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Costs of land and inland water transport in the southern and eastern Baltic area from the 14th to the 16th century: Research, problems, sources and methods**

Koszty transportów lądowych i wodnych śródlądowych
w południowej i wschodniej strefie bałtyckiej w XIV–XVI w.:
badania, problemy, źródła i metody

Abstract: This article considers methodological issues related to research on the costs of land and inland water transport in the southern and eastern parts of the Baltic area from the 14th to the 16th century. The first sections discuss the rather poor historiography devoted to this issue and the state of the preserved sources. Subsequently, the problems often faced by historians when examining the costs of land and inland water transport are presented. One example is the different monetary systems operating in

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the area under investigation. The article also presents coefficients that may be helpful in comparing costs in different areas and from different years.

Keywords: land transport, inland water transport, transport costs, history of the Baltic area, money, source database, economic history

Streszczenie: Niniejszy artykuł dotyczy metodyk związanych z badaniami kosztów transportu lądowego i śródlądowego wodnego w południowej i wschodniej części strefy bałtyckiej w okresie od XIV do XVI w. W pierwszej części omówiona została dość uboga historiografia poświęcona temu zagadnieniu oraz stan zachowanych źródeł wraz z ich ogólną charakterystyką. Następnie przedstawiono problemy, na jakie mogą natrafić historycy badający koszty transportu lądowego i wodnego śródlądowego. Przykładem tych problemów jest zróżnicowanie systemów monetarnych funkcjonujących na badanym obszarze. W artykule zaprezentowano również wskaźniki, które mogą być pomocne w porównywaniu kosztów z różnych badanych obszarów i lat.

Słowa kluczowe: transport lądowy, transport śródlądowy, koszty transportów, historia strefy bałtyckiej, pieniądź, baza źródłowa, historia gospodarcza

1. Introduction

Research dedicated to the economic history of the southern and eastern Baltic region¹ has a tradition spanning two hundred years. From the 19th century, historians from different countries and with different methodological approaches have investigated many aspects of the economic life of the Hanseatic area.²

¹ The term “southern and eastern Baltic area” covers the area from the city of Lübeck, through Mecklenburg, Pomerania, Prussia to Livonia.

² Research to date has largely focused on the history of trade, merchant labor, rents, and the general economic situation of individual countries. Among the more important works in this fields are: J. Ahvenainen, *Der Getreidehandel Livlands im Mittelalter*, Helsinki 1963; R. Czaja, *Strefa bałtycka w gospodarce europejskiej w XIII–XV wieku ze szczególnym uwzględnieniem Prus krzyżackich*, in: *Ziemie polskie wobec Zachodu. Studia nad rozwojem średniowiecznej Europy*, ed. S. Gawlas, Warszawa 2006, pp. 195–245; L. K. Goetz, *Deutsch-russische Handelsgeschichte des Mittelalters*, Lübeck 1922; U. Hauschild, *Studien zu Löhnen und Preisen in Rostock im Spätmittelalter*,

Despite such a rich tradition of research on economic history, the subject of transport costs – in particular the costs of land and inland water transport – has largely been ignored thus far, appearing mainly as a secondary goal in existing work.³ Interestingly, some prior works that dis-

Köln–Wien 1973; A. L. Horoškevič, *Torgovlá Velikogo Novgoroda s Pribaltikoj i Ganzoj v XIV–XV vekah*, Moskva 1963 [A. L. Хорошкевич, *Торговля Великого Новгорода с Прибалтикой и Ганзой в XIV–XV веках*, Москва 1963]; S. Jenks, *England, die Hanse und Preussen: Handel und Diplomatie 1377–1474*, vol. 1–3, Köln–Wien 1992; C. Kardasz, *Rynek kredytu pieniężnego w miastach południowego pobrzeża Bałtyku w późnym średniowieczu* (Greifswald, Gdańsk, Elbląg, Toruń, Rewel), Toruń 2013; Ch. Link, *Der preußische Getreidehandel im 15. Jahrhundert. Eine Studie zur nordeuropäischen Wirtschaftsgeschichte*, Köln–Weimar–Wien 2014; M. Małowist, *Wschód a Zachód Europy w XIII–XVI wieku: konfrontacja struktur społeczno-gospodarczych*, Warszawa 1973; G. Mickwitz, *Aus Revaler Handelsbüchern: zur Technik des Ostseehandels in der ersten Hälfte des 16. Jahrhunderts*, Helsingfors 1938; V. Niitemaa, *Der Binnenhandel in der Politik der livländischen Städte im Mittelalter*, Helsinki 1952; M. North, *Geldumlauf und Wirtschaftskonjunktur im südlichen Ostseeraum an der Wende zur Neuzeit (1440–1570). Untersuchungen zur Wirtschaftsgeschichte am Beispiel des Großen Lübecker Münzfunde und der schriftlichen Überlieferung*, Sigmaringen 1990; H. Samsonowicz, *Untersuchungen über das Danziger Bürgerkapital in der zweiten Hälfte des 15. Jahrhunderts*, Weimar 1969; J. Sarnowsky, *Die Wirtschaftsführung des Deutschen Ordens in Preußen (1382–1454)*, Köln–Weimar–Wien 1993; W. Stark, *Lübeck und Danzig in der zweiten Hälfte des 15. Jahrhunderts*, Weimar 1973; idem, *Untersuchungen zum Profit beim hanseischen Handelskapital in der ersten Hälfte des 15. Jahrhunderts*, Weimar 1985.

³ M. Biskup, *Handel wiślany w latach 1454–1466*, “Roczniki Dziejów Społecznych i Gospodarczych” 1952, vol. 14, pp. 155–202; O. Blümcke, *Die S. Laurentius-Bruderschaft der Träger in Stettin*, “Baltische Studien” 1885, vol. 35, no. 1, pp. 267–359; R. Czaja, *Przenoszenie listów między miastami hanzeatyckimi w strefie bałtyckiej w XIV–XV wieku*, “Klio. Czasopismo poświęcone dziejom Polski i powszechnym” 2012, vol. 23, no. 4, pp. 7–24; K. Fritze, *Zur Lage der hansestädtischen Plebejer*, “Rostocker Beiträge” 1966, vol. 4, pp. 31–44; C. Kardasz, *Der Export von Holz und Waldwaren aus dem südlichen Ostseeraum im Spätmittelalter*, in: *Märkte, Messen und Waren im hansischen Handel*, eds. R. Holbach, J. Sarnowsky, Wismar 2021, pp. 203–228; M. W. Maćkiewicz, *Crews of inland ships in late medieval Prussia*, in: *Pomorze, Prusy i ich sąsiedzi na przestrzeni dziejów. Pomerania, Prussia, and their neighbours throughout history*, eds. J. Moździen et al., Gdańsk 2024, pp. 15–29; idem, *Elbling carters and wagenknechts from the turn of the fourteenth and fifteenth centuries*, in: *Zwischen Ostsee und Adria II. Ostmitteleuropa im Mittelalter und in der Frühen Neuzeit. Die Mobilität von Menschen, Gütern,*

cussed transport of various goods – for example falcons – despite carrying out an analysis of transport frequency, were not interested in transport costs.⁴ The lack of research dedicated to this issue is surprising, especially considering the large number of preserved sources offer an opportunity to investigate this subject using both quantitative and qualitative methods.

Unfortunately, the historiography of other lands is also fairly scant.⁵ Most papers on the history of land or inland water transport do not mention transport costs. These works focus mainly on the efficiency of

Geld, Diplomaten, Reliquien, eds. A. Bárány et al., Debrecen 2024, pp. 287–314; idem, *Wydatki zakonu krzyżackiego oraz rady Starego Miasta Torunia na transporty wojskowe w trakcie kampanii dobrzyńskiej z 1409 roku*, “Acta Universitatis Lodziensis. Folia Historica” 2023, vol. 114, pp. 9–25; H. Samsonowicz, *Formy pracy kupca hanzeatyckiego w XIV–XV w. (Z dziejów techniki wymiany towarowo-pieniężnej)*, “Kwartalnik Historii Kultury Materialnej” 1964, vol. 12, no. 2, pp. 235–278; W. Stieda, *Mündriche und Träger in Reval*, “Beiträge zur Kunde Est-, Liv- und Kurlands” 1912, vol. 7, pp. 86–152; idem, *Pramführer und Träger in Lübeck*, “Zeitschrift des Vereins für Lübeckische Geschichte und Altertumskunde” 1910, vol. 12, no. 1, pp. 49–68; C. Tryk, *Sokolnictwo w Prusach Krzyżackich i Książęcych od XIV do XVI wieku*, Olsztyn 2015; H. von zur Mühlen, *Transportwesen und Reisetätigkeit der Revaler Fuhrleute*, in: *Zwischen Lübeck und Novgorod. Wirtschaft, Politik und Kultur im Ostseeraum vom frühen Mittelalter bis ins 20. Jahrhundert*. Norbert Angermann zum 60. Geburtstag, eds. O. Pelc, G. Pickhan, Lüneburg 1996, pp. 203–221.

⁴ M. L. Heckmann, *Niemand säll valcken versinden dan der meyster. Die Falkenüberlieferung des Deutschen Ordens und des Herzogs in Preußen. Eine quantitative, qualitative und chronologische Auswertung*, “Preußenland” 2023, vol. 14, pp. 23–51; M. L. Heckmann, D. Heckmann, *Sokoły w państwie krzyżackim i księstwie pruskim – rzadkie dobro ekologiczne i ekonomiczne*, in: *Historia. Klimat. Przyroda. Perspektywa antropocentryczna*, eds. P. Oliński, W. Piasek, Toruń 2018, pp. 167–204.

⁵ The few works devoted to the costs of transport include: B. Ballaux, B. Blondé, *Road transport productivity in the sixteenth-century Low Countries: The case of Brabant, 1450–1650*, “The Economic History Review” 2018, vol. 71, no. 3, pp. 707–726; H. Dubois, *Techniques et coûts des transports terrestres dans l’espace bourguignon à la fin du moyen âge*, “Annales de Bourgogne” 1980, vol. 52, pp. 65–82; J. Masschaele, *Peasants, merchants, and markets. Inland trade in Medieval England, 1150–1350*, New York 1997; idem, *Transport costs in Medieval England*, “The Economic History Review” 1993, vol. 46, no. 2, pp. 266–279.

transport,⁶ types of vehicles and draft animals,⁷ transport workers,⁸ and their impact on trade relations. Regrettably, apart from the analysis of transport prices, they examine the issues discussed here only superficially.⁹ Researchers' mission related to transportation costs may be surprising because the question of prices and wages has been, and continue to be, a popular research topic.¹⁰

⁶ D. Ellmers, *Techniken und Organisationsformen zur Nutzung der Binnenwasserstraßen im hohen und späten Mittelalter*, in: *Starssen- und Verkehrswesen im hohen und späten Mittelalter*, ed. R. Ch. Schwinges, Ostfildern 2007, pp. 161–183; J. Langdon, *The efficiency of inland water transport in medieval England*, in: *Waterways and canal-building in medieval England*, ed. J. Blair, Oxford 2014, pp. 110–130; C. von Looz-Corswarem, *Schifffahrt und Handel auf dem Rhein vom Mittelalter bis ins 19. Jahrhundert. Beiträge zur Verkehrsgeschichte*, Köln–Weimar–Wien 2020.

⁷ J. Langdon, *Horse hauling: A revolution in vehicle transport in twelfth and thirteenth-century England?*, "Past and Present" 1984, vol. 103, no. 1, pp. 37–66; idem, *Horses, oxen and technological innovation: The use of draught animals in English farming from 1066–1500*, Cambridge 1986.

⁸ C. Martin, *Carters in the City: The operation and regulation of commercial carriage in the City of London, 1250–1550*, "London and Middlesex Archaeological Society Transactions" 2016, vol. 67, pp. 209–225; A. Schmidt-Händel, *Landtransport im Spätmittelalter und in der Frühen Neuzeit am Beispiel des Erfurter Waidhandels*, in: *Von Nowgorod bis London. Studien zu Handel, Wirtschaft und Gesellschaft im mittelalterlichen Europa. Festschrift für Stuart Jenks zum 60. Geburtstag*, eds. M. L. Heckmann, J. Röhrkasten, Göttingen 2008, pp. 197–212; S. Selzer, *Als Hansehistoriker an sächsischen Geleitstellen: Wagen, Waren und Fuhrleute im Landverkehr zwischen Süd und Nord um 1500*, in: *Märkte, Messen und Waren...*, pp. 129–156.

⁹ J. F. Edwards, B. P. Hindle, *The transportation system of medieval England and Wales*, "Journal of Historical Geography" 1991, vol. 17, no. 2, pp. 123–134; J. Langdon, *Inland water transport in Medieval England*, "Journal of Historical Geography" 1993, vol. 19, no. 1, pp. 1–11; J. Langdon, J. Claridge, *Transport in Medieval England*, "History Compass" 2011, vol. 9/11, pp. 864–875; R. S. Lopez, *The evolution of land transport in the Middle Ages*, "Past & Present" 1956, vol. 9, pp. 17–29; L. Pósán, *Handel und Warenverkehr zwischen Ungarn und dem Balkan im Mittelalter*, in: *Zwischen Ostsee und Adria...*, pp. 237–270; J. F. Willard, *Inland transportation in England during the fourteenth century*, "Speculum: A Journal of Medieval Studies" 1926, vol. 1, pp. 361–374.

¹⁰ For the general state of research at the end of the 20th century, see: D. H. Fischer, *The Great Wave: Price revolutions and the rhythm of history*, New York–Oxford

To fill this gap in research, this article presents the sources and methods needed to analyse the costs of land and inland water transport on the southern coast of the Baltic Sea from the 14th to the 16th century. This does not mean that it will not be useful for researchers in other regions, especially the methodological part. The relative paucity of research on the costs of land and inland water transport – not only for the Baltic area – means that the problem of which tools are best used to study transport costs remains an important question.

The article considers the following three questions: What sources can be used to carry out research on land and inland water cost of transport? Why is the “simple” analysis of price changes not a sufficient analysis of transport price? In what ways is it useful for research on transport to compare costs with the amount of silver contained in coins and the trofa index?¹¹ As a conclusion, it will also propose two measures that will significantly facilitate research on transport costs.

2. Sources

Before we move on to methodological issues, I would like to present the sources – both published and archival ones – that may be used by a researcher of transport costs in the Baltic area.

The base of published accounting sources from the Baltic area is quite large. The first group I would like to present here are the sources created by the administration of the church. The most numerous of these sorts of sources are those created by officials of the Teutonic Order. They include: The Book of Marienburg's Treasurer,¹² The Book of Marienburg's

1996. There one will also find a bibliography of price research for the 19th and 20th centuries.

¹¹ This index will be explained later in the article.

¹² *Das Marienbueger Tresslerbuch der Jahre 1399–1409*, ed. E. Joachim, Königsberg 1896. Further cited as MTB.

House Commander,¹³ The Book of Marienburg's Convent,¹⁴ debt books and invoices of the Grand Schaffer and Lieger of the Teutonic Order in Prussia,¹⁵ and various other minor sources.¹⁶ The remaining published church accounts involve those of individual priests.¹⁷

The second category of published accounting sources are municipal ones originating from town administrative offices. This group encompasses the treasury books from the following towns: Reval (currently Tallinn),¹⁸ Riga (currently Rīga),¹⁹ Danzig (currently Gdańsk),²⁰ Elbing

¹³ *Das Ausgabebuch des Marienburger Hauskomturs für die Jahre 1410–1420*, ed. W. Ziesemer, Königsberg 1911. Further cited as AMH.

¹⁴ *Das Marienburger Konventsbuch der Jahre 1399–1412*, ed. W. Ziesemer, Danzig 1913; *Die Reste des Marienburger Konventsbuch aus den Jahren 1395–1398*, "Zeitschrift des Westpreussischen Geschichtsvereins" 1920, vol. 60, ed. A. Sielmann, pp. 67–73.

¹⁵ *Schuldbücher und Rechnungen der Großschäffer und Lieger des Deutschen Ordens in Preussen*, vol. 1–4, eds. C. A. Franzke et al., Köln–Weimar–Wien 2008, 2013, 2018.

¹⁶ Numerous accounting sources were published by Jürgen Sarnowsky, see: J. Sarnowsky, op. cit., pp. 707–859.

¹⁷ *Rachunki plebana kościoła parafialnego Świętych Janów w Starym Mieście Toruniu z lat 1445–1446*, "Roczniki Historyczne" 2003, vol. 69, ed. A. Radziński, pp. 167–187.

¹⁸ *Tallinna wanimad linna arweraamatud: 1363–1374/Die ältesten Kämmerereibücher der Stadt Reval: 1363–1374*, ed. O. Greiffenhagen, Tallinn 1927; *Das Revaler Kämmerereibuch von 1376–1380*, "Zeitschrift für Ostforschung" 1992, vol. 41, ed. D. Heckmann, pp. 186–247; *Kämmerereibuch der Stadt Revel 1432–1463*, ed. R. Vogelsang, Köln–Wien 1976–1979; *Kämmerereibuch der Stadt Reval 1463–1507*, ed. R. Vogelsang, Köln–Wien 1983. Further cited as KSR.

¹⁹ *Kämmererei-Register der Stadt Riga: ein Beitrag zur deutschen Wirtschaftsgeschichte*, ed. A. von Bulmerincq, Leipzig 1902; *Die Kämmererei-Register der Stadt Riga 1348–1361, 1405–1474*, ed. A. von Bulmerincq, Riga 1909. Further cited as KRSR.

²⁰ *Najstarsza księga kamlarska Głównego Miasta Gdańska z lat 1379–1382*, in: *Najstarsze księgi kamlarskie Głównego Miasta Gdańska z XIV–XV wieku*, ed. M. Grulkowski, Warszawa 2016, pp. 102–203, further cited as NKKGMG; *Podręczny rejestr kamlarii Głównego Miasta Gdańska z drugiej połowy XV w.*, in: *ibidem*, pp. 227–277, further cited as PRKGMG.

(currently Elbląg),²¹ Thorn (currently Toruń),²² Rostock.²³ These books are not the only published accounting sources created by the town treasuries. Other sources are the accounts of city offices,²⁴ military expenses,²⁵ maintenance of churches,²⁶ and accounts for council feasts.²⁷

The final, more copious group of sources were produced by merchants.²⁸ These include books belonging to wealthy merchants such as Hildebrand Veckinchusen, Johan Pyre, or Matheus Spielmann, as well

²¹ *Nowa księga rachunkowa Starego Miasta Elbląga 1404–1414*, vol. 1–2, ed. M. Pelech, Warszawa–Poznań–Toruń 1987–1989. Further cited as NKRSME.

²² *Księga kamlarii miasta Torunia 1453–1495*, eds. K. Kopiński, K. Mikulski, J. Tandecki, Toruń 2007.

²³ *Mecklenburgisches Urkundenbuch Bd. 10*, ed. Verein für Meklenburgische Geschichte und Alterthumskunde, Schwerin 1877, no. 7118; *Mecklenburgisches Urkundenbuch Bd. 13*, ed. Verein für Meklenburgische Geschichte und Alterthumskunde, Schwerin 1884, no. 7726.

²⁴ *Das Hafenbuch von Treptow an der Rege 1536–1569*, eds. S. Birli, H. Wernicke, Köln–Weimar–Wien 2017; *Ein Ausgabenverzeichnis für Mauerausbesserungen der Revaler Bürgerstadt von 1388/89*, “Zeitschrift für Ostforschung” 1988, vol. 37, ed. D. Heckmann, pp. 175–186; *Księga Theudenkusa*, ed. L. Koczy, Toruń 1937. Further cited as Kth.

²⁵ I. Janosz-Biskupowa, *Materiały dotyczące udziału Torunia w wyprawie krzyżackiej na ziemię dobrzyńską w r. 1409*, “Zapiski Historyczne” 1960, vol. 25, no. 2, pp. 83–101.

²⁶ *Średniowieczne rachunki kościołów toruńskich*, eds. A. Sumowska, M. Sumowski, P. Oliński, Toruń 2023; M. Sumowski, *Rachunki witryka kościoła św. Jakuba w Toruniu z 1468 r.*, in: *Parafie w średniowiecznych Prusach w czasach Zakonu Niemieckiego od XIII do XVI w.*, ed. R. Biskup, A. Radziwiński, Toruń 2015, pp. 237–271.

²⁷ B. Herdзин, P. Oliński, *Rachunki z uczty wydanej na cześć wielkiego mistrza Ulryka von Jungingen w Toruniu w 1407 roku*, in: *Studia nad dziejami miast i mieszczaństwa w średniowieczu. Studia ofiarowane Profesorowi Antoniemu Czacharowskiemu w sześćdziesiątą piątą rocznicę jego urodzin i czterdziestolecie pracy naukowej*, eds. R. Czaja, J. Tandecki, Toruń 1996, pp. 295–301.

²⁸ *Die Handelsbücher des Hildebrand Veckinchusen*, eds. M. P. Lesnikov, W. Stark, Köln–Weimar–Wien 2013; *Kaupmees Matheus Spielanni Arveraamatud 1568–1570*, ed. I. Leimus, Tallinn 2017; S. Stockhusen, *Hinrik Dunkelgud und sein Rechnungsbuch (1479 bis 1517). Lebensformen eines Lübecker Krämers an der Wende vom 15. zum 16. Jahrhundert*, Stuttgart 2019; A. P. Orłowska, *Johan Pyre. Ein Kaufmann und sein Handelsbuch im spätmittelalterlichen Danzig. Darstellung und Edition*, Wien–Köln–Weimar 2022.

as those belonging to stallholders, such as Hinrik Dunkelgud. The relevance of this type of source for research on transport costs in the Baltic area has already been demonstrated by Gunnar Mickwitz.²⁹

Naturally, published sources are not the only documentation that should be used when investigating the costs of land and inland water transport. There are many unpublished accounting books in archives in Germany, Poland, Latvia, Estonia and Sweden. Unpublished sources can be split into the same groups, i.e. sources of church provenance, city councils and merchants. The sum of the information contained in published and unpublished sources will create a huge database to enable a quantitative analysis of carriage costs.

However, certain limitations of the preserved sources should be mentioned. For instance, there are practically no extant agreements between transport clients and land carriers for the period under consideration in this article. The only source of this type, as far as I know, is the contract between two inhabitants of Reval, the merchant Marquard Bretholt and the carter Lorenz Karman. This agreement dates back to the turn of the 16th century and concerns transport involving 5 horses and 5 sleighs.³⁰ A substitute for these sources may be the contracts concluded between the merchants and the skippers, some of which have survived and have already been edited and discussed in historiography.³¹

It should also be remembered that among the transport costs examined, the majority concern transport for territorial rulers (e.g., the Teutonic Knights or bishopricks) or town councils. This domination of official sources over private ones is also dictated by the fact that sources created by officials usually end up in the municipal archives, thanks to which they have survived to this day. By contrast, private sources could have been

²⁹ G. Mickwitz, op. cit., pp. 143–151.

³⁰ *Revaler Urkunden und Briefe von 1273 bis 1510*, ed. D. Heckmann, Köln–Weimar–Wien 1995, no. 172.

³¹ R. Vogelsang, *Salz und Korn. Zum Revaler Handel im 15. Jahrhundert*, in: *Reval: Handel und Wandel vom 13. bis zum 20. Jahrhundert*, eds. N. Angermann, W. Lenz, Lüneburg 1997, pp. 143–148.

either destroyed by the owners or their heirs over time, or destroyed due to wars or other events such as natural disasters.

The preserved accounting sources are plagued by an additional fundamental issue: inaccurate calculations. Erroneous calculations of both income and expenditure found in the account book of the city of Greifswald from the years 1361–1409 were investigated by Georg Fengler. The magnitude of these mistakes is well illustrated by the fact that in 1395 Greifswald's income was 1107 marks, according to the author of the account book, whereas Fengler's calculations indicated that the city's income was roughly 973 marks.³² Additionally, the error could have been greater than 100 marks in terms of expenditure.³³ Miscalculations were also recorded for sources from Prussia.³⁴ In summary, when examining transportation costs, it is important to remember that some costs may differ significantly from others. This difference was not caused by market factors or, for example, weather conditions, but by simple errors on the part of the sources' creators.

It is necessary to remember that accounting sources are not the only kind that are helpful for this topic. Economic life has always operated within a legal framework, which could also involve matters related to transport costs. An example of such legal regulations are the Statutes (Ger. *Willkür*) for the Brotherhood of Vistula Skippers, which included all skippers from late medieval Prussia. These statutes raised the issue of calculating transport costs per mile traveled and resolving the question of daily wages for crews.³⁵

³² G. Fengler, *Untersuchungen zu den Einnahmen und Ausgaben der Stadt Greifswald im 14. und beginnenden 15. Jahrhundert (besonders nach dem Kämmererbuch von 1361–1411)*, Greifswald 1936, pp. 83, 116.

³³ Ibidem, pp. 115–116.

³⁴ W. Długokęcki, *Mierzeja Wiślana od XIII do połowy XV wieku (1454 r.)*, Gdańsk 1995, pp. 173–193; M. W. Maćkiewicz, *Elbing carters...*, p. 291.

³⁵ *Acten der Ständetage Preussens unter der Herrschaft des Deutschen Ordens*, vol. 1, ed. M. Toeppen, Leipzig 1878, no. 17, 22, 46. About daily wages for crew members, see: M. W. Maćkiewicz, *Crews of inland ships...*, pp. 26–27.

Useful sources of information are also privileges granted to porters, carters and bordings³⁶ carriers brotherhoods.³⁷ These privileges are similar to the Statutes for the Brotherhood of Vistula Skippers. They not only contain information about how a given brotherhood functioned, but they also provide information about the remuneration its members received for the haul services provided.³⁸

Official prices for transportation costs can be found not only in the statutes of the brotherhoods, but also in independently issued documents, the so-called “fuhrtaxen”. An example of such a document is the Fuhrtaxen of Reval from 1542, which regulated the transport prices of, for example, bags of salt.³⁹

Having categorised the sources into three main parts and providing a general outline of the preserved sources, it is time to describe the history of selected archives that store these sources. This description will offer some insight into what causes particular gaps in the source material. The number of available sources for towns in the Baltic area varies. For example, the sources for medieval and early modern Königsberg (currently

³⁶ A type of inland and coastal vessel used to unload goods from larger vessels – that is, those that could not enter the river port – into the port. Read more about this ship: R. Domżał, *Statki i ich załogi na Dolnej Wiśle w XIII–XV wieku*, Gdańsk 2014, pp. 38–40.

³⁷ About the functioning of these brotherhoods, see: O. Blümcke, op. cit., pp. 267–359; R. Domżał, op. cit., pp. 64–89; K. Fritze, op. cit., pp. 33–39; W. Stieda, *Mündriche und Träger...*, pp. 86–152; idem, *Pramführer und Träger...*, pp. 48–68; G. Strenga, *Turning transport workers into Latvians? Ethnicity and transport workers' guilds in Riga before and after the Reformation*, “Journal of Baltic Studies” 2021, vol. 52, no. 1, pp. 61–83. In addition, some of the brotherhood privileges were also published in above works of Blümcke and Stieda.

³⁸ An example of such a source is the brotherhood of carters from Reval, whose first statute dates back to 1435, see: *Liv-, est- und kurländisches Urkundenbuch*, vol. 8, ed. H. Hildebrand, Riga–Moscow 1884, no. 1030. For guilds from Riga, see: *Schragen der Gilden und Aemter der Stadt Riga bis 1621*, eds. W. Stieda, C. Mettig, Riga 1896, pp. 233–235, 252–260, 278–281, 414–421.

³⁹ P. Johansen, H. von zur Mühlen, *Deutsch und Undeutsch im mittelalterlichen und frühneuzeitlichen Reval*, Köln–Wien 1973, pp. 456–457.

Kaliningrad) were almost entirely destroyed during the Second World War.⁴⁰

A similar fate befell the sources from the archives of Dorpat (currently Tartu), in which few sources have survived for the 14th, 15th and 16th centuries. This is due to the destruction of the city archive during the Livonian War (1558–1582).⁴¹

In the case of Thorn, it is known that many municipal treasury books were damaged during the siege of the town by the Swedes at the beginning of the 18th century.⁴² Fortunately, other records of expenses of town offices have been preserved. What is also important, the archive in Thorn, unlike the Königsberg archive, was lucky that it did not suffer any major losses during the Second World War.⁴³

The sources stored in the former archives of the Teutonic Order have two completely different histories. The archives of the Prussian branch of the Order were kept in Königsberg from the 15th century until the Second World War. The Order's manuscripts survived the war in relatively good condition. Currently, the sources of the Prussian Branch of the Order are mostly kept in Geheimes Staatsarchiv Preußischer Kulturbesitz in Berlin, under the signature XX. Hauptabteilung (XX. HA).⁴⁴ The archive of the Livonian Branch of the Order was less fortunate. After the secularisation of Order's Livonian Branch in 1561, the archive fell into the possession of

⁴⁰ D. Heckmann, *Wiederherstellung eines verlorenen Archives – das Beispiel des Stadtarchivs Königsberg in Preußen*, "Archivalische Zeitschrift" 2005, vol. 87, pp. 185–188; J. Tandecki, *Średniowieczne księgi wielkich miast pruskich jako źródła historyczne i zabytki kultury mieszczańskiej (organizacja władzy, zachowane archiwalia, działalność kancelarii)*, Warszawa–Toruń 1990, p. 86.

⁴¹ J. Götz, *Das Archiv des livländischen Deutschordenszweiges. Eine archivgeschichtliche Untersuchung*, in: *Die Kirche im mittelalterlichen Livland*, eds. R. Biskup, J. Götz, A. Radziwiński, Toruń 2019, pp. 9–10.

⁴² K. Ciesielska, *Zarys dziejów Archiwum Toruńskiego*, "Zapiski Historyczne" 1978, vol. 43, no. 4, pp. 11, 13–14.

⁴³ M. Grulkowski, *Najstarsze księgi miejskie Głównego Miasta Gdańska z XIV i początków XV wieku. Studium kodykologiczne*, Warszawa 2015, pp. 22–31.

⁴⁴ W. Vogel, *Zur Geschichte des Geheimen Staatsarchivs Preußischer Kulturbesitz*, "Archivar" 1992, vol. 45, pp. 338–343.

Gotthard Kettler and his inheritor. Gotthard moved the Order's archive to his residence in Mitau (currently Jelgava). Unfortunately, this estate was besieged and captured by the Swedes in 1621. From this time, the archive of the Livonia Branch of the Order was dispersed. Today, the remains of this archive can be found in archives in Sweden, Denmark, Germany and Latvia.⁴⁵

However, the turbulent history of the archives from the Baltic Sea area does not pose a serious problem for researchers of the economic history of this region. Many ledgers or accounts for the territories of modern Germany have survived, as well as for Poland, Latvia and Estonia, which contain information on transport costs.

In the area considered in this article, between the 14th and 16th centuries there was a change in the language in which pragmatic records were kept. From the second half of the 14th century, in many Baltic cities, registers were increasingly written in Middle German (both Low and High Middle German). The gradual popularisation of the German language meant that from the 15th century onward, most municipal accounts and those kept by the Teutonic Order were written in Middle and Early Modern German.⁴⁶

The language change led to a visible change in the quality of the preserved information on transport costs. Sources written in Latin usually contained very short information about transport costs. A good example of this is *The Oldest Book of the Municipal Treasury of the Main Town of Danzig* from 1379–1382. This book was mostly written in Latin. Most of the transportation costs were recorded as follows: "Aurige: Item 3 fer. Item 3 fer. Item 3 fer. Item 3 fer. Item 3 fer. Item 3 fer. Item 3 fer. Item 25 sc. Item 25,5 sc. Item 28 sc minus 4 den. Item 1 mk. et 1 sc. Item 19 sc. Item 21 sc. Item 20 sc. minus 1 sol. Item 21 sc. Item 3 fer. Item 3 fer."⁴⁷ There are more similar mentions in this source.⁴⁸ Regrettably, such records are useless in research on transport costs. They only give

⁴⁵ J. Götz, *op. cit.*, pp. 9–77.

⁴⁶ C. Kardasz, *Rynek kredytu pieniężnego...*, pp. 67–70.

⁴⁷ NKKGMG, p. 106.

⁴⁸ NKKGMG, pp. 116, 128, 140, 155, 176.

information that certain carriers received different payments for transport. However, it is not known what kind of transport this was, what route it took, when it was transported, etc. Only occasionally does this source mention the section where the transport operation took place. Such examples are: "Item nuncio ad Elbinghum 7 sc.",⁴⁹ "Item ad reysem in Puczk 1 mk. 9 sc. et 2 den.",⁵⁰ "Item 1 mk. ad reysam in Marienborch",⁵¹ "Item 1,5 mk. versus Marienborg",⁵² "Item nuncio in Thorun 4 sc."⁵³ However, as we can see, these examples only inform us about the costs and the route. The goods that were transported were not recorded there.

Records kept in Middle German frequently contain additional information about the transport operation carried out. For example, from The Handy Register of the Municipal Treasury of the Main City of Danzig from 1463–1464 one can read that: "Item Schulten vor bergervisch, vor heringe den heren, de to Marienborch voren, und oly 16 sc."⁵⁴ This note tells us who the carrier was, what goods were transported, on what section this transport took place, and how much the transport cost. Furthermore, we can also discover more information from preserved sources. For instance, a mention from the accounts of the Teutonic Order from Althausen (currently Starogród) informs us that: "Item 8 mr. 12 s. vor 16 ton[nen] Danczker bir. Item 1 mr czu fracht vor das bir von Danczk bis czu Kolmen".⁵⁵ From this source we learn what was transported, how much the transported goods cost, how much the transport itself cost, on what section the transport took place, and that it was inland water transport.

Some sources reveal when a given transport operation took place. The best source of information about this is the Reval Municipal Treasury books. These sources were recorded chronologically throughout the en-

⁴⁹ NKKGMG, p. 109.

⁵⁰ NKKGMG, p. 125.

⁵¹ NKKGMG, p. 134.

⁵² NKKGMG, p. 135.

⁵³ NKKGMG, p. 154.

⁵⁴ PRKGMG, p. 266.

⁵⁵ Geheimes Staatsarchiv Preußischer Kulturbesitz: XX HA, Ordensbriefarchiv, no. 7546, k. 3v.

tire period under study, so they enable us to examine whether, for example, the seasons had an impact on the cost of transport.⁵⁶ In the case of these sources, at the beginning of each group of entries, we have information on what day they were entered into the book. Therefore, we can assess with a high degree of accuracy when a given transport took place. For instance: “Sabatto ante Martini [...] Item betalt Bartolomeus Vorman-schen vor 3000 unde 200 dackstene to vorende 3 mr. 7 s.”,⁵⁷ “Sabbato ante Letare [...] Item betalt vor 37 hupe stens to vorende unde uptosettende 59 mr. myn 6 s.”⁵⁸

In books that were not recorded chronologically, there is sometimes information about when transport operations took place. For example: “Item 23 scot eyne furmanne, eyne schirmecher eyne koch und eyne koch ken Labiow zu füren, die dem voythe Samaythen sollen, am obunde Petri und Pauli apostolorum”,⁵⁹ “Item 1 mrc Hans, dem dyner, gesant mit drabanten vor Marienborg Annucciacionis Marie”.⁶⁰

Occasionally, we can also find very precise notes in the sources that include how to calculate transport costs. Examples of such mentions are: “Item 5 m. 10 sc. 10 d. Pauwel furmanne unde syme conpan vor wyn czu füren unserm homeyster ken der Konicz unde ouch eyne teyl des weder heerczufüren, vor 54 mylen gelonet”,⁶¹ “Item 11 sc Niclos Behmen eyne furmanne mit 2 pferden vor eyne vas wyn dem herren erczbisschoffe von Ryge czum Bratyan czu füren, jo dem howpthe von der myle 1 sc.”⁶² Unfortunately, the above method of recording is very rare, and most of the preserved records do not inform us how transport costs were calculated.⁶³

⁵⁶ M. Grulkowski, *Najstarsze księgi miejskie Głównego Miasta Gdańska z XIV i początków XV wieku*, pp. 401–402.

⁵⁷ KSR, p. 633.

⁵⁸ KSR, p. 853.

⁵⁹ MTB, p. 400.

⁶⁰ KTh, p. 164.

⁶¹ AMH, p. 255.

⁶² AMH, p. 144.

⁶³ For a similar observation, see: B. Ballaux, B. Blondé, op. cit., pp. 710–711.

Despite any reservations it may have about the methods of recording transport costs, the source material provides considerable opportunities to conduct research on the cost of land and inland water transport. However, the collected source material requires appropriate methodological processing so that it can be transformed into a valuable study.

3. Problems and methods

Research linked to transport costs in pre-industrial times must inevitably face many problems, both conceptual and related to source. This part of the article will present problems regarding the functioning of the economy of the southern coast of the Baltic Sea, such as various types of payments and numbers of monetary systems. Furthermore, indices that are inherent in research on transport costs will also be provided in this part of the article.

3.1. Types of transport payments

In our present times, it is easy to determine the type of payment for transport. Contracts between the carrier and the client involve the transport cost in the agreed currency. In the past, the types of payment were more manifold than they are today. These remittances can be divided into three types. The first involved monetary payments. The second was remuneration by transferring some usable good, e.g., clothes. The third was associated with feudal obligations. The latter did not belong to goods-money relations, and therefore will not be subject to further analysis.

The monetary payments can be grouped into three auxiliary subgroups: ordinary payments, gifts, and travel money (Ger. *Zerung*, *Terung*). The term ordinary payment is understood as a monetary remittance from the client to the transport operator. This remuneration could be calculated in four methods. It could be a daily or weekly wage,⁶⁴ earnings based

⁶⁴ NKRSME I, p. 23.

on the quantity of goods transported,⁶⁵ payment based on the number of draft animals used⁶⁶ or a salary related to the distance.⁶⁷ In accounts from the Baltic area, we can also find numerous references to gifts received by carriers. Based on the Marienburg Treasurer's Book, it can be concluded that most of the gifts were received by people associated with the Teutonic Order, for instance the Order's servants (Ger. Knecht or Diener),⁶⁸ or emissaries of other rulers.⁶⁹ However, it should be remembered that gifts were also obtained by villagers,⁷⁰ carters,⁷¹ ship's servants⁷² and ferry operators.⁷³ The last type of monetary payment for transport was travel money. This sort of payment was usually collected by messengers,⁷⁴ members of the urban elite⁷⁵ or servants who were responsible for the transport operation.⁷⁶

Due to the fact that remuneration in the form of transfers of goods are usually recorded with information about the price of these goods. It is possible to compare both types of payments which, in turn, will provide an answer regarding whether the prices of such transport were similar or whether one of them was more profitable for the client. As we can see, the multiplicity in types of payment is one of the factors that should be examined to answer whether they had any impact on the final cost of the transport action.

⁶⁵ NKRSME I, p. 97.

⁶⁶ NKRSME I, p. 84.

⁶⁷ AMH, p. 255.

⁶⁸ MTB, p. 193.

⁶⁹ MTB, p. 544.

⁷⁰ MTB, p. 480.

⁷¹ MTB, p. 423.

⁷² MTB, p. 165.

⁷³ MTB, p. 270.

⁷⁴ KRSR, p. 80.

⁷⁵ KRSR, p. 86.

⁷⁶ MTB, p. 521.

3.2. The problem with different monetary systems

The southern coast of the Baltic Sea did not constitute a single political system in the period under study. The considered region was divided in different periods between powers such as the Teutonic Order (Prussia and Livonia), episcopal rulers (Prussia and Livonia), the Kingdom of Poland (Prussia), the Kingdom of Denmark (Livonia), the Kingdom of Sweden (Livonia), feudal lords from the Holy Roman Empire (Pomerania and Mecklenburg), and free cities of the Empire (e.g. Lübeck). The variety of political forces meant that individual areas of the southern Baltic coast had different monetary systems.

On the southern coast of the Baltic Sea, there was no single constant conversion rate from marks to denars. For instance, in Lübeck, 1 Lübeck mark consisted of 16 shillings or 192 denars.⁷⁷ The same monetary system operated in Greifswald.⁷⁸

Until the beginning of the 15th century, the monetary system in Prussia was as follows: 1 Prussian mark consisted of 1 ferding or 24 scots or 60 shillings or 720 denars.⁷⁹ The monetary system of Prussia was further complicated by the reform of Grand Master of the Teutonic Order Michael Küchmeister (1414–1422). Küchmeister added to the previously existing system of Prussian marks – from now on called “good” Mark – a second mark system, the so-called “weak” mark (Ger. *geringes mark*).⁸⁰ The value ratio between these units of account was 1 : 2. Further reforms took place at the end of the 15th century. Based on these, the Prussian monetary system was as follows: 1 mark consisted of 1⅓ gulden or 4 ferd-

⁷⁷ F. Engel, *Tabellen alter Münzen, Maße und Gewichte zum Gebrauch für Archivbenutzer*, Rinteln 1965, p. 14.

⁷⁸ G. Fengler, op. cit., pp. 118–120.

⁷⁹ E. Joachim, Vorwort, in: *Das Marienbueger Tresslerbuch der Jahre...*, p. VIII.

⁸⁰ M. Dygo, *Die Münz- und Währungspolitik des Deutschen Ordens in Preussen in der ersten Hälfte des 15. Jahrhunderts*, transl. W. Borodziej, Warszawa 1987, pp. 26–42; O. Volckart, *Die Münzpolitik im Ordensland und Herzogtum Preussen von 1370 bis 1550*, Wiesbaden 1996, pp. 75–90.

ings or 20 groschs or 60 shillings or 360 denars.⁸¹ The last of the major reforms took place in 1531 and was initiated by the Polish King Sigismund I the Old. This reform introduced the following monetary system: 1 floren consisted of 1.5 mark or 6 ferdings or 30 groschs or 90 shillings or 540 denars.⁸²

In Livonia, the accounting system differed significantly from the Prussian or Lübeck systems. Until the years 1422–1426, the local monetary system was split into 1 Riga mark, which consisted of 36 shilling or 48 öre or 144 artiger or 432 denars/*lübische*.⁸³ This monetary system was a mixture of Germanic and Scandinavian marks.⁸⁴ As a result of the devaluation of the shilling, which took place at the turn of the 14th and 15th centuries, the Livonian authorities and the knights decided to reform this system. The new system with new coins looked like this: 1 “new” mark consisted of 144 “new” artiger/shilling or 432 “new” denars.⁸⁵ The townspeople were against this reform, as they did not accept the new monetary system and continued to keep their accounts using the old system. Since the new mark was stronger than the old one by 1 : 4, the division of the old mark into new coins was as follows: 1 “old” mark consisted of 36 “new” artiger/shilling or 108 “new” denars.⁸⁶ It should therefore be remembered that from the 1420s the mark used in Reval or Riga was equivalent to 108 denars, and not – as it resulted from the Livonian law – 432 denars. In the context of Livonia research, it is crucial to be aware of this reform, particularly because certain source editions fail to mention it, which may result in inaccurate calculations.⁸⁷

⁸¹ M. Grulkowski, *Wstęp*, in: *Najstarsze księgi kamlarskie Głównego Miasta Gdańska z XIV–XV wieku*, pp. 23–24.

⁸² J. Wijaczka, *Gospodarka Prus Królewski*, in: *Prusy Królewskie: społeczeństwo, kultura, gospodarka 1454–1772*, ed. E. Kizik, Gdańsk 2012, p. 180.

⁸³ L. Kotter, *Tallinna rea finantsid 15. sajandil (1433–1507)*, Tallinn 1999, pp. 26–27.

⁸⁴ I. Leimus, *Trade and finance*, in: *Medieval Livonia: History, society and economy of a territory on the Baltic frontier*, eds. A. Selart, A. V. Murray, Turnhout 2025, pp. 231–232.

⁸⁵ L. Kotter, op. cit., p. 27; I. Leimus, op. cit., pp. 232–235.

⁸⁶ L. Kotter, op. cit., pp. 27–28, 31.

⁸⁷ An example of such an edition is *Kämmereibuch der Stadt Revel 1432–1463*, see: R. Vogelsang, *Einleitung*, in: *Kämmereibuch der Stadt Revel 1432–1463*, p. 12.

The variety of currency systems on the southern and eastern coasts of the Baltic Sea may therefore cause many methodological problems. These systems were independently subject to inflation; hence their mutual value relationship was subject to market fluctuations.⁸⁸ Between the 14th and first half of 15th centuries, we can see a general tendency to reduce the amount of silver in coins.⁸⁹ The reason for this was the shortage of silver on the market at that time and the closure or reduction of productivity of many mines in Germany, France, Bohemia and Hungary.⁹⁰ The situation on the silver market began to change in the second half of the 15th century, when silver mining in the above-mentioned regions was revived.⁹¹ A researcher dealing with price developments over 300 years must take these changes into account, as they may result in general trends towards increases or decreases in transport costs.

3.3. Problem with different units of measurement

Another issue that warrants consideration is the units of measurement employed in the Baltic area's economy. Problems related to historical metrology can be divided into two groups. The first concerns the relationships between the individual measures used in sources. The second concerns the relationships between historical measures and those used today.

To illustrate the first problem, we will employ the unit of measurement known as a last (Ger. *Last*). This unit was a unit of volume, not weight.⁹² The last was used to measure a wide variety of goods such as beer, mead,

⁸⁸ For example, see: U. Hauschild, op. cit., pp. 4–9.

⁸⁹ About this process in Prussia, see: M. Dygo, op. cit., pp. 12–24. About this process in Livonia, see: I. Leimus, op. cit., pp. 232–234.

⁹⁰ J. Day, *The great bullion famine of the fifteenth century*, "Past & Present" 1978, vol. 79, pp. 12–40; A. Laube, *Zur Profitsbildung im erzgebirgischen Silberbergbau des 15. und 16. Jahrhunderts*, in: *Hansische Studien V: Zins-Profit. Ursprüngliche Akkumulation*, eds. K. Fritze, E. Müller-Mertens, J. Schildhauer, Weimar 1981, pp. 78–79.

⁹¹ J. Day, op. cit., pp. 40–41; A. Laube, op. cit., pp. 79–86; J. U. Nef, *Silver production in Central Europe, 1450–1618*, "The Journal of Political Economy" 1941, vol. 49, no. 4, pp. 585–586.

⁹² Ch. Link, op. cit., p. 80.

fish, oil, salt, fruit or grain.⁹³ In the case of goods transported in barrels called “tonne”,⁹⁴ it is known that 1 last consisted of 12 such barrels.⁹⁵ However, the division of last into smaller units becomes more complicated when the last used to measure grain is analysed. In the western part of the Baltic zone, 1 last of grain consisted of 8 drömt or 96 bushels (Ger. *Scheffel*).⁹⁶ In Prussia and Livonia, 1 last consisted of 60 bushels.⁹⁷ This difference alone proves that a researcher dealing with the topic of trade or transport of grain must take into account the origin of the source examined in order to be able to properly calculate the amount of goods transported.

The above analysis is only a cursory example of how diverse the old measures were. It is also feasible to specify the volumes of various barrel types that are employed in transportation. However, this subject is far too extensive to discuss here.⁹⁸

The last problem outlined in this section regards the methods of converting old volume measures into modern ones. Before presenting the calculations obtained by historians, it is worth emphasising one thing: the authors of the sources were unaware of the metric or kilogram systems. Furthermore, the strong decentralisation of the Middle Ages meant that ancient weights differed even among cities that maintained close trade re-

⁹³ T. Wolf, *Tragfähigkeiten, Ladungen und Maße im Schiffsverkehr der Hanse (vornehmlich im Spiegel Revaler Quellen)*, Köln–Wien 1986, pp. 37.

⁹⁴ However, it should be remembered that the tonnes could have different capacities, depending on where they were produced and what goods they were used to transport, see: H. Witthöft, *Zeichen, Verpackung, Mass/Gewicht und Kommunikation im Hansischen Handel*, in: *Der hansische Sonderweg? Beiträge zur Social- und Wirtschaftsgeschichte der Hanse*, eds. S. Jenks, M. North, Köln–Weimar–Wien 1993, pp. 206–209, 214–217; T. Wolf, *Tragfähigkeiten, Ladungen und Maße...*, pp. 32–33, 36–38.

⁹⁵ However, in the case of salt from Baye, 1 last consisted of 18 tonne, see: T. Wolf, *Massentransport zur See und die Quantizierung für die historische Forschung*, in: *Der hansische Sonderweg?...*, p. 230.

⁹⁶ T. Wolf, *Tragfähigkeiten, Ladungen und Maße...*, pp. 53–54.

⁹⁷ Ch. Link, op. cit., p. 36; T. Wolf, *Tragfähigkeiten, Ladungen und Maße...*, pp. 54–56.

⁹⁸ For a more detailed analysis of this issue, see: T. Wolf, *Tragfähigkeiten, Ladungen und Maße...*, passim.

lations.⁹⁹ For these reasons, it is important to remember that all such calculations are subject to a certain – perhaps significant – margin of error.

The first conversion given will be the conversion of 1 last of salt to kilograms. According to the Russian historian Anna Leonidovna Horoškevič, 1 last of salt in the 14th century was equal to 1920 kilograms.¹⁰⁰ Thomas Wolf provided slightly different calculations of the weight of 1 last of salt in his work. According to Wolf, 1 last of salt from Lüneburg weighed 1632.96 kg, while 1 last of salt from Baye weighed 2122.848 kg.¹⁰¹ Contemporary research on the salt trade in North-Eastern Europe applies Wolf's conversions.¹⁰² Therefore, it is safer to use these calculations to convert quantities to the kilogram system.

The conversion of Prussian grain lasts into kilograms is also controversial. In his work on the foreign trade of Danzig in the 15th century, Henryk Samsonowicz assumed that 1 last of grain was approximately 2500 kg.¹⁰³ The Polish historian did not point out, however, that the last was not a unit of weight, but a unit of volume and as such had a different weight depending on the weight of the goods being measured. More precise results for the Prussian last were provided by Thomas Wolf, according to whom 1 Prussian last of wheat weighed 2316.6 kg, and 1 last of rye 2162.16 kg.¹⁰⁴ Of course, such an accurate weight should raise some doubts, but even assuming a certain margin of error, Thomas Wolf's results seem to show the kilogram weight of a Prussian last of wheat and rye more precisely than Henryk Samsonowicz.¹⁰⁵ Thomas Wolf's research

⁹⁹ J. E. Kleinenberg, *Preise, Maße und Profit im hansischen Novgorod-Handel im 14. und 15. Jahrhundert*, in: *Hansische Studien V...*, pp. 54–60.

¹⁰⁰ A. L. Horoškevič, op. cit., p. 230.

¹⁰¹ T. Wolf, *Tragfähigkeiten, Ladungen und Maße...*, p. 192.

¹⁰² R. Vogelsang, *Salz und Korn...*, pp. 139–140.

¹⁰³ H. Samsonowicz, *Handel zagraniczny Gdańska w drugiej połowie XV wieku (rejonizacja handlu na podstawie ksiąg cła palowego)*, "Przegląd Historyczny" 1956, vol. 47, no. 2, p. 290.

¹⁰⁴ T. Wolf, *Tragfähigkeiten, Ladungen und Maße...*, p. 55.

¹⁰⁵ Christina Link, for example, based her work on the trade of grain on the calculations made by Thomas Wolf, see: Ch. Link, op. cit., p. 80.

also mentions that the kilogram value of a Prussian last was slightly different from that used, for example, in Lübeck or Hamburg.¹⁰⁶

To summarise this section, we should highlight how diverse ancient measures were. Even a measure like the last had a different number of bushels (depending on the area), and converted to modern measures, it could weigh either 1632.96 kg (salt) or even about 2500 kg (the weight of 1 last of wheat in Hamburg). These differences in weight could be the reason why the cost of transporting 1 last by water in Prussia at the beginning of the 15th century varied. According to Mateusz Wiktor Maćkiewicz's calculations, transporting 1 last of Scanian herring on the Danzig-Marienburg route cost 7 scot, while transporting 1 last of beer from Elbing to Marienburg (a route about half as long) cost 6 scot, only slightly less. Additionally, transporting spring grains from Schwetz (Pol. Świecie) to Groß Montau (Pol. Mątowy Wielkie) – which is a similar distance to the Danzig-Marienburg route – cost a whopping 11 scot.¹⁰⁷ These different results in the transport costs of 1 last in relation to distance may be caused by the weight of the transported goods.

3.4. Price fluctuation

Price research can be conducted in many schemes. The simplest method is to compare nominal prices from the period examined in this article and from the investigated area in order to obtain information about price fluctuations. Such research will enable us to analyse the inflation and possible deflation to which transport costs were subjected. Of course, these pledges do not have to apply only to nominal prices for each transport event. Prices such as the transport cost of 1 barrel of a good, or 1 bushel of grain, may also be subject to research. Research devoted to the costs of transport 1 unit of a given good, conducted by James Masschaele,¹⁰⁸ allows us

¹⁰⁶ T. Wolf, *Tragfähigkeiten, Ladungen und Maße...*, pp. 55–56.

¹⁰⁷ M. W. Maćkiewicz, *Crews of inland ships...*, pp. 25–26.

¹⁰⁸ In his article, James Masschaele adopted the unit of computation d. per ton-mile, see: J. Masschaele, *Transport costs...*, pp. 270–274; idem, *Peasants, merchants, and markets...*, pp. 207–210.

to compare “large” transport events, e.g. those that concerned the transport of 20 barrels of beer, with the “small” transport of 1 barrel.¹⁰⁹ Scrutinising price fluctuations, both nominal and transport prices for 1 unit of a good, offers some tangible insights into price structure. However, these approaches have limitations. Their main one is that different monetary systems operated throughout the Baltic Sea region. For this reason, it is true that the general direction of price changes can be compared, but using only nominal prices does not offer full explanation regarding which region experienced wider fluctuations. Such comparisons require a constant factor that occurred in each examined land. Such factors may be, for example, the amount of silver in coins or the correlation of transport costs with the prices of food products. By comparing the price structure with these two factors, we can examine land and inland water transport prices not only as costs, but also as a factor influencing the financial position of people professionally involved in transport.

3.5. Price fluctuation compared to silver

As noted above, nominal transport prices alone are worth investigating. However, to better understand these prices and their value for professional carriers, we need some measures that will show the real value of nominal prices in a manner less prone to error. One such measure is the comparison of nominal transport prices with the amount of silver contained in coins at that time.

The choice of silver rather than gold was dictated by the fact that in the studied area, silver coins outweighed gold coins, and silver coins formed the basis for the monetarisation of the Baltic zone. Fortunately, the historiography of the Baltic area has covered the issue of silver content in coins rather extensively.¹¹⁰ This makes it much easier to compare costs with the

¹⁰⁹ Other works examining transportation costs in relation to distance are: H. Dubois, op. cit., pp. 74–76; R. S. Lopez, op. cit., p. 18; M. W. Maćkiewicz, *Wydatki zakonu krzyżackiego...*, pp. 13–21.

¹¹⁰ The works already cited that raised this problem involved: M. Dygo, op. cit.; U. Hauschild, op. cit.

amount of silver contained. Juxtaposing nominal costs with the amount of silver may indicate whether transportation prices expressed in silver were subject to the same fluctuations as nominal ones. For example, did carriers earn more silver in any of the regions studied than in others? Did 14th century carriers earn less silver than 16th century carriers?

Comparing nominal prices with the amount of silver contained in coins seems to be an extremely useful measure of the value of transportation costs. The silver content of the coin rather than its nominal price was used by price researchers such as Wilhelm Abel.¹¹¹ However, many historians were skeptical about this method. One example of such a skeptic is Marie-Jeanne Tits-Dieuaide, who rightly argued that the reduction of prices to the mere quantity of metal in coins does not take into account, for instance, the psychological factors that influenced price formation as well as the fact that coin devaluations and revaluations did not always affect price changes or that sometimes these changes occurred slowly.¹¹² Another significant limitation of comparing nominal prices to the quantity of silver is that it does not fully reflect the purchasing power of carriers' earnings. To learn how the purchasing potency of carriers' wages has changed, and therefore whether salary of carriers actually increased or remained unaffected by inflation, another measure is needed that will compare transport costs with the cost of living.

3.6. Price fluctuation compared to the trofa index

The diverse monetary systems used in the medieval and early modern Baltic region generate methodological problems for researchers. The analysis of price fluctuations does not permit us to thoroughly perceive changes in transport costs. It could happen, however, that transport prices

¹¹¹ W. Abel, *Agrarkrisen und Agrarkonjunktur. Eine Geschichte der Land- und Ernährungswirtschaft Mitteleuropas seit dem hohen Mittelalter*, Hamburg–Berlin 1966, pp. 27–30, 37–41, 50–70, 113–141, 286–290.

¹¹² M. J. Tits-Dieuaide, *La formation des prix céréalières en Brabant et en Flandre au XVe siècle*, Bruxelles 1975, pp. 22–28. The footnotes also include a bibliography of the dispute over the use of the conversion of prices into the amount of metal contained in the coins.

es were rising, but at the same time the prices of basic products were rising faster. This meant that carriers, despite earning nominally more, actually became poorer. Simply comparing the amount of silver in coins does not utterly solve this problem, because such a juxtaposition is not rooted in the cost of living. The ratio of the amount of silver in a coin allows us to inspect how a given coin has strengthened or weakened, but it does not bestow details about the carriers' cost of living. Therefore, transport costs should be compared with the trofa index.

The trofa index was created by Polish historian Zbigniew Żabiński.¹¹³ It is a biological indicator of the purchasing power of money. What does the trofa consist of? According to Żabiński, trofa is the cost for a working person to feed himself daily. To calculate this, we need to create a "basic diet" for a person from the area under study. This diet must consist of approximately 3000 kcal, consisting of 75 grams of protein, 100 grams of fats and 450 grams of carbohydrates.¹¹⁴ The cost of such provisions should incorporate an additional 20% of its cost, which includes food additives and the costs of preparing it. The constructed index offers an overview of the cost of living in different areas and historical periods. Therefore, the trofa index is extremely serviceable for research on the costs of land and inland water transport in the Baltic area from the 14th to the 16th century. It will not only allow researchers to compare changes in the costs of living of carriers from a particular region over the course of three centuries, but will also help compare the costs of living between each of the studied Baltic regions for virtually the entire period under research. The only problem with using the trofa index is that it depends on whether accounts containing the cost of basic food products have been preserved for the period in question. Without them, it is impossible to calculate the trofa (or, at least, the calculations of the trofa will not be very accurate).

¹¹³ The entire following part of the article is based on: Z. Żabiński, *Biologiczny wskaźnik siły nabywczej pieniądza*, "Rocznik Dziejów Społecznych i Gospodarczych" 1958, vol. 20, pp. 37–51.

¹¹⁴ The above data was provided by Zbigniew Żabiński in his work. Of course, modern articles should base the "basic diet" on data postulated by modern dietetics.

3.7. Transport profitability. The cost of transporting one unit of a given good in relation to distance

When investigating transport costs, we must not forget about the profitability of conveyance. This topic was dealt with by James Masschaele for medieval England,¹¹⁵ Henri Dubois for medieval Burgundy,¹¹⁶ Bart Ballaux with Bruno Blondé for medieval and early modern Brabant,¹¹⁷ and Gunnar Mickwitz for early modern Livonia.¹¹⁸ The measure they used to compare costs was 1 denars per ton-mile.¹¹⁹

This measure should, of course, be used in research on transport costs from the Baltic area with a minor caveat. The basic unit for research on the costs of grain transport in the Baltic area should be bushels. The transportation cost of goods transported in “tonne” barrels should be calculated in those barrels. Therefore, 1 last of beer should be converted into 12 barrels of beer. For that reason, the meter should be modified to the following formula: the cost of transporting 1 unit of a given good in relation to distance.

We can observe the potential of this formula by using several examples. From The Marienburg Treasurer's Book we can learn that: “item 1,5 m. und 40 pf., 3 leste byrs unde 4 tonnen vom Elbinger ken Marienburg zu furen; Petir vischkowffer hatte das gelt vor uns usgegeben und nam is widdir von uns am donrstage noch Invocavit”.¹²⁰ This source gives the following information. On the Marienburg-Elbling section (ap-

¹¹⁵ J. Masschaele, *Transport costs...*, pp. 266–279.

¹¹⁶ H. Dubois, *op. cit.*, pp. 74–76.

¹¹⁷ B. Ballaux, B. Blondé, *op. cit.*, pp. 707–726.

¹¹⁸ G. Mickwitz, *op. cit.*, pp. 143–151.

¹¹⁹ This measure was also used to a lesser extent by Robert S. Lopez and Mateusz Wiktor Maćkiewicz, see: R. S. Lopez, *op. cit.*, p. 18; M. W. Maćkiewicz, *Wydatki zakonu krzyżackiego...*, pp. 9–25. One of the mentioned historians who used a slightly different formula, i.e. the cost of transporting 1 last in marks and not in denars, was Gunnar Mickwitz.

¹²⁰ MTB, p. 55.

prox. 3.5 Prussian miles),¹²¹ 40 barrels of beer (3 lasts and 4 barrels) were transported for a total cost of 1120 denars (1.5 Prussian marks and 40 denars). The carrier was Petir Vischkowffer and the transport took place on 11 March 1399. As can be calculated, the cost of transporting 1 barrel was 28 denars. With this result, we can proceed to calculate the cost of transporting 1 barrel in relation to distance. This cost was approx. 8 d. per mile.

The same calculations can be made for other goods. For instance, we also learn from The Marienburg Treasurer's Book that: "item 8 m. vor 8 tonnen methe vom Elbinge, als die konigynne hy was, die [der] huskompthur bezalte, und 14 scot den selben methe vom Elbinge ken Marienburg zu furen".¹²² So, an official of the Teutonic Order paid 420 denars (14 scot) for the transport of 8 barrels of mead. The cost of transporting 1 barrel was 52.5 denars. On this basis, it can be calculated that the cost of transporting 1 barrel in relation to distance was approx. 15 d. per mile.

This pattern can also be used for other units, such as the last. We can also acquire a knowledge from the above source that: "item 5 scot eyne last calks von Danczk ken Marienburg zu furen meister Jacob Johans zon".¹²³ Based on this mention, it knows that the son of master Jacob Johann hauled 1 last of lime on the Danzig-Marienburg route. This route is approx. 6 Prussian miles long. The cost of transporting 1 last of lime was 150 denars (5 scot), which means 25 d. per mile in relation to distance.

The above example manifests how useful the proposed formula is for research on costs, and in particular on their profitability.

¹²¹ According to Franz Engel, 1 Prussian mile was 7532 meters, see: F. Engel, *op. cit.*, p. 2.

¹²² MTB, p. 55.

¹²³ MTB, p. 29.

3.8. Transport profitability. Transport cost in relation to the prices of transported goods

Calculating transportation costs in relation to distance is not the only measure that may be useful in this research. To calculate the profitability of individual transport actions, a measure that I called “transport cost in relation to the prices of transported goods” may also be beneficial. Of course, in cases of transport costs, loading and unloading costs are occasionally recorded. These types of costs should be encompassed as transport costs so that when calculating this measure, on the one hand, all expenses related to transport are included, and on the other, the entire cost of transported goods is included.

This type of indicator has already been used in studies of maritime transport costs. These studies show that the cost of transport in relation to the cost of goods between Flanders and Italy was about 15%.¹²⁴ In turn, the same cost on Hanseatic routes was to be up to 50%.¹²⁵

Several examples from The Marienburg Treasurer’s Book explain this measure more clearly. The following transport action is mentioned, date 22 January 1401: “Item 6 m. vor 1 last Wissmars byrs, dy der huskompthur zu Danczik koufte, und 1 m. von Danczik ken Marienburg zu furen; das gelt berechente uns der huskompthur am tage Vincencii martiris”.¹²⁶ From the information provided, it is known that the transport cost was 1 mark and the cost of beer from Wismar was 6 mark. Thanks to this data, it can be calculated that transport cost in relation to the cost of the prices of transported goods was approximately 16.67%.

From another example, we learn: “item 30 m. ane 16 scot vor eyn vas wyne, das [der] huskompthur zu Danczk unserm homeyster koufte; das vas hilt 6 omen an 16 stoffe, dy ome vor 5 m. item 1 m., den wyn of eyne wagene von Danczk ken Marienburg zu furen”.¹²⁷ The cost of transported

¹²⁴ W. R. Childs, *Trade and shipping in the medieval West: Portugal, Castile and England*, Porto 2013, p. 46.

¹²⁵ H. Samsonowicz, *Formy pracy...*, p. 268; R. Vogelsang, *Salz und Korn...*, p. 146.

¹²⁶ MTB, p. 102.

¹²⁷ MTB, p. 456.

wine was 30 mark without 16 scot (21120 denars), and the cost of transport was 1 mark (720 d.). Thus, the cost of transportation in relation to the price of goods was approximately 3.41%.

The last example will contain “loading” information. This mention comes from 12 September 1402 and reads as follows: “item 5 m. vor 5 tonnen Rigisch methe, 20 pf., den methe zu laden, und 10 scot, den methe ken Marienburg zu furen; das gelt berechent uns der huskompthur von Danczk am tage Euffemie”.¹²⁸ This means: goods, i.e. 5 barrels of mead, cost 5 mark (3600 denars). Loading cost 20 denars and the cost of transport was 10 scot (300 denars). So, the entire transportation cost was 320 denars. Transport cost in relation to the prices of transported goods in this case was approx. 8.89%.

The above instances reflect how useful the presented measure is for research on transport costs, and especially for the profitability of transport. By using this measure in larger quantities, it will be possible to inspect how much impact transport costs had on the final price of a given good.

4. Summary

John Langdon, in his article on the efficiency of inland water transport in medieval England, wrote that in the present age we tend to narrow the meaning of the word efficiency to monetary and time-related aspects only, while transport efficiency also embraces items such as: reliability, degree of professionalisation, capital or the capacity to handle both large and small amounts of traffic.¹²⁹ While entirely agreeing with these words, it should be noted that the issue of conveyance costs also needs to be looked at more broadly than merely through changes in prices. As this article demonstrates, research on transport costs requires not only information about price fluctuations themselves, but also measures that will allow us to relate these prices to the diverse economic situations in the past. Phenomena as common as inflation can mean that a nominal increase

¹²⁸ MTB, p. 150.

¹²⁹ J. Langdon, *The efficiency of inland water transport...*, p. 111.

in transport costs actually meant impoverishment for carriers, because the costs of basic goods grew faster than their earnings. Moreover, the profitability of transport depended not only on how much a given transport cost, but also on what percentage the transport cost was in relation to the price of the transported goods. One may, therefore, be tempted to say that in research on the costs of land and inland water transport, transport costs themselves are only one of many parts of this diverse issue. This is a topic that remains neglected by historians.