59 percent, appeared in the *schipgeldregisters* only once. Just over 40 percent of all members of the Archangel population in the years 1697-1717 made more than one journey to Archangel.

Making use of the charts of the changing population tool, more detailed patterns could be observed. On the following chart, it can be observed that the share of “new” participants on the Archangel route grew significantly in the years 1713-1715, which would eventually lead to the all time high of 1716. This period of expansion was preceded by a period of growing specialization in the years 1709-1712. In these years, the share of “new” participants diminished in favor of a growing share of “known” participants on the Archangel route.

[25] *Polnoe Sobranie Zakonov Rossijskoj Imperii. Pervaja Serija s 1649 po 12 dekabrja 1825 goda* (sost. pod rukovodstvom M.M. Speranskogo), (Sanktpeterburg, 1830), IV, no. 2387; Repin, ‘Izmenenie’, 178.

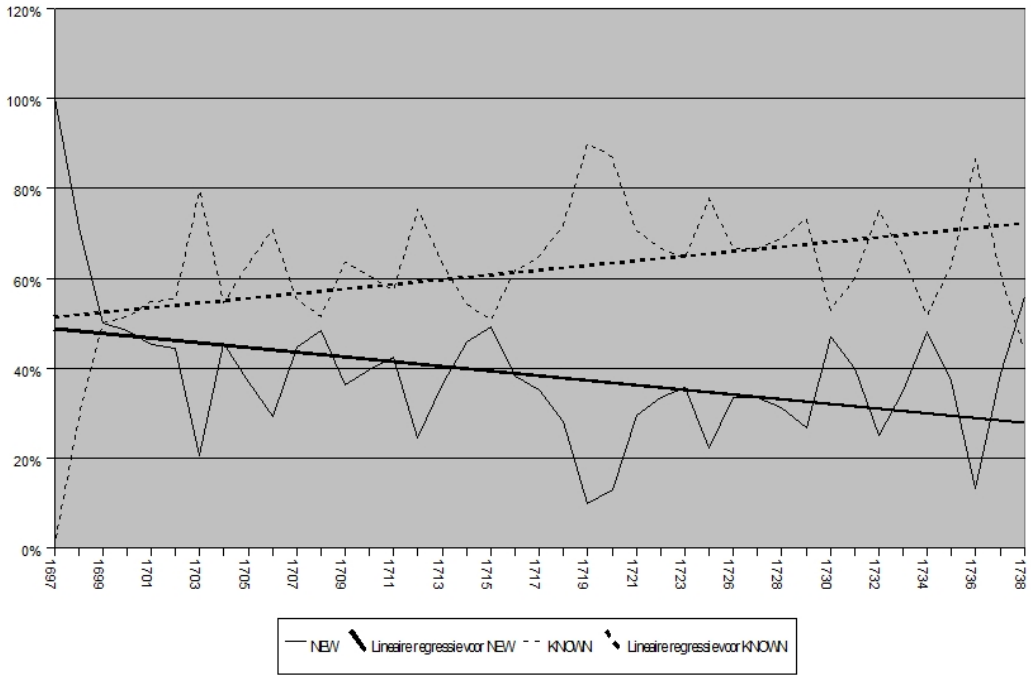

Chart 3: Population dynamics on the Archangel route.

In 1712, the share of "new" participants decreased at an unusual pace, leading to temporary stagnation in the participation of Dutch shipmasters in the Archangel trade. Thus, it had to be concluded that Dutch maritime shipping to Archangel received a new external impulse in 1713-1715. This external impulse was probably the renewed permission to export grain from Archangel[26]. This permission, then, must have undone the awaited effects of attempts to divert trade to St. Petersburg.

By taking a closer look at the organizational patterns brought to the surface using the repetitiveness tool and the changing population tool, it was possible to assess the behavior of the Dutch maritime shipping population towards a destination that benefited from a near monopoly position at that time. As was described above, the majority of Dutch shipmasters made only one return journey to Archangel in the years 1697-1717. 178 shipmasters realized two or more journeys. Of this group of shipmasters, seventy four had a disperse pattern with a limited number of voyages (CR>2). On the other hand, 104 shipmasters seemed to have executed their journeys in an organized manner, limiting the time that elapsed between two return journeys and showing a preference for multiple consecutive voyages (CR<2). The share of these 104

[26] Michail Dmitrievič Čulkov, *Istoričeskoe opisanie rossijskoj kommercii pri vsech portach I granicach ot drevnich vremjan do nyne nastojaščego i vsech preimuščestvennych uzakonenij po onoj gosudarja imperatora Petra Velikogo i nyne blagopolučno carstvujuščej gosudaryni imperatricy Ekateriny Velikaja, sočinennoe Michajlom Čulkovym*, (Sanktpeterburg, 1781-1787), I, book 2, 53.

shipmasters in Dutch shipping to Archangel in the period 1697-1717 was 53 percent (529 out of 1003 ship movements)[27].

# shipmasters	# ship movements	% of total	CR
258	258	25%	nvt
74	216	22%	CR > 2
104	529	53%	CR ≤ 2
108	1003		

Table 4: Archangel, Summary of repetitiveness, 1697-1717.

This meant that more than half of all voyages were executed by a relatively small group of shipmasters that adopted strategies in which (temporarily) "fixed" routes and organizational routines played a key role. Existing assumptions about early-modern shipmasters as "randomly seeking the highest possible profit" appeared to be applicable only to part of the maritime shipping population. This part of the population is large in absolute numbers and their presence is essential. The "one-time-only" participants provide the shipping population active on the Archangel route with its necessary added value. As a continuous addition of "new" supply, they are one of the necessary constituents of a stable and specialized population. Such a population of Dutch shipmasters sailed the Archangel route in the first two decades of the eighteenth century.

While Dutch shipping activities in Archangel flourished, their presence in Narva, Vyborg and St. Petersburg was very small. In fact, no population had been established yet, since these cities were conquered by Russia. It would take until 1718 before the measures gathered under the umbrella of polarization would start to sort effect, but once that had happened, things changed rapidly.

(3) transformation

Archangel's monopoly effectively came to an end in 1718, when the ports in the eastern part of the Gulf of Finland resumed their activities, now under Russian reign. The far-reaching changes of the *polarization* process described in the previous paragraph were matched by the increasingly fast adaptation of the population of Dutch shipmasters to these new circumstances. The *specialization* process boosted after 1718 and resulted in the establishment of a new order as early as 1724. The seven-year period between 1718 and 1724 could effectively be called a period of transformation, marked by recurrent changes in the relative position of the various ports in this study as opposed to one another.

[27] This calculation was made on the basis of the number of shipmasters for which the average CR of the patterns they followed was smaller than two.

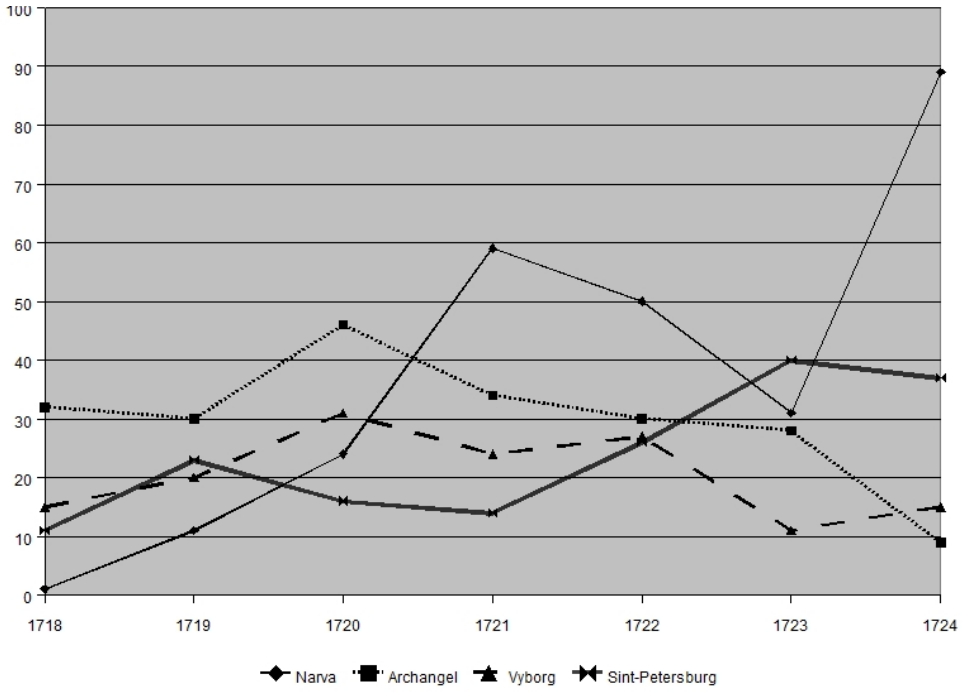

Chart 4: Annual shipping numbers, 1718-1724.

The main empirical features of this process of transformation were: (1) the increasing number of gradual shifts of the shipping population active on the Archangel route to the newly established populations active on the Narva and Vyborg routes (an individual example of the first empirical feature can be found in appendix 6 pt. 2); (2) the almost complete absence of shifts from Archangel to St. Petersburg; (3) the immediate appearance of a strong interference between the populations of Dutch shipmasters active on Narva and Vyborg routes; (4) the formation of a separate population of Dutch shipmasters on the St. Petersburg route, with almost no previous experience in the region of the eastern part of the Gulf of Finland, or any significant interference with the other Dutch maritime shipping populations active in the same region. All these empirical features of the transformation process were observed using the spatial change tool for the years 1718-1724.

In the period 1718-1724 108 Dutch shipmasters were active on the Archangel route, 152 on the Narva route, 129 on the St. Petersburg route and 103 on the Vyborg route. However, the total population of Dutch shipmasters active in this period was not 492, as would be the case when all ports would have had separate populations, but 415. There was interference between the various populations active in the eastern part of the Gulf of Finland and in Archangel. This interference was the strongest between Archangel and Narva, Archangel and Vyborg, and Narva and Vyborg. The number of Dutch shipmasters that was active not only on the St. Petersburg route, but also in one of the other ports in this case-study was limited to twenty on a total of 129 Dutch shipmasters, or 16 percent. This low degree of participation of Dutch shipmasters in the

St. Petersburg population differed strongly from the interference rates of the Vyborg (45 percent), Narva (36 percent) and – to a lesser degree – Archangel (25 percent) populations.

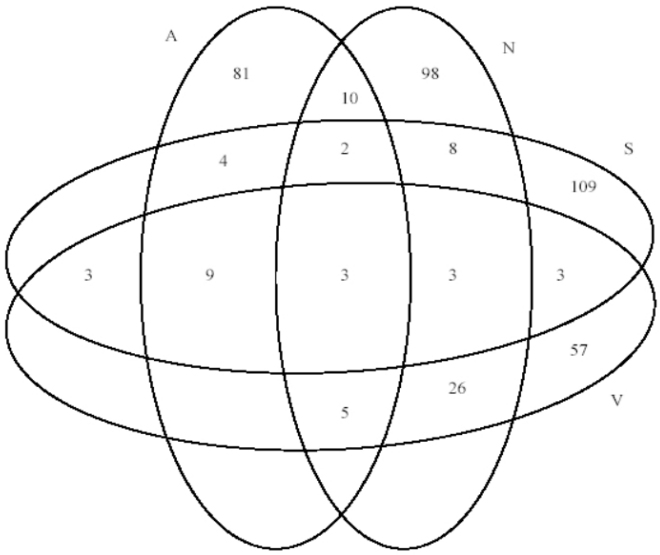

Illustration 2: Visual representation of interference between populations active on various routes, 1718-1724.

(4) new order

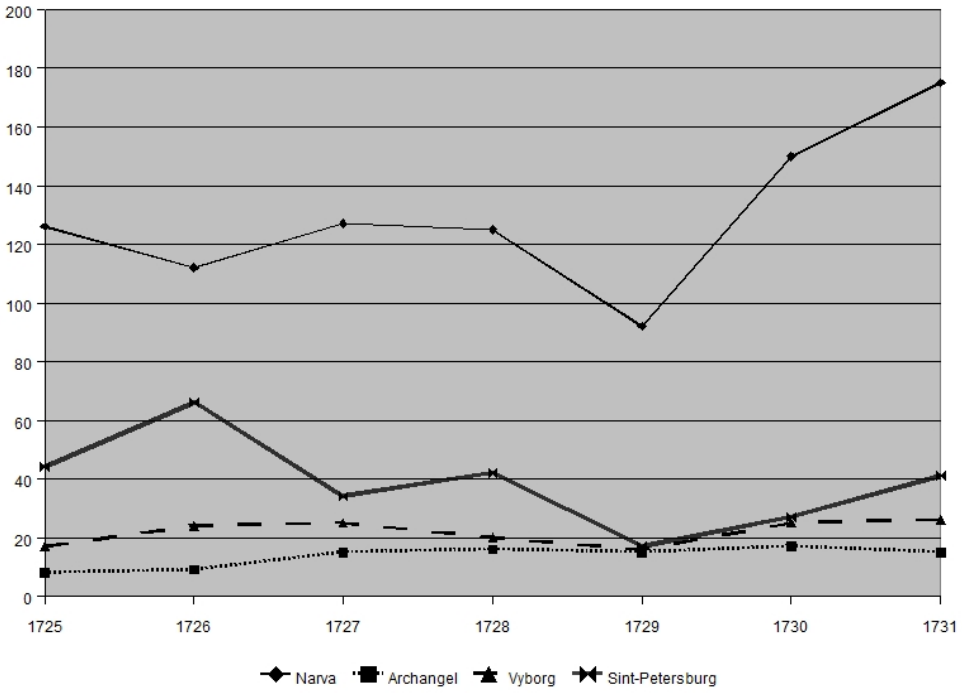

Chart 5: Annual shipping numbers, 1725-1731.

The so-called new order that appeared after 1724 was marked by the absence of significant changes in the participation of Dutch shipmasters on one or another route. Until 1731, the positions of the four central ports in this study would stay the same. Narva took the lead, followed by St. Petersburg, Vyborg and Archangel.

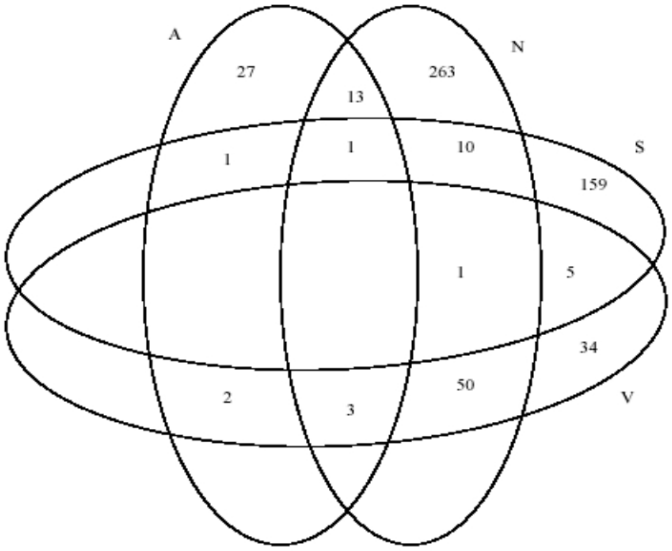

Illustration 3: Visual representation of interference between populations active on different routes, 1725-1731.

The activities of the Dutch shipping populations in the second half of the 1720s had the following characteristics: (1) in Archangel, a very small population of Dutch shipmasters continued its operations; (2) in Narva, a large, highly specialized population of shipmasters dominated timber exports; (3) in Vyborg, a small population of shipmasters dominated timber exports; (4) in Vyborg and in Archangel, an increasing part of the Dutch shipping population interfered with that of Narva, providing evidence of a hierarchical relation in which Vyborg and Archangel welcomed Narva's overhead; (5) in St. Petersburg, a far from stable population of Dutch shipmasters imported and exported valuable goods. Specialization was apparent on various levels. The Archangel population was specialized in its specific route; the Narva and Vyborg populations were specialized in their routes and in the cargoes that they carried from these ports; the St. Petersburg population was – even though formally unstable – active on a route that was used for the import and export of specific kinds of goods that were valued highly at customs.

By calling the period starting in 1725 a "new order", it is by no means intended to suggest that there are no further developments to be observed. Quite the contrary. In the second part of the 1720s the empirical analysis of the various Dutch maritime shipping populations already showed many signs of growing complexity. For instance, increasing interference between the populations on the Narva and Archangel routes

could be observed, which also had its effects on the composition of the Vyborg population.

		Archangel	Narva	Vyborg	St. Petersburg
1725	NEW	n/a	45%	65%	68%
	KNOWN	n/a	55%	35%	32%
	ONCE	n/a	20%	47%	43%
	REST	n/a	80%	53%	57%
1726	NEW	33%	30%	58%	62%
	KNOWN	67%	70%	42%	38%
	ONCE	22%	17%	25%	52%
	REST	78%	83%	75%	48%
1727	NEW	33%	36%	68%	38%
	KNOWN	67%	64%	32%	62%
	ONCE	13%	20%	12%	29%
	REST	87%	80%	88%	71%
1728	NEW	31%	25%	30%	55%
	KNOWN	69%	75%	70%	45%
	ONCE	12%	10%	15%	36%
	REST	88%	90%	85%	64%
1729	NEW	27%	20%	37%	59%
	KNOWN	73%	80%	63%	41%
	ONCE	20%	8%	25%	47%
	REST	80%	92%	75%	53%
1730	NEW	47%	32%	48%	48%
	KNOWN	53%	68%	52%	52%
	ONCE	24%	11%	16%	22%
	REST	76%	89%	84%	78%
1731	NEW	40%	30%	50%	51%
	KNOWN	60%	70%	50%	49%
	ONCE	27%	14%	38%	41%
	REST	73%	86%	62%	59%

Table 5: Changing populations, tabular overview, 1725-1731. Legenda: new = shipmasters that appear on this route for the first time, known = shipmasters that have been registered as active on this route before, once = shipmasters that appear on this route only once in the given period, rest = shipmasters that appear more than once on this route in the given period.

It could be observed that the interference between the populations active in Archangel and in Vyborg almost completely disappeared in favor of a large increase in the interference between the Narva, Vyborg and Archangel populations. At the same time, repetitiveness breakdowns for all four ports in the case-study, provide evidence for the distinctions made between Narva and (to a lesser degree) Archangel on the one hand,

and Vyborg and St. Petersburg on the other hand. The same observation could be made using the changing population tool.

(5) growing complexity & order under threat

In the early 1730s the growing complexity that already made its appearance in the closing years of the 1720s would become a dominant feature of Dutch maritime shipping in the Gulf of Finland and Archangel. This growing complexity took the following forms: (1) intra-year interference between populations; (2) temporary shifts to a destination other than the dominant destination when external circumstances provided unusual opportunities; (3) temporary shifts to a destination other than the one being dominant, when external circumstances forced the shipmaster to do so.

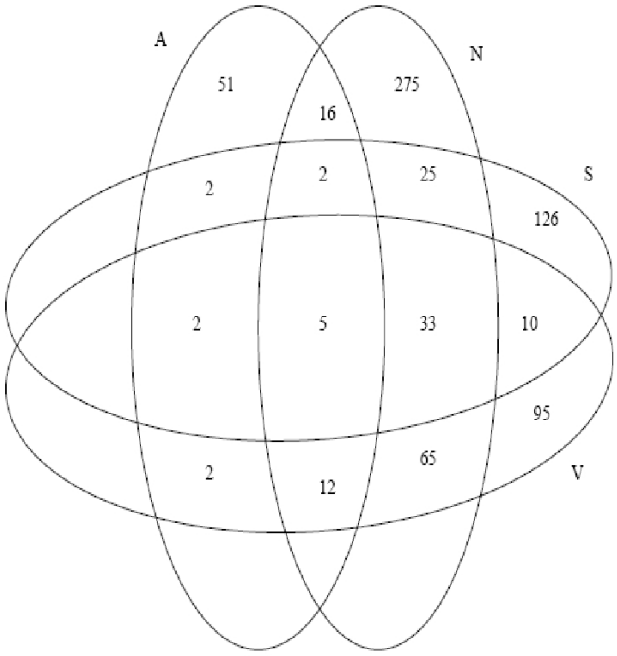

Illustration 4: Visual representation of interference between populations active on different routes, 1732-1740.

A closer look at the shipping patterns in appendix reveals a clear repetitive character (i.e. the existence of a dominant route) in all cases. At the same time, the patterns of Dirk Claasze Hop, Gerrit Claas Hop, Jan Pieters Swaan and Jappe P. Swaan clearly show that shipmasters consciously shifted from one route to the other when external circumstances required him to do so. When turning to the additional information gathered from the sources, we can get a first clue of the reasons for the emergence of these 'pattern shifts'.

Dirk Claasze Hop carried out twenty two return voyages in the years 1724-1739. Eight of them were between Narva and Amsterdam, fourteen between Archangel and

Amsterdam. As far as we know, Dirk Claasze Hop started his career on the Narva route, from where he imported cargoes of timber [1.1-1.4] [28]. He then switched to Archangel for the first time in 1726 returning with a cargo of grain (?) [1.5]. This journey set the tone of the next thirteen years, during which Dirk Claasze Hop annually made one return journey to Archangel early in the year [1.6-1.22]. Interestingly enough, in four cases in the years 1730-1733, he completed a journey to Narva after having returned from Archangel [1.9, 1.11, 1.13, 1.15]. This is in itself evidence of the shipmaster's concern with his possibilities to maximize profit. More important, however, is that this operational strategy coincided with a further evolution of Dirk Claasze Hop's activities on the Archangel route. From 1731 onwards, Hop returned from Archangel with an ever increasing volume of cargo (expressed in the *lastage* of the cargo[29], or CL). Following Knoppers' analysis of the meaning of '*lastage* of the cargo' (CL) and '*lastage* of the ship' (SL), it can be stated that these cargoes did not consist of timber[30]. The pattern of Dirk Claasze Hop can thus be summarized as *repetitive in routes, flexible in cargoes*. Dirk Claasze Hop's career thus contains proof of the first two types of growing complexity, namely: the appearance of intra-year interference between populations and the appearance of temporary shifts when external circumstances provided unusual opportunities. In Dirk Claasze Hop's case the export of ship loads of grain from Archangel was such an opportunity.

In the case of Jan Pieters Swaan [4] the third type of growing complexity finds expression. As can be seen in the appendix, only when external circumstances forced him to leave the Narva route, Swaan appeared on the Vyborg route [4.9, 4.10 and 4.13]. He did not change the type of cargo that he carried, however, as the constant CL clearly shows. From 1734 onwards, the existing order seems to have been become threatened, probably as a reaction to the severe actions the local government of the St. Petersburg district (of which Narva was part) undertook to fight the increasing abuse of forest resources for export purposes (see: the *polarization* process). Shipmasters from Hindeloopen temporarily moved away from Narva, and called at Vyborg, Kronstadt and even St. Petersburg and Archangel instead. These *minor shift* are exemplified by the shipping patterns of Jan [4] and Jappe Swaan [5]. In those cases, where the shipmasters in question re-oriented from Narva to Vyborg and Kronstadt, no changes in the cargo can be found. In case of a shift to Archangel, the different route also provoked a different kind of cargo to be exported from these places. A good example is Jappe Swaan's journey to Archangel in 1740 [5.18].

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[28] Here and in the rest of the paper, numbers between [...] refer to the correspondent number in the appendices. When reference is made to one particular journey registered in the appendices, the number will be structured as follows: [1.5], which means that I am talking aobut the fifth journey of the shipmaster located under number [1] in appendix.

[29] A *last* is a volumetrical measure and a measure of weight that was equal to approximately 2000 kg.

[30] Knoppers, *Dutch trade with Russia*, I, 67-89.

Of course, not all shipmasters were touched by the growing complexity in the organizational structure of Dutch maritime shipping in the Gulf of Finland and in Archangel. The shipping pattern of Gerrit Janse Hop [3] differs from the previous patterns in the way that no shift to a different port of destination could be discovered in the sources. Even though such a shift may have occurred eventually, it is safe to say that the pattern of Gerrit Janse Hop was *repetitive in routes*. At the same time, we can see that Gerrit Janse Hop imported mixed cargo (Dutch: *stukgoed*) to St. Petersburg and exported products valued highly by the Danish customs officers in the Sound. Even though the actual diversity of products exported from St. Petersburg is unknown, it can be assumed that they were similar throughout the journeys. Therefore, this pattern can also be called *repetitive in cargoes*.

5. Generalization

The empirical results of the case-study show that the impact of a new port on the organizational structure of maritime shipping is anything but straightforward. The interplay of local and regional economic policies, infrastructural developments and the location of industries play a major role in the organization of maritime shipping destined to the places and regions that were affected by it. The actual effect on the organization of maritime shipping, however, can be rather unexpected. The reason for this is that maritime shipping is an economic activity in its own right: maritime shipping is defined not only by the nodes it connects nor by its own social structures exclusively, but by both elements at the same time. In adopting organizational strategies varying from flexibility to repetitiveness in the choice of both cargoes and routes, maritime shipping is bounded by destination, the origin of the shipmaster, the size of his ship and the type of cargo carried.

Connections between the region of origin of a population of shipmasters and the destination(s) frequented by these populations are present throughout the relational database. Instead of presenting these patterns one-by-one, I have summarized the data in the following table.

	region of origin												
port of destination	TOTAL ship movements	Frisia		North-Holland		Wadden Islands		West-Frisia		Baltics		Others	
		TOT	%	TOT	%	TOT	%	TOT	%	TOT	%	TOT	%
Archangel	547	125	23%	137	25%	140	26%	84	15%	6	1%	55	10%
Kronstadt	77	40	52%	11	14%	22	29%	1	1%	2	3%	1	1%
St. Petersburg	563	97	17%	192	34%	142	25%	22	4%	80	14%	30	5%
Vyborg	400	201	50%	82	21%	85	21%	19	5%	5	1%	8	2%
Narva	2213	1537	69%	306	14%	239	11%	55	2%	42	2%	34	2%
GRAND TOTAL	3800	2000	53%	728	19%	628	17%	181	5%	135	4%	128	3%

Table 6: Relation between region of origin and port of destination, Source: Galjootsgeldregisters, 1717-1740.

What we observe in the table above, is an obvious distinction between the specialized timber exporting ports of Narva, Vyborg and the less frequented port of Kronstadt on the one hand and the ports of St. Petersburg and Archangel on the other hand. The differences are most notable with regard to the participation of Frisian shipmasters in maritime shipping on these routes. Frisian shipmasters accounted for at least half of all ship movements from Narva, Vyborg and Kronstadt, with an exceptionally high number of movements originating in Narva (69 percen). On the other hand, shipmasters from Frisia were not involved in maritime shipping on the Archangel or St. Petersburg routes to an extent higher than 23 percent in the year 1717-1740. On these routes, shipmasters from North-Holland and from the Wadden Islands were in favor. Of particular importance is the extent to which West-Frisian shipmasters were active on the Archangel route as opposed to the other routes mentioned in the table. 15 percent of all Dutch ship movements on the Archangel route in the years 1717-1740 were executed by West-Frisian shipmasters, most of them coming from Warder. This share is exclusive for Archangel and deserves to be studied in detail. Apparently, some of these shipmasters made a shift to Narva at some point, which is reflected in the absolute numbers for West-Frisian shipmasters on the Narva route; the share of these West-Frisians on the Narva route, however, remained very small (2 percent). The overall picture that evolves from the table above is one of specialization of Frisian shipmasters in timber exports from the eastern Gulf of Finland. The exports of other goods (like hemp, for instance) were concentrated in St. Petersburg and to a lesser degree Archangel in the years 1717-1740. Frisian shipmasters participated in these exports only to a limited extent, while shipmasters from North-Holland and the Wadden Islands had a greater share on these routes. To sum up, we can indeed observe interdependence between the origin of the shipmaster and the port of destination, as this has already been recognized by Unger and Lindblad and De Buck[31]. More precisely, we can observe that shipmasters from one region seemed to be able to gain a dominant position on a limited number of routes. In the cases of Narva, Vyborg and Kronstadt, this position can be directly related to the export characteristics of these ports (timber exclusively), while in the cases of Archangel and St. Petersburg the situation is less univocal. However, even in those cases, the underlying patterns of flexibility and repetitiveness in terms of cargo, origin and destination are equally present.

In the following tables, relations between the port of destination and imported cargo, and the port of departure and exported cargo are established on the basis of the number of ship loads of one type of cargo per port of destination/departure.

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[31] P. De Buck, J.Th. Lindblad, "Shipmasters in the shipping between Amsterdam and the Baltic 1722-1780," W.J. Wieringa (ed.), *The interactions of Amsterdam and Antwerp with the Baltic Region, 1400-1800: papers presented at the 3rd international conference of the "Association internationale d'Histoire des Mers Nordiques de l'Europe", Utrecht, August 30th-September 3rd 1982* (Leiden, 1983), 151-152; W.S. Unger, "De publikatie der Sonttabellen voltooid," *Tijdschrift voor Geschiedenis*, nr. 71 (1958), 187.

	Number of ship movements				
cargo	TOTAL	KRONSTADT	NARVA	ST. PETERSBURG	VYBORG
timber	650	52	452	16	130
grain	56	9	21	17	9
hemp	132	4	6	114	8
iron	7	1	0	6	0
leather	44	0	6	38	0
blanco	137	14	21	99	3
various	426	32	296	5	93
others	50	1	11	26	12

Table 7: Relation between port of departure and exported cargo. Number of ship loads counted. Source: Dutch Sound toll tables, 1714-1740.

It is fair to say that a strong relation between cargo and port of departure existed. Narva, Vyborg and Kronstadt were – before all – specialized in timber exports, while St. Petersburg played a profoundly different role. Exports from St. Petersburg consisted primarily of ship loads containing hemp, iron, juchten and to a lesser degree grain. There is little interference in the type of goods carried from Narva and Vyborg on the one hand and St. Petersburg on the other hand. This lack of interference becomes even more striking when looking at the table containing an overview of imported cargo per port of destination.

	Number of ship movements				
CARGO	TOTAL	Kronstadt	Narva	Sint-Petersburg	Vyborg
ballast	1014	10	844	34	126
mixed cargo	214	0	3	202	9
tobacco	5	0	0	0	5
wine	14	0	1	13	0
salt	46	0	10	9	27
blanco	16	0	3	11	2
various	2	0	1	1	0
others	6	0	1	3	2

Table 8: Relation between port of destination and imported cargo. Number of ship loads counted. Source: Dutch Sound toll tables, 1714-1740.

Indeed, timber exports from Narva, Vyborg and Kronstadt coincided with the almost complete absence of cargo on the journey towards these destinations (marked by the notion *ballast*), whereas shipmasters on their way to St. Petersburg usually had their

ships loaded with mixed cargo and sometimes with wine. Only in a small number of cases did shipmasters on their way to Narva or Vyborg carry tobacco or salt, thus making use of the very limited import possibilities that these ports had. The difference between St. Petersburg as opposed to the other ports in the eastern part of the Gulf of Finland must be understood as a direct consequence of the *polarization* policy that was adopted in favor of St. Petersburg. However, this is not the complete story. In the following paragraph, I will substantiate that a strong relation also existed between the region of origin of the shipmaster and the cargo that he carried. This will be a preparatory step towards the final part of my argument.

Having established strong relations between port of destination and the origin of the shipmaster and between port of destination (or departure) and cargo carried from them, it no surprise that a strong relation can also be found between the region of origin of the shipmaster and the cargo that he carried. The obvious differences in the strategies adopted by shipmasters originating from various regions in The Netherlands finds expression in the following breakdown of type of cargo per region of origin of the shipmaster.

	Number of ship movements						
cargo	TOTAL	FRISIA	N-HOLL.	WADDEN	W.-FRISIA	S.-HOLL	OTHERS
timber	650	358	176	45	18	36	17
grain	56	22	27	4	1	0	2
hemp	132	28	69	19	6	3	7
iron	7	1	5	0	0	0	0
leather	44	4	32	8	0	0	0
blanco	137	37	69	8	2	5	16
various	426	223	162	20	13	2	6
others	50	11	25	7	1	0	6

Table 9: Breakdown of type of cargo per region of origin of the shipmaster; number of ship loads counted. Source: Dutch Sound toll tables, 1714-1740.

The breakdown of type of cargo per region of origin of the shipmaster clearly shows that there is limited interference in the type of goods carried between the shipmasters from different regions of origin. Despite the obvious limitations of the source material[32], it is obvious that timber exports were controlled by Frisian shipmasters. The

[32] The overview presented here was compiled on the basis of data gathered from the Dutch Sound toll tables. So, there is no data available about shipmasters from Archangel. Unfortunately, in a considerable number of cases, no indication of the cargo carried was given in the Dutch Sound toll tables (blanco), while in other cases, large groups of different goods were gathered together without making it possible to connect one good to one particular shipmaster (various). On the other hand, in the majority of cases, only the dominant item of cargo is named, which makes the Dutch Sound toll tables a very convenient source for the creation of summaries like the table above.

participation of shipmasters from North-Holland, South-Holland and the Wadden Islands was small compared to that of Frisian shipmasters, but nevertheless the number of ship loads of timber products was the largest in these regions as well. Especially shipmasters from South-Holland seemed to have been specialized in timber exports from the Gulf of Finland, albeit on a much smaller scale than the Frisian shipmasters. Shipmasters from North-Holland were dominant in the exports of iron, hemp, different kinds of grain and Russian leather. Remarkable, and in line with the established relations between the region of origin and the port of destination of the shipmaster, is the small number of ship loads that was carried by shipmasters originating in Western-Frisia.

The enormous differences between the contents of ship loads destined to or originating from St. Petersburg and ship loads to and from the other ports in the easternmost part of the Gulf of Finland can now find their final confirmation through the observation of the average customs duty paid per last of cargo exported by Dutch ships from the Gulf of Finland (unfortunately, no similar data is available for Archangel).

Indeed, what can be observed here is the difference between so-called *rich trade* of small quantities of expensive goods from St. Petersburg as opposed to *bulk trade* of large, voluminous quantities of cheap (semi-)raw materials from Narva and Vyborg. The average custom paid for one last of cargo coming from St. Petersburg in the years 1722-1740 was 2.9 *rikstaler*. One last of cargo coming from Narva or Vyborg cost only 0.2 resp. 0.3 *rikstaler* at the Danish customs house in Helsingør. When taking a closer look at the data that constituted the basis of this calculation, the discrepancy becomes even more apparent. The total tonnage of cargo exported from Narva between 1722 and 1740 exceeded that of St. Petersburg more than eight times (338.213 lasts of cargo from Narva against 41.668 lasts of cargo from St. Petersburg), while the number of Dutch ships coming from Narva (2.684) was only 3.5 times as large as the number of Dutch ships coming from St. Petersburg (810). At the same time, the total amount of customs paid by Dutch shipmasters on ship loads coming from Narva (84.549 *rikstaler*) accounted for only 71 percent of the total amount of customs paid by Dutch shipmasters on ship loads coming from St. Petersburg (119.494 *rikstaler*).

In the previous paragraphs, I have explained how the polarization and specialization processes influenced the organizational structure of Dutch maritime shipping in the Gulf of Finland after the foundation of St. Petersburg. In the empirical analysis, I have substantiated that shipmasters adopted a number of different strategies in their choice of routes and cargoes, varying from repetitive to flexible patterns. I have denoted the impact of external shocks on the shipmasters' patterns, distinguishing between minor, temporary shifts and major, permanent changes in the shipmasters' behavioral patterns. Until now, however, I have not explicitly paid attention to one underlying explanatory factor that – together with origin of the shipmaster, cargo carried and port

of destination – played a decisive role in the formation of routes and routines. This final explanatory factor is the size of the ship.

The decisive role of the size of the ship can be substantiated by proving its connection to type of cargo carried, origin of the shipmaster and destination of the ship. It goes without saying that the size of the ship influenced the destination of the shipmaster and the type of cargo that he carried. In the following table, the recurring discrepancy between St. Petersburg and the other ports in the eastern part of the Gulf of Finland is present once again. On the basis of data compiled from the *galjootsgeldregisters*, it becomes clear that the ships used by the St. Petersburg population of Dutch shipmasters were much smaller than those used on the Narva, Vyborg and Archangel routes[33]. Seemingly, ships of all sizes were present on all routes. It must be noted, however, that the table above is a static representation of the average ship sizes during the years 1722-1740. On the basis of this table, it is unclear whether or not the occurrence of temporary shifts might have blurred this representation; neither does this overview say anything about the number of small or large ships in the fleets to either of these ports.

	Archangel	Narva	Vyborg	St. Petersburg
AVG	133,2	135,5	124,6	65,3
MIN	27	24	22	15
MAX	230	210	216	180
STDEV	42,7	34,8	43,3	29,4

Table 10: Ship size distribution. Source: Galjootsgeldregisters, 1722-1740.

To sum up, in order to understand the impact of a new port on the organization of maritime shipping it is necessary to take into account both the interplay of economic geographical circumstances and the complex organizational structure of maritime shipping. In my case-study the interplay of economic geographical circumstances took the form of a process of *polarization*; while the evolution of the organizational structure of Dutch maritime shipping was described as a process of *specialization*. As became clear in the empirical analysis, both individual behavioral strategies of Dutch maritime shipmasters and changes in the behavior of populations of shipmasters could be related to the processes of *polarization* and *specialization*, resulting in an evolutionary pattern that shows remarkable resemblance to the theoretical analytical framework of evolutionary economics elaborated by Dopfer et. al. This, in turn, is proof of the successful application of evolutionary theory to a profoundly economic historical topic. The analysis of micro cases and their subsequent integration into a broader scope have clearly shown that databases in which the evolutionary framework of Dopfer, Foster and Potts is reflected enhance the explanatory possibilities of economic historians.

[33] The table is based on standardized name and size information of all ships.

APPENDIX

[1] HOP (Hoop), DIRK (Dirick, Dirck, Direck) Claasze(n) (Claas(en), Claesze, Claasz, Claesen, Clase, Classen), from Warder, Amsterdam, Hindeloopen, Wartena[34]
Ship[35]: Jong Stam (Jonge Ham; 1725-1739, SL: 154 / 146 / 128[36])

1. Amsterdam – Narva – Amsterdam
   a. 1-5-1724. Amsterdam to Narva. Ballast [dsr1466][37]
   b. 23-6-1724. Narva to Amsterdam. 30 rks[38] [dsr1497]
2. 20-8-1724. Amsterdam to Narva. Ballast [dsr1489]
3. Amsterdam – Narva – Amsterdam
   a. 1-7-1725. Narva to Amsterdam. 29 rks [dsr1654]
   b. 21-8-1725. Narva to Amsterdam. CL[39]: 154 [ggr12471]
4. Amsterdam – Narva – Amsterdam
   a. 6-9-1725. Amsterdam to Narva. Ballast [dsr1785]
   b. 29-11-1725. Narva to Amsterdam. 28: 18 rks [dsr1871]
   c. 26-1-1726. Narva to Amsterdam. CL: 146 [ggr12583]
5. Amsterdam – Archangel – Amsterdam
   a. 1726. Amsterdam to Archangel. [sr1307]
   b. 12-2-1727. Archangel to Amsterdam. CL: 180 [ggr12023]
6. Amsterdam – Archangel – Amsterdam
   a. 1727. Amsterdam to Archangel. [sr1322]
   b. 11-2-1728. Archangel to Amsterdam. CL: 128 [ggr12039]
7. Amsterdam – Archangel – Amsterdam
   a. 1728. Amsterdam to Archangel. [sr1332]
   b. 10-11-1728. Archangel to Amsterdam. CL: 128 [ggr12047]
8. Amsterdam – Archangel – Amsterdam
   a. 1729. Amsterdam to Archangel. [sr1354]
   b. 29-3-1730. Archangel to Amsterdam. CL: 128 [ggr12073]
9. Ameland – Narva – Amsterdam
   a. 18-4-1730. Ameland to Narva. Ballast [dsr3345]
   b. 15-6-1730. Narva to Amsterdam. 32:42 rks [dsr3446]

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[34] Here and elsewhere, information about the homeport of the shipmaster is extracted from the galjootsgeldregisters (GGR) of the Directory Boards of Baltic and Muscovy Trade. In a number of cases, several different homeports appeared in connection to one shipmaster. We will treat these variations as facts, and refer to the scholarly works mentioned in footnote 7 for a discussion of the meaning of statements about homeports in early-modern maritime shipping records.

[35] Here and elsewhere, the years in which the shipmaster used the same ship are added in brackets. The information is based on the schipgeldregisters (SR) and galjootsgeldregisters (GGR) of the Directory Boards of Baltic and Muscovy Trade exclusively and does not stand for the years the ship existed. E.g. after 1724 another ship may have started to use the 'Schoenenburg' instead. Unfortunately, we do not know that. The exact occurences of name variations, both with regard to the name of the ship as to the name of the shipmaster, can be found in the databases of SR and GGR (available on request).

[36] SL stands for lastage of the ship, a measure that gives an indication of the ship size. Information about SL is taken from the GGR of both Directory Boards mentioned before. Variations regularly occurred, even when clearly one and the same ship was measured. This was probably due to changes in the measurement procedures and happened mostly in the early 1720s. In such cases, the details about changes in the SL can be found in the on line database.

[37] Here and elsewhere, the number between [] stands for the corresponding number of the record in the Access-databases of the archival sources used. dsr = Danish Sound Toll Registers, nst = Dutch Sound Toll Tables, ggr = Galjootsgeldregisters, sr = Schipgeldregisters.

[38] rks stands for 'riksdalers' and refers to the amount of customs due at the Sound in Elsinore.

[39] CL stands for lastage of the cargo, a measure of the volume of the cargo carried by the ship. Information about CL can be found in the Galjootsgeldregisters (ggr) and in the lastgeldregisters (lg). CL was the basis for the calculation of the galjootsgeld (*galliot duty*) each shipmaster was due upon arrival in Amsterdam. Following the findings of Knoppers, we use the following rule in this paper: CL = SL = cargo of timber; CL > SL ≠ cargo of timber. For details, see: Knoppers, *Dutch trade with Russia*, I, 67-89.

c. 14-7-1730. Narva to Amsterdam. CL: 130 [ggr10648]
10. Amsterdam – Archangel – Amsterdam
a. 1730. Amsterdam to Archangel. [sr1373]
b. 6-3-1731. Archangel to Amsterdam. CL: 128 [ggr12082]
11. Amsterdam – Narva – Amsterdam
a. 16-5-1731. Amsterdam to Narva. Ballast [nst872], [dsr7656]
b. 1-7-1731. Narva to Amsterdam. 32:30 rks [dsr7744]
c. 27-7-1731. Narva to Amsterdam. CL: 130 [ggr10809]
12. Amsterdam – Archangel – Amsterdam
a. 1731. Amsterdam to Archangel. [sr1391]
b. 7-3-1732. Archangel to Amsterdam. CL: 198 [ggr12095]
13. Amsterdam – Narva – Amsterdam
a. 25-4-1732. Amsterdam to Narva. Ballast [dsr6842]
b. 7-6-1732. Narva to Amsterdam. 33 rks [dsr7257]
c. 1-7-1732. Narva to Amsterdam. CL: 130 [ggr11024]
14. Amsterdam – Archangel – Amsterdam
a. 1732. Amsterdam to Archangel. [sr1400]
b. 4-4-1733. Archangel to Amsterdam. CL: 160 [ggr12116]
15. Amsterdam – Narva – Amsterdam
a. 27-4-1733. Amsterdam to Narva. Ballast [nst1009]
b. 6-6-1733. Narva to Amsterdam. Timber, 33 rks [nst1100], [dsr6406]
c. 18-7-1733. Narva to Amsterdam. CL: 130 [ggr11314]
16. Amsterdam – Archangel – Amsterdam
a. 1733. Amsterdam to Archangel. overwintert in Archangel, in 1734 weergekeert [sr1426]
b. 7-8-1734. Archangel to Amsterdam. CL: 215 [ggr12133]
17. Amsterdam – Archangel – Amsterdam
a. 1734. Amsterdam to Archangel. [sr1464]
b. 24-12-1734. Archangel to Amsterdam. CL: 128 [ggr12154]
18. Amsterdam – Archangel – Amsterdam
a. 1735. Amsterdam to Archangel. [sr1482]
b. 13-10-1735. Archangel to Amsterdam. CL: 230 [ggr12167]
19. Amsterdam – Archangel – Amsterdam
a. 1736. Amsterdam to Archangel. [sr1511]
b. 24-8-1736. Archangel to Amsterdam. CL: 250 [ggr12192]
20. Amsterdam – Archangel – Amsterdam
a. 1737. Amsterdam to Archangel. [sr1529]
b. 14-9-1737. Archangel to Amsterdam. CL: 240 [ggr12206]
21. Amsterdam – Archangel – Amsterdam
a. 1738. Amsterdam to Archangel. [sr1547]
b. 27-8-1738. van Archangel gearriveert. [sr1547]
c. 17-9-1738. Archangel to Amsterdam. CL: 128 [ggr12222]
22. 20-10-1739. Archangel to Amsterdam. CL: 214 [ggr12251]

[2] HOP, GERRIT Claas (Classen, Cl.), from Warder, Edam, Texel, Amsterdam
Ship: Juffrouw Elisabeth (1734-1748, SL: 84)
1. 25-4-1732. Texel to Narva. Ballast [dsr6843]
2. Amsterdam – Archangel – Amsterdam
a. 1734. Amsterdam to Archangel. [sr1453]
b. 19-10-1734. Archangel to Amsterdam. CL: 122 [ggr12147]
3. Unknown – Narva – Amsterdam
a. 12-10-1735. Narva to Amsterdam. 124 ½:18 [dsr5612]
b. 17-11-1735. Narva to Amsterdam. CL: 115 [ggr7832]
4. 26-4-1738. Amsterdam to Narva. Ballast [dsr4460]
5. 22-5-1740. Amsterdam to Wiborg. Ballast [dsr3649]

[3] HOP, GERRIT Janse (Janson, J., Hanssen, Jantzen), from Warder, Amsterdam, Broek
Ship: Jonge Cornelis (1737-1738, SL: 50 / 30), Vrijheid (1753, SL: 109)
1. Amsterdam – Sint-Petersburg – Amsterdam

a. 20-7-1737. Amsterdam to Sint-Petersburg. 104:6 rks[dsr4957]
b. 13-9-1737. Sint-Petersburg to Amsterdam. Blanco, 63½:6 rks [nst1528], [dsr4867]
c. 4-10-1737. Sint-Petersburg to Amsterdam. CL: 70 [ggr8160]

2. Amsterdam – Sint-Petersburg – Amsterdam
   a. 22-10-1737. Amsterdam to Sint-Petersburg. Mixed cargo, 156½:12 [nst1589], [dsr4758]
   b. 30-5-1738. Sint-Petersburg to Amsterdam. Blanco [nst1759]
   c. 1-7-1738. Sint-Petersburg to Amsterdam. CL: 50 [ggr8273]
3. Amsterdam – Sint-Petersburg – Amsterdam
   a. 23-5-1740. Amsterdam to Sint-Petersburg. Mixed cargo, 173½ rks [nst2721], [dsr3661]
   b. 7-9-1740. Sint-Petersburg to Amsterdam. CL: 71 [ggr8758]
4. Amsterdam – Sint-Petersburg – Amsterdam
   a. 2-10-1740. Amsterdam to Sint-Petersburg. Mixed cargo, 261½:12 rks [nst2779], [dsr3718]
   b. 9 (10)[40]-12-1740. Sint-Petersburg to Amsterdam. Rye, hemp, 61:6 rks [nst2867], [dsr3627]

[4] SWAAN, JAN PIETERS, from Amsterdam, Hindeloopen
Ship: Vrede van Utrecht (1732-1740, SL: 150)

1. 19-7-1732. Narva to Amsterdam. CL: 156 [ggr1107]
2. 1-12-1732. Narva to Amsterdam. CL: 156 [ggr11220]
3. 14-7-1733. Narva to Amsterdam. Timber [nst1203]
4. 16-7-1733. Narva to Amsterdam. CL: 156 [ggr11288]
5. 23-6-1734. Narva to Amsterdam. CL: 156 [ggr11520]
6. 22-9-1734. Narva to Amsterdam. CL: 156 [ggr11653]
7. 15-11-1735. Narva to Amsterdam. CL: 156 [ggr7826]
8. 1-8-1736. Narva to Amsterdam. CL: 156 [ggr7917]
9. 20-11-1736. Vyborg to Amsterdam. CL: 156 [ggr8011]
10. 19-3-1738. Vyborg to Amsterdam. CL: 156 [ggr8256]
11. 1-12-1738. Narva to Amsterdam. CL: 156 [ggr8503]
12. 11-9-1739. Narva to Amsterdam. CL: 156 [ggr8616]
13. 9-9-1740. Vyborg to Amsterdam. CL: 156 [ggr8760]

[5] SWAAN, JAPPE P., from Hindeloopen
Ship: Vrouw Geertrui (1729-1744, SL: 146)

1. 1-9-1729. Narva to Amsterdam. CL: 146 [ggr10517]
2. 8-11-1730. Vyborg to Amsterdam. CL: 146 [ggr10732]
3. 21-7-1732. Narva to Amsterdam. CL: 146 [ggr11081]
4. 25-11-1732. Narva to Amsterdam. CL: 146 [ggr11211]
5. 19-8-1733. Narva to Amsterdam. CL: 146 [ggr11366]
6. 5-4-1734. Narva to Amsterdam. CL: 146 [ggr11506]
7. 19-7-1734. Narva to Amsterdam. CL: 146 [ggr11589]
8. 17-11-1734. Narva to Amsterdam. CL: 146 [ggr11723]
9. 29-6-1735. Narva to Amsterdam. CL: 146 [ggr7747]
10. 12-11-1735. Narva to Amsterdam. CL: 146 [ggr7822]
11. 2-8-1736. Narva to Amsterdam. CL: 146 [ggr7924]
12. 21-12-1736. Kronstadt to Amsterdam. CL: 146 [ggr8034]
13. 12-10-1737. Kronstadt to Amsterdam. CL: 146 [ggr8171]
14. 9-7-1738. Kronstadt to Amsterdam. CL: 146 [ggr8306]
15. 27-10-1738. Narva to Amsterdam. CL: 146 [ggr8451]
16. 7-8-1739. Narva to Amsterdam. CL: 146 [ggr8569]
17. 3-11-1739. Narva to Amsterdam. CL: 146 [ggr8651]
18. 18-10-1740. Archangel to Amsterdam. CL: 275 [ggr12282]

[40] Date of return 9-12 according to nst, 10-12 according to dsr