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Interaction Between Transportation Cost and Commodity Pricing in International Trade. Dry-Commodity Export Shippers' Perspective in Malawi. The Trade Reducing Factor

Vincent Collins Matemba[1*]., Kasonde Mundende[2]., Inonge Milupi[2]

[*1]Institute of Distance Education-University of Zambia

[2]University of Zambia, School of Humanities and Social Science

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ABSTRACT

While transportation is considered as a trade facilitator in international trade, high transportation costs can adversely impact on commodity pricing and its competiveness on the market. Studies have shown that raising transportation costs by 10 percent reduces trade volume by more than 20 percent. The purpose of this study was therefore, to understand the impact that transportation cost has on pricing of goods from Malawi in international trade. The study sought to establish transportation costs affordability perception from export commodity shippers and assess how transportation cost affects commodity pricing on the international market. The study employed quantitative research approach and descriptive research design in which a closed-ended questionnaire was used to collect data from a sample of 104 shippers in dry-commodity export shipping community. Simple random sampling method was used to determine the sample size. The study found that shippers do not find transportation costs affordable and that the high transportation costs affect negatively the pricing of the goods on the market. The study therefore recommends that government, through the Ministry of Transport and Public Works, to develop logistics cost estimation model and invest in logistics management systems that will enable the industry to collect data, identify bottlenecks and improve the transport system to reduce transportation cost.

Keywords: Transport Cost, International Trade, Commodity Pricing, Malawi

INTRODUCTION

There are many factors that economists are interested in to measure a country's wealth and to understand the reasons why different countries grow at different rates. One such factor is international trade which is the exchange of capital, goods and services across international borders (Grozdanovska et al., 2017). International trade can act as a stimulus for economic growth and development in less developed countries (LDCs) (Farahane et al., 2020). Malawi being a less developed country also considers trade as a catalyst and main engine of its economic growth (*Malawi National Transport Master Plan Ministry of Transport and Public Works*, 2017). One of the enablers of international trade is transportation and it is considered to play a vital role in trade facilitation (Shahparan et al., 2024).

Malawi economy is firmly built in primary and secondary sector of economy which is mining, agriculture and manufacturing (MNTMP, 2017). These sectors produce tons of goods requiring transportation. However, the transport system in Malawi is not well developed and this makes it costly. While it plays trade facilitation role, high transport cost affects negatively the commodity pricing on the international market (Byiers et al., 2020). As depicted in Table 1, transport cost as a percentage of commodity value is high for exports from Malawi and this cost is factored into the selling price of a commodity making it high-priced for the consumers. As a result, goods from Malawi face challenges competing with commodities from other countries and this reduces export volume and slows down economic growth in the process.

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Table 1: Transport cost as a percentage of commodity value

Exports	Mode	Tobacco	Sugar	Tea
Beira	Road	3%	16%	5%
Durban/Johannesburg	Road	6%	36%	-
Nacala	Rail	2%	11%	4%

Source: Malawi National Transport Master Plan (2017)

To arrest the rising cost of transportation, Malawi government is pursuing some operational objectives which include facilitation of modal shift from costly road transport to low-cost rail transport (MNTMP, 2017).

Conceptual Framework

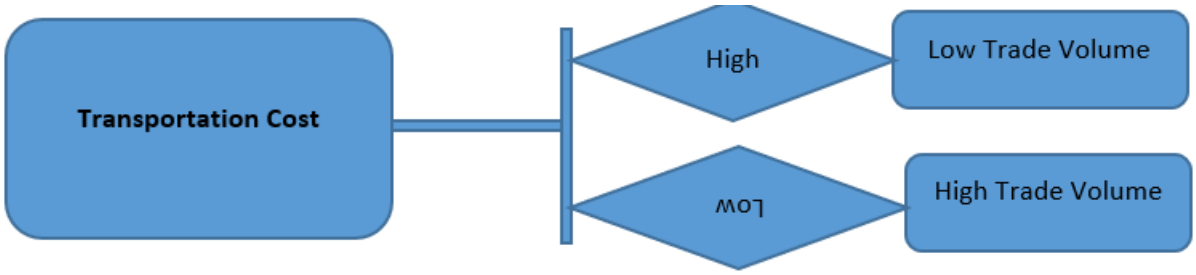

Figure 1: Conceptual Framework

As illustrated in the conceptual framework in Figure 1, there is an empirical evidence that countries with lower transportation costs have had faster manufactured export and overall economic growth than countries with higher transportation costs (Naude & Matthee, 2007). An increase by 10 percent of international transportation cost would reduce trade volume by as much as 20 percent and this could be even more in most landlocked African countries such as Malawi (Naude & Matthee, 2007).

Purpose of the study

The purpose of the study was to establish how transportation costs affect commodity pricing on the international market from the perspective of dry commodity export shippers in Malawi.

LITERATURE REVIEW

International trade is the exchange of goods and services between countries (Cuong & Tien 2022). This encompasses all commercial activities that take place for the purpose of promoting the transfer of goods, services, resources, ideas, people and even technology across national boundaries or borders (Grozdanovska et al., 2017). In this study however, international trade is referred to the exchange of tangible goods between countries for the purpose of doing business. For international trade to be successful, there is a need for movement of goods from one place of origin to another place of destination and this is facilitated by transportation (Byiers et al., 2020; Shahparan et al., 2024). This transportation, however, comes with a price called transportation cost that shippers incur in acquiring this carriage services. Transportation cost is the price that a shipper pays to have the goods moved, packed, insured, loaded and offloaded (Hayakawa & Tsubota, 2022; Kweka, 2005). In this study however, transportation costs are freight charges or rates that the shippers pay a carrier company or a transporter for the movement of goods from the point of origin to the point of destination.

Studies have shown that there is a relationship between transportation cost and commodity pricing for both national and international trade (AÇIK & BAŞER, 2021; Hayakawa & Tsubota, 2022; Melas & Michail, 2021; Savić et al., 2020). In recent years, there has been a substantial increase of commodity prices and this has been attributed to high transportation costs. This biting impact has triggered the consciousness and interest

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of policy makers to start working on ways to reduce these high transportation costs (Chinecherem et al., 2020; Savić et al., 2020). Transportation costs represent a significant determinant of total operating costs and thus, the selling price which affects the competitiveness of products and the achieved business results.

The adverse impact of high transportation costs has been registered in many sectors of economy which include mining, agriculture, manufacturing and pharmaceutical industry (AÇIK & BAŞER, 2021; Chinecherem et al., 2020; Melas & Michail, 2021; Savić et al., 2020). In a study that was conducted by Chinecherem and others in 2020 in which the researchers were assessing the impact of transportation costs on prices of consumables in Anambra state of Nigeria, it was found that high transportation cost does not only contribute to continuous rise of consumable commodities, but also affect the marketing of those products (Chinecherem et al., 2020). By employing multi-stage cluster sampling technique as a survey research design in its methodology, the study started by establishing the factors that push the cost of transport high. It was established that bad roads and illegal collection of money by highway patrol team contribute to the rising transportation costs (Chinecherem et al., 2020). The study therefore recommended that the government should maintain the main roads to reduce wear and tear of the vehicles and also curtail the illegal collection of money by the highway patrol men (Chinecherem et al., 2020).

In contrast to the workability of Chinecherem et al., (2020) recommendation in which they hypothesized that the construction of roads would reduce transportation costs, the study that was conducted in Japan by Hayakawa & Tsubota (2022) proved otherwise. A study was conducted to establish a relationship between transportation costs and butter pricing in Japan (Hayakawa & Tsubota, 2022). It was revealed that, while highway construction increased transportation speed, the average transportation time from the production site also drastically increased and this was because of the transportation distance and resulted into the rising of butter prices by 3.3 percent (Hayakawa & Tsubota, 2022). In this study, it was established that the construction of new highways encouraged butter factories to relocate and this resulted into the concentration of production sites in one region and the distribution of finished butter was made from this site to all the regions. This consequently increased the distance from factories to the customers and thus, increasing transportation travel time and cost (Hayakawa & Tsubota, 2022). Before the construction of new highways, factories were located in almost all regions close to the customers. This study uncovers the important aspect in logistics system that should not be ignored. The study concludes that the construction of road system alone cannot solve the transportation cost challenges. A holistic approach should be taken and endeavour assessing all factors that would be in play in a road construction. It is clear that without a careful assessment, solving one problem in one area could create another problem in other areas.

The impact of transportation costs has also been studied in crop production sector (Savić et al., 2020). As it has been established in the literature, transport activity has a significant implication for all economic sectors. However, it is more apparent in agriculture sector for obvious reason that the sector is freight intensive that requires transportation from farms to warehouses and production sites, when being used as raw materials. The role of transportation in agriculture sector also goes beyond the production site to distribution centres and final consumers. In a study that was conducted in Serbia in the year 2020, it was found that, in addition to the risks arising from the specificity of agriculture production and climate change, agricultural producers are increasingly being exposed to the risks of market nature which includes the risks of changes in the prices of finished agricultural goods and raw materials (Savić et al., 2020). It was then recommended that when it comes to transportation costs, it is important to understand that reducing transport costs is not an independent business goal and it is necessary to observe the connection between transportation variable cost and gross margins (Savić et al., 2020). This transportation cost reduction drive can be achieved by generating information which is also an integral part in supporting various management and cost systems.

In the developed countries such as United States of America (USA), high transportation costs affect the commodity pricing as well. The prices of time sensitive goods like fresh fruits and vegetables are heavily affected by high transportation costs (Volpe et al., 2013). The high cost of transportation has been attributed to increase in fuel prices and this significantly impacts food price levels and volatility. In USA, the consumer demand for fruits and vegetables has been proven to be price-sensitive and fuel price surges potentially reduce the consumption of fresh produce. This suggests that there is indeed a relationship between transportation costs and commodity prices. Cognizant of the fact that different types of goods require different types of

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transportation modes as a result of differences in shipping requirements, studies have also been carried out in dry commodities (AÇIK & BAŞER, 2021; Melas & Michail, 2021). Using a threshold regression approach, a study was conducted to assess the relationship between commodity prices and transportation rates in dry bulk shipping (Melas & Michail, 2021). It was found that in the case of large drops in commodity prices, the magnitude of the relationship can strongly change and in such cases, the impact is more passed on to freight rates than under normal conditions, while the prevalence of oil prices becomes less significant (Melas & Michail, 2021). This suggests that, as the commodity prices drop, the transportation rates need to adjust more to such changes for the purpose of maintaining a more or less constant ratio of the transport cost to the end price of the commodity (Melas & Michail, 2021).

A similar study in dry bulk shipping was also conducted in 2021 by Acik and Baser in which they were looking at the interaction between commodity prices and freight rates by using content analysis (AÇIK & BAŞER, 2021). The study looked at how studies in empirical literature interpreted the relationship between commodity pricing and freight rate in maritime industry (Açik & Başer, 2021). By employing interpretive content analysis method, the study found that the relationship between commodity pricing and transportation rate in sector reports is interpreted with the assumption that the commodity price reflects the demand for itself (Açik & Başer, 2021). In addition, the study found that the increase in commodity demand led to an increase in both commodity prices and transport demand which results in a rise in transportation costs. The increase in commodity prices encourages manufacturers to produce more and this led to an increase in transport demand and consequently, pushed the transportation cost high (Açik & Başer, 2021). Similarly, the decline in demand for the commodities caused the decline in both commodity prices and demand for transport, thereby affecting negatively the transportation rates. This decline in commodity prices adversely affected the producers' production motivation and led to a decline in both transport demand and transport rates (Açik & Başer, 2021). While some studies have established a negative relationship between transportation costs and commodity prices where high transportation costs reduce the products intake by consumers, some studies have also established a positive relationship between transportation costs and products' intake by consumers (AÇIK & BAŞER, 2021). What is more important is knowing the perspective from which this relationship is being observed. As it has been established, the increase in commodity prices inspires manufacturers to produce more and this creates high transport demand which in turn raises transportation costs. This is a positive relationship between transportation costs and commodity prices and it has been looked from the high-commodity price and hgh-demand for transport perspective (AÇIK & BAŞER, 2021). It has also been established that the increase in transportation costs reduces the commodity demand and this is a negative relationship between these two variables and has been looked at from the high transport-costs and low-demand for commodity perspective (Chinecherem et al., 2020; Volpe et al., 2013). It can therefore be concluded that commodity pricing and transportation costs have a relationship and that the movement of one of these variables will affect the other whether positively or negatively.

In Sweden, the relationship between freight costs and higher commodity prices were analysed to assess how these factors affect the inflation of the country (World Bank Group, 2021). In 2021, many commodities in Sweden were rising substantially especially in prices of metal and food. The maritime transportation costs were also registered high and this was attributed to increasingly strong global demand, combined with supply challenges. The rise of commodity prices and transportation costs had a greater impact on inflation (World bank Group, 2021). This suggests that the transportation costs' impact goes beyond the microeconomic to macroeconomic level, affecting a larger society. While there are differences in how transportation costs affect the commodity prices at both micro and macro levels, countries are paying much attention to finding ways on how to curb the rising costs of transportation. This includes development of policies that would optimize logistics systems and the drive to facilitate modal shifts from high-cost road transport to low-cost rail, water and intermodal transportation (Abendin & Duan, 2021). Governments are also investing in logistics information systems to enable them collecting logistics data that would support in identifying areas across the supply chain requiring improvements in relation to transportation costs. In a bid to make informed decisions, some countries such as South Africa publish Logistics Barometer results yearly that provide numerical analysis of logistics costs trend. This information has proved to be useful because it identifies trends and is applied by both operational and strategic analysts in the public and private sector for future planning, policy development and investment objectives at macroeconomic level.

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METHODOLOGY

Research Paradigm and Philosophical Assumptions

This study was ontologically guided by objectivism position where it was believed that there was only a single reality to the phenomenon under study, independent of human consciousness. The study was also epistemologically grounded in positivism for the purpose of being objective throughout the research process. This being a quantitative study, in which social reality has a constancy across time, space and context, the investigator used scientific methods and endeavoured avoid disturbing what was being studied to eliminate biasness. And to guarantee a value free science, the study took an etic approach in its axiology (Rescher & Nicholas, n.d.; Saunders et al., 2007).

Research Design

The research aimed to describe the relationship between transportation cost and commodity pricing. As such, descriptive research design was employed to answer the "how" question regarding the research problem. In this design, mean and standard deviation were produced to get an overall picture of the data set and understand how dispersed a set of data was.

Target Population

Transportation cost is more impactful in bulky commodity shipping as these require more space in a transportation mode. Therefore, this study targeted manufacturers that are export shippers of dry goods from Malawi. These goods include agriculture produce, textiles, minerals and timber.

Description of Sample and Sampling Procedure

Malawi Export Promotion Council is mandated to promote the export of agriculture and manufactured goods produced in Malawi and was considered a sampling frame for this study. Targeting 141 manufacturers and producers that were registered by the council in the year 2021, a simple random sampling technique was used to draw a sample from this population of shippers using Yamane formula as shown below (Yamane, 1970).

$$n = \frac{N}{1 + N(e)^2}$$

Where n= sample size required

N= number of people in a population

e= allowable error in percentage

To calculate the sample size from 141 commodity exporting firms, the study specified a 5 percent error as shown in the equation below:

$N = 141/ (1 + 141 (0.05^2))$ ……104 (Yamane, 1970).

Description of Research Instruments and Data Analysis

Using Google Forms, a five-point Likert scale questionnaire was created and a link was sent to all study respondents through WhatsApp and emails. This method was ideal as it reduced response time and enhanced response rate because of its simplicity and cost effectiveness. The collected data were organized and prepared using SPSS v20 and descriptive analysis was performed to establish the measures of central tendency and variability in forms of mean and standard deviation in the data set.

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Data Management

Factor analysis was used in SPSS software to test internal validity. To measure reliability, Cronbach's Alpha test was run in SPSS at a threshold of 0.7 and above. The study also used Keiser-Meyer-Olkin (KMO) at a threshold of <0.7 and Bartlett's test at $P<0.05$ to measure sampling adequacy.

FINDINGS AND DISCUSSIONS

The study sought to establish shippers' perception on transportation cost affordability when exporting their goods from Malawi. The shippers were asked to indicate the extent to which they found the affordability of transportation cost when shipping out their goods. A scale of 1 to 5 was used where 1 represented **"very affordable"** and 5 represented **"not affordable".** Table 2 shows descriptive statistics for transportation costs' affordability as perceived by export shippers.

Table 2: Descriptive Statistics for Transportation Costs Affordability

Item	Minimum	Maximum	Mean	Standard Deviation (SD)
Transportation Cost	3	5	3.94	.543

Source: Field Data, 2023

The descriptive statistics for affordability of transportation costs revealed an overall mean score of 3.94 (SD=.543). This shows a negative perception of transportation cost among the shippers. The low standard deviation which is .543 suggested that most of the data that were observed were clustered tightly around the mean and thus, more precise. The results therefore indicate that shippers found transportation costs not to be affordable. The study results corroborate with a report in the Malawi National Transport Master Plan of 2017 in which transportation costs were stated to be high and unaffordable in Malawi. The results also build on existing evidence that was provided in a study that was conducted by Byiers et al. (2020) in which it was found that transportation cost in Malawi is very high. While transport facilitates trade, businesses are suffering more each day when transportation is extortionate. A popular explanation to this high-priced transportation has been distance. Studies have found that a 1 percent increase in distance increases transportation cost by 0.25 percent (Naude & Matthee, 2007). Malawi being a landlocked country, exports travel long distances to international markets via Beira and Nacala in Mozambique and Durban in Republic of South Africa.

The study further sought to establish the extent to which transportation cost affect export commodities' pricing on the market. The export shippers were asked to indicate the level of their agreement in a scale of 1 to 5 where 1 represented **"not at all"** and 5 represented **"extremely much"**.

Table 3: Descriptive Statistics for Transportation Cost Effect on Commodity Pricing

Item	Minimum	Maximum	Mean	Standard Deviation (SD)
Transportation Cost Effect	2	5	4.06	.944

Source: Field Data, 2023

As illustrated in Table 3, the descriptive statistics for transportation cost effect on commodity pricing revealed an overall mean score of 4.06 (SD=.944). This shows a negative perception of transportation cost effect on commodity pricing among export shippers. The low standard deviation which is .944 indicated that most of the data points that were observed clustered tightly close to the mean, and therefore, more accurate. From the short review above, key findings emerge that export shippers are extremely affected by the high transportation cost in their commodity pricing. The study provides a new insight into a relationship between transportation costs and commodity pricing and establishes a clear interaction between these two variables. A similar pattern of results was also obtained in a study that was conducted by Chinecherem et al.(2020) in which they found

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that high transportation costs negatively affected the prices of consumable commodities. These results are also directly in line with the previous findings in which high transportation costs had been found to represent a significant determinant of total operating costs and thus, the selling price which affects the competiveness of commodities on a global market (AÇIK & BAŞER, 2021; Melas & Michail, 2021; Savić et al., 2020). Because of lack of proper methodology for measuring logistics costs and integrated logistics information system for data collection, we decided not to quantify the transportation cost proportionate to commodity value.

Malawi 2063 is an aspiration that aims to transform Malawi into a wealthy and self-reliant industrialized "upper-middle-income country by the year 2063 (NPC, 2020). This desire champions industrialization drive and agriculture productivity among its three pillars. The achievement of this aspiration is expected to be catalyzed by economic infrastructure which includes transportation, among others (NPC, 2020). These two pillars i.e. industrialization and agriculture productivity will produce a considerable amount of goods requiring transportation from extraction points to manufacturing sites and markets. This highlights the importance that transportation has on economic growth of a country and thus, the success of Malawi 2063 aspiration hinges on the efficient transportation system. Regrettably, as a country, much attention is given to macroeconomic indicators such as inflation and interest rates, when each of these indicators in isolation, has a smaller cost implication on a final commodity compared to transportation costs. Further, most of the macroeconomic indicators such as gross domestic product (GDP) and price index that are given much attention to, are directly affected by transportation cost yet transportation seldom makes an agenda item in policy discussions. As discussed above, countries with lower transportation costs have had faster manufactured export and overall economic growth than countries with higher transportation costs because high transportation costs have a potential of significantly reducing trade volume (Naude & Matthee, 2007). It is therefore important that Malawi starts considering transportation as a trade facilitator and that if not managed well, it can break the economy.

CONCLUSSION

The purpose of this study was to establish an interaction between transportation cost and commodity pricing on the international market from the perspective of export shippers in Malawi. By employing a descriptive study design, the study established that transportation cost in Malawi is not affordable to shippers. There is a strong perception among shippers that transportation costs are high. The study further found that transportation costs adversely impact commodity pricing on the international market. This therefore suggests that, the unaffordability of transportation costs has negative impact on commodity pricing and trading on international markets and transportation being crucial for international trade, Malawi suffers economically. This therefore suggests that there is an interaction between transportation costs and international trade.

RECOMMENDATIONS

To effectively manage transportation costs in Malawi, the following suggestions are made:

1.The government, through the Ministry of Transport and Public Works should develop a methodology for measuring logistics costs. This will allow an evaluation of transportation efficiency and identification of bottlenecks and challenges that require control and improvements. The development of the logistics costs estimation model should include building an integrated logistics information network that will be used in inducing advance communication technologies and collection of transportation data for decision making. One can only manage and control what can be identified and measured. By identifying the transportation cost structure, government would be able to eliminate the non-value adding logistics activities and thus, reducing the overall transportation costs.
2.The government through the Ministry of Transport and Public Works should invest more in transport infrastructure. As a landlocked country, being closer to the sea would potentially reduce transportation costs and shipment travel time. As the **"crow flies",** it is only 200 kilometers from the closest tip of Malawi to the Indian ocean. Constructing road or rail to that point would bring Malawi closer to the sea and possibly reduce transportation costs and travel time. This investment could also encourage exporting manufacturers to relocate to that area for easy water transportation and hence, reduced transportation costs.

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