A QUALITATIVE RESEARCH ON EMPTY CONTAINER REPOSITIONING PROBLEM IN TURKEY

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ABSTRACT

As a result of numerous favorable effects of containerization, there has been considerable increase in the tendency of using containers in international movements of both finished as well as semi-finished goods. Such an intensive use of containers has eventually resulted in the intensive exits of all containers from the major export countries. In sight of trade imbalances, there have been various difficulties, however, encountered in succeeding the smooth return of the containers back to the country of origin. Therefore, it has become an important issue for liner shipping industry to manage and reposition the containers that has left behind empty. The problems caused by empty containers are not only limited to certain economic effects on shipping companies. The purpose of this study is to analyze the problems resulted from empty container repositioning. To manage this, the relevant literature published in the last twenty years will be thoroughly reviewed and the solution methods used for empty container problems by such studies will be evaluated.

Keywords: Containerization, Empty Container Repositioning, Repositioning Problem, Empty Container Repositioning Management, Liner Shipping, Trade Imbalance.

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1.   INTRODUCTION

The invention of trade dates back to the early periods of the history of humanity. Trade originated from people's desires to fulfill their needs. Whereas, in the beginning, such needs were met through exchange of the goods people had for the goods possessed by others, people started using certain goods such as bread, gold, beans and pearl, etc. as a means of exchange similar to money due to the need for a common means of exchange as the business life advanced and commodities became diversified.

The invention of money facilitated and promoted trade while the development of transportation and communication technologies paved the way for globalization. Improved transportation and communication technologies boosted the desire of multinational companies to engage in production activities in the countries where they could get inexpensive labor so as to enhance their competitiveness. The circulation of freights increased across the world when multinational companies and various merchants making investments in different countries seized the opportunity of arbitrage in international trade. Considering that around 70% of the world is covered by water, maritime transportation is the most productive and efficient mode for the increasing freight transportation among other transportation systems such as airline transportation, railroad transportation and road transportation.

Maritime transportation started to improve over time as a result of the demands of people and the advancing technological means. Such developments in maritime trade brought along the growth of mercantile fleet, improvement of transportation modes and intermodal transportation, and diversification of transportation systems.

2.   THE DEVELOPMENT OF SEA TRADE

In view of the last century, one of the most significant changes experienced in the trade environment in the world is "globalization". Globalization seeks for an integrated economic order of the world based on abolishing trade barriers such as tariffs, export duties and import quotas. The underlying objective is to ensure the abundance of goods, services and products. The key driving force in ensuring such abundance is the labor productivity arising from the competitive environment. Therefore, nations become integrated in terms of communication, transportation and trade, which is generally referred to as economic globalization. In this context, economic globalization involves trade, direct foreign investments, capital flow, immigration, proliferation of technology and freer circulation and proliferation of languages, cultures and opinions.

Maritime transportation improves day by day under the influence of the advancing technology and the demands of the users as in the case of other transportation modes. Such developments experienced in the maritime trade brought along the growth of mercantile fleet, improvement of transportation modes and intermodal transportation, and diversification of transportation systems. Even though containerization provides great

convenience in terms of transportation, empty containers resulting from trade imbalances stand as an issue that needs to be managed well.

The globalization of the world economy dramatically increased the circulation of goods across the world. Economic pressures and competitive production models forced most companies to resort to low-cost production beyond their limits, and in turn, the change in micro and macro economy required faster and more economical circulation of commodities around the world. Holding the high ground in this respect, maritime transportation reached its peak with the container system that was developed and became popular (Yazici, 2008: 221); and resulted in advancements in many fields (production of large container ships, diversification of the services offered at ports, multimodal transportation systems, logistic processes and supply chain management) that would support this method of transportation.

According to UNCTAD Review of Maritime Transport 2010, while maritime transportation was 2,5 billion tons in 1970s, it increased 5,9 billion tons at the beginning of 2000s, it was 8,2 billion tons at the end of 2008. Because of global economic crisis, it was 7,8 billion tons in 2009. In Turkey, 93,6% of all import and 72% of all export was carried out by maritime transportation in 2009.

2.1. The Review of the Development Of Container Transportation at Sea Trade

With the world economy swiftly entering into the globalization process, the means of cooperation among developed, developing and underdeveloped countries increased. The barriers to trade limits among countries gradually decreased and started to disappear; international trading volume expanded; the transfer of advanced technology from developed countries to developing countries increased; international finance markets improved; the flow of labor increased among countries; and significant developments took place in foreign capital flow. Such relations brought up a phenomenon referred to as 'global economic integration'. Shortly, global economic integration stands for the increase in the goods, labor and capital movements among countries and the expansion of fields of economic cooperation of countries. International trade constitutes the most significant aspect of global economic integration whereas transportation constitutes the most significant aspect of international trade.

Maritime transportation which has a larger load bearing capacity in one go is also the most convenient mode of transportation in terms of cost efficiency. Considering the foreign trade of Turkey, it is stated that any changes experienced in trade reflect on maritime transportation since a large part of exportation and importation, either in amount (ton) or value ($), takes place via maritime transportation

Even though it has a variable structure, containerization shows a general increase every year. In consideration of the containerization on a global scale, there is a decrease in containerization rates only in the year 2009; however, such rate is seen to have swiftly recovered and reached the same level in 2010. Various sources indicate that the reason why containerization tends to increase every year is that any group of commodities can now be transported in containers and that types of containers for different purposes increase day by day.

Having shown marked improvements since the day it was first used until today, even though containerization comprises of certain constituents such as the container itself, container ships, container ports, shipowners and maritime agencies, container ships and container ports are considered to rank highest in the list of constituents since they are the most important constituents.

2.2. Turkey's Position at the World Foreign Trade

The Foreign Trade Data of Turkish Statistical Institute (TUIK) analyzed reveals that the foreign trade figures in Turkey has ever increased since the day the Republic was founded. However, importation and exportation do not increase at an equal rate; and the foreign trade deficit in Turkey increasingly grows bigger due to heavy importation. The imbalance between importation and exportation creates trade imbalances; not every container arrived can be returned loaded and there may be container pile-ups in some areas.

While Turkey's export volume was 243 billion US Dollar in 2009, it increased 300 billion US Dollar in 2010. Table 1 shows the Turkey's import and export position in world trade.

Table 1. The share of Turkey's Import and Export Position in World Trade (Billion US Dollar)

EXPORT			YEARS	IMPORT		
World	Turkey	%		World	Turkey	%
1.989	2,9	0.15	**1980**	1,968	7,9	0.40
3.387	13,0	0.38	**1990**	3,489	22,3	0.64
6.146	27,8	0.45	**2000**	6,490	54,5	0.84
12.147	113,9	0.93	**2010**	12,385	185,4	1.49

Source: The table was formed with data from Turkish Statistical Institute (TUIK) and Word Trade Organization, International Trade Statistics, 2010.

According to TUIK's statistics, during the last 5 years the maritime transportation for both of import and export trade has been the first when the using of transportation modes in Turkey is analyzed. While the second one is highway and the third one is airway. The numeric data is shown on Table 2.

Table 2. The distribution of transportation modes considering import and export rate in Turkey (000 US Dollar)

EXPORT (000 US Dollar)						
Years	Maritime	Railway	Highway	Airway	Others	Total
2014	86.372.467	923.133	55.307.141	14.103.686	1.008.613	157.715.040
2013	82.930.885	956.521	53.674.535	12.960.697	1.279.999	151.802.637
2012	77.983.403	1.017.753	50.440.156	21.781.595	1.238.830	152.461.737
2011	73.576.383	1.242.610	50.257.712	8.577.890	1.252.271	134.906.868
2010	58.788.225	992.502	45.989.372	7.694.195	516.316	113.980.611
IMPORT (000 US Dollar)						

Years	Maritime	Railway	Highway	Airway	Others	Total
2014	141.426.670	1.206.626	37.302.567	24.696.869	37.591.227	242.223.959
2013	139.927.201	1.773.400	40.058.217	32.602.866	37.299.565	251.661.250
2012	129.029.330	2.346.113	39.414.333	23.797.146	41.958.219	236.545.141
2011	133.440.206	3.185.525	44.516.802	21.514.596	38.184.548	240.841.676
2010	112.599.917	2.454.676	42.446.443	17.409.929	10.630.793	185.541.758

Source: TUIK, http://www.tuik.gov.tr (Date of Access:19.02.2015)

3.   EMPTY CONTAINER REPOSITIONING PROBLEM

World trade differs by continent and by region. While some countries have higher import rates others have higher export rates; and this results in trade imbalances among regions in the world. Due to such imbalances in trade, containers pile up in some areas whereas there are shortages of containers where and when needed; the unavailability of empty container supply interrupts trade and causes customer dissatisfaction. This consequently reveals the importance of "empty container management".

In the maritime industry, the effective management of empty container is an important problem. Because of intensive competitive in container market, how the container is transfered from one point to another point is an critical decion as an operational level.

As we mentioned before, container transportation has had a significant role in world trade since 1950. Besides that, the importance of containerization has been increasing day by day since 1970. Especially after Cold War, balance of world trade was changed and this period affected maritime industry, and the container owners was face to face with a return of empty containers was as a big problem.

According to Song and Dong (2009), as the world trades are getting more imbalanced in recent years, particularly in Trans-Pacific and Asia-Europe routes. In other words, due to the increasing imbalance and volatility of the trade demands, shipping companies and port operators are facing challenges of managing container operations effectively, in particular the empty container repositioning (Song, 2009; Song and others, 2005; Theofanis and other, 2009).

Since directional imbalances in trade activities result in a surplus or shortage of empty containers in different parts of the world, their management can be thought of as a network problem whose arcs represent balancing flows, inventory links and decisions concerning the time and place to lease containers from external sources (Francesco, 2007: 6).

Aside from the trade imbalances, based on the belief that the freight rates are higher for the regions where the most number of voyages are made and vice versa, it is revealed that another factor contributing in regional container pile-ups is a result of the container rates. In addition, the affordable prices of new containers cause the containerization to become a one-way movement and outbound containers not to return empty. This is because the most significant disadvantage for transportation companies in terms of transporting empty containers is that transporting empty containers bear no profits but create significant logistic costs. Whereas container production costs were once more affordable than the

costs of reshipment of empty containers, new container production costs went up along with the increase in steel prices, which in turn made the reshipment of empty containers a current issue again. Due to the increasing demand, there was also an increase in the costs of reshipment of empty containers.

3.1. Empty Container Repositioning Problem in Turkey

Empty container repositioning problem does not affect only containers owners about empty containers' transportation cost, but also agents and logistics brokers which provide containers to their customers. At this point, customer satisfaction is damaged, and the customers try to find an alternative solutions with other transportation modes. Turkey was come across with this problem as world.

The Turkey ports and terminals, which are given services for containers, handled 5,8 million TEU in 2010. Approximately, the share of empty container in total containers was 1,5 million TEU and average between 2006-2010 was 35 %.

Table 3. The number of empty and full containers in Turkey between 2006-2010 (TEU)

	Empty Container	Full Container	Empty/Full Rate (%)	Total
2010	1,535,772	4,328,260	0.35	5,864,032
2009	1,197,783	3,320,135	0.36	4,517,917
2008	1,350,088	3,875,313	0.35	5,225,401
2007	1,219,827	3,484,890	0.35	4,704,717
2006	874,634	2,687,616	0.33	3,562,250
Ortalama			**0.35**	

Source: www.turklim.org

Because of scarcity of handling, data from Black Sea Region was not calculated. According to Port Operators Association of Turkey (TURKLIM), the regions that have empty container surplus were Aegean, Mediterranean and Marmara respectively between 2006-2010. Table 4 shows the surplus rate.

Table 4. Considering the Regions of Turkey, the Rate of Empty containers to Full Containers (%)

	Marmara	Aegean	Mediterranean
2006	0.30	0.39	0.31
2007	0.33	0.42	0.35
2008	0.33	0.42	0.34
2009	0.33	0.47	0.37
2010	0.31	0.48	0.39
Average	**0.32**	**0.44**	**0.35**

Source: www.turklim.org

4.   METHODOLOGY OF THE STUDY

Like the whole world, Turkey experiences issues related to empty container supply. A qualitative research was planned in order to obtain findings on the reflections on Turkey of the research problem defined in light of international literature. In this context, face-to-face meetings were held with the Turkish representatives of the world's major operators of container ships.

Despite the intensive international literature on the subject matter, it was seen that the subject matter was not addressed much at the national level. Even if not an objective, it is considered as a unique contribution. Therefore, the research is a heuristic study in terms of the intended purpose. Primary and secondary sources were used as data collection method.

4.1.   Determination of the Research Problem

As a result of the literature review made, plenty of international articles, academic papers, dissertations and final reports were found, representatives from the sector were interviewed; and as a result, it was determined that there are problems experienced in the market related to the subject matter even though it does not arouse the interest of the academic environment in Turkey. In this sense, the research problem determined is to unearth the reasons of the empty container repositioning problem in Turkey and to come up with solutions.

4.2.   Research Limits

The research studies only 15 liner shipping companies offering services in Turkey and listed in the "20 Top Ranked Operators of Container Ships" Table in the Review of Maritime Transport 2010 of UNCTAD and some of the Turkish Ports when analyzing the effects of empty container repositioning on Turkey.

When deciding on ports, differentiation of state ports and private ports was taken into consideration, and Turkish State Railways Izmir Port was selected as a state port while MARPORT, the largest private port of Turkey, and NEMPORT, the largest private port of the Aegean Region, were selected as private ports.

4.3.   Determination of the Interview Questions

Since there are no case studies conducted on this subject in Turkey, the data obtained from the literature review, the cause of the problem, the subjects addressed in previous studies conducted and the common point of all studies played an important role when defining the questions.

The most important factor taken into consideration when determining the interview questions was with whom the interview would be made. In addition to making interviews with container ship operators conducting liner shipping, it was believed that it was necessary to involve ports, which are the entrance and exit doors of maritime trade, in the interviews. Therefore, 2 separately structured interview forms were prepared for the ports and the liner shipping companies.

In this context, the questions intended for the port managers are as follows:
1.   How does the empty container problem experienced in the world affect you?
2.   What are the consequences (positive/negative) of storing empty containers in the port area for pot operations? Do containers pile up?
3.   What is the effect of an empty container on incomes/expenses of the port?
4.   What are the differences resulting from the manner of stacking empty containers?
5.   How many days is the average waiting period for an empty container at the port?
6.   How do you evaluate such number?
The questions intended for the representatives of the liner shipping companies are as follows:
1.   What are the general reasons (at a macro scale) of the empty container problem experienced in the international container transportation?
2.   What are the effects of the empty container problem experienced in the world on Turkey?
3.   What are the negative aspects caused by the empty container problem?
4.   Could you please briefly define the extra costs arising from the empty container problem? Who covers such costs?
5.   How does the problem affect the container freights?
6.   How does the problem affect service quality and what is the reaction of the customer?
7.   What are the temporary solutions you come up with for the problem?
8.   Do you have a permanent solution to suggest for the empty container problem?

4.4.   Research Population and Sample

The research population is the liner shipping companies visiting Turkey via Turkish Ports. The sample is the 15 liner shipping companies offering services in Turkey and listed in the "20 Top Ranked Operators of Container Ships" Table (please see Table 5) in the Review of Maritime Transport 2010 of UNCTAD and some of the Turkish Ports when analyzing the effects of empty container repositioning on Turkey. Only Hapag-Lloyd Company was interviewed both in Izmir and Istanbul.

1 state port (Turkish State Railways Izmir Port) and 2 private ports (MARPORT and NEMPORT) were selected as ports.
Names of the companies and ports interviews are given in Table 6.
The mid-level managers and senior managers of the companies and the ports having a good command of the subject were interviewed. The names of the persons interviewed are not disclosed for the confidentiality of the interviews.

Table 5. The 20 top-ranked operators of Conteyner Ships, 1 January 2010

	Operator	World Share (TEU)
1	Maersk Line	%11.7
2	MSC	%10.1
3	CMA CGM	6.3%
4	Evergreen Line	4.0%
5	APL	3.5%
6	COSCON	3.3%
7	Hapag-Lloyd	3.1%
8	CSCL	3.1%
11	MOL	2.3%
12	K Line	2.2%
13	Yang Ming	2.1%
14	OOCL	1.9%
15	Hamburg Sud	1.9%
16	HMM	1.7%
17	Zim	1.4%
18	CSAV	1.3%
19	UASC	1.2%
20	PIL	1.2%

Table 6. Information about face-to-face Interview

		Line / Ports	Place
Lines which give services in Turkey	**1**	Turkon	Izmir
	2	Hapag-Lloyd	Izmir
	3	APL	Izmir
	4	OOCL	Izmir
	5	CMA-CGM	Izmir
	6	COSCON	Izmir
	7	UASC	Izmir
	8	ZİM	Izmir
	11	Arkas	Istanbul
	12	Hanjin Line	Istanbul
	13	Hapag-Lloyd	Istanbul
	14	Yang Ming	Istanbul
	15	Tarros	Istanbul
	16	DAL	Istanbul
Ports	**17**	TCDD İzmir	
	18	Nemport	
	19	Marport	

Source: UNCTAD Review of Maritime Transport 2010

5.   RESULTS AND EVALUATIONS

Containerization has become highly important in the last 30 years. However, managerial problems rise as a result of empty container supply due to trade imbalances in the world trade.

As a result of the literature review made, plenty of international articles, academic papers, dissertations and final reports were found, and it was determined that there are problems experienced in the market related to the subject matter even though it does not draw attention in Turkey. The literature was reviewed also to ensure that the study is helpful for further studies, and all studies conducted until today were reviewed. Therefore, the research is a heuristic study in terms of the intended purpose. Primary and secondary sources were used as data collection method.

The data gathered from all of the sources indicate that this problem results from trade imbalances. The in-depth face-to-face interviews conducted also substantiates such determination; and it is determined that the empty container repositioning problem is linked to the economic fluctuations experienced and the trade imbalances experienced as a result of the import and export balance disturbed. The interviews conducted also supported such data collected; and it was detected that the empty container repositioning problem is the trade imbalances originating from the import-export imbalances experienced in the world.

For the evaluation of the effects of the problem on Turkey, the method of in-depth and face-to-face interviews with the officials from the ports, known as the entrances of maritime trade, and the container liner shipping companies were adopted within the qualitative process of the research. Semi-structured interview form method was selected as the interview form.

Firstly, while it was detected during the interviews conducted with the ports that the ports did not directly encounter the empty container problem experienced in the world, but instead, this was the problem of the liner shipping companies, it was also established that the problem had indirectly, if not directly, affected the ports. The most important of these is the increase in the queue just when the agency is faced with the problem of supplying empty container to the customer; and containers start to pile up in port areas from the moment the empty container is supplied.

According to the answers given during the interviews with the port authorities, it was determined that stacking empty containers in port areas creates operational problems and impedes the productive operation of the port by causing lack of space. Therefore, it was determined that dry port is an important logistic support for container stacking, inspection of the required compliances by the agency (such as checking readiness to load) and performing the necessary loading activities.

In addition, it was established that storing empty containers at the port area boils down to only porterage, occupies space instead of bringing in income and reduces operational productivity.

Furthermore, it was found out that the stacking is an operation that is completely related to the equipment used. The interviewees indicated that while stacks of 2-3 and 7-8 are possible depending on the space available, stacks of 5-6 are ideal for productive handling. Even though it was emphasized that the average waiting period of empty containers at the ports could vary by ports and agencies, it was established that the average period was 7 to 10 days.

As a result of the interviews conducted with the officials of the liner shipping companies and department officials who are the direct addressee of the empty container repositioning problem, it was established that this problem originated from the trade imbalances experienced in the world as suggested in the literature. In consideration of its effects on Turkey, it was established that the empty container problem experienced in the world affected the freight balance in general.

As a result of the interviews conducted with both port authorities and officials of the liner shipping companies, it was determined that the empty container problem experienced in Turkey originated from trade imbalances in the domestic markets rather than the import-export balances at the ports.

As a result of the interviews made, the negativities posed by the empty container problem experienced can be diversified. However, the primary negativities were considered as increased costs, changes in services, customer dissatisfaction and the resulting loss of customer, and the loss of prestige in the environment.

All persons interviewed indicated that both the excess and the lack of empty containers were the issue most disliked by the container ship operators; and the reason for that was explained as empty containers completely denoting cost. Therefore, the costs created by empty containers fall into two categories as the surplus of empty containers and the need for empty containers. The extra costs arising from the surplus of empty containers are repositioning, storage, transportation and loading-unloading costs. Empty container freight, transshipment port charges, port local charges, shipping cost and loading-unloading costs are among the costs associated with the need for empty containers. It was established that all of such costs were covered by the container ship operators. Furthermore, it was detected as a result of the interviews conducted that the empty container problem experienced has a direct influence on the freights. In addition, the interviewees indicated that factors like container damages, purchases, etc. had direct effects on the container freights.

In containerization, supplying containers is the greatest and most basic service offered to a customer (container user) by liner shipping companies. Based upon the interviews, all interviewees indicated that the empty container problem faced in the market is a problem that irritates the customer since it directly affects the customer. The interviewees stressed that it could even lead to loss of customers if the problem became bigger.

According to the data gathered from the interviews, it is possible to come up with temporary solutions for the problem by supplying equipment from nearby locations, ordering shipment of required number of empty containers and renting empty containers from different agencies. Nevertheless, most of the interviewees pointed out that it would be a more reasonable action to find permanent solutions through long-term planning. Therefore, it was stated that it was possible to come up with permanent solutions for the empty container repositioning problem but there was not a best point for this and that it was a sector that could be improved on a daily basis. Thus, the following were mentioned by the interviewees as the actions that could be taken:
- Give weight to exportation since Turkey is a country that is heavily dependent upon importing, and increase our exportation level through accurate estimations and proper marketing methods,
- Establish central departments within liner shipping companies that will only perform empty container analyses and planning, and ensure their integrated operation with the import-export and logistics departments,
- Work on foldable containers that the whole world has started to work on today,
- Rent warehouses through reasonable agreements, and
- Set up hubs that are considered as centers in a regionally powerful area.

6.   SUGGESTIONS AND FURTHER STUDIES

In the analyses performed in relation to the literature review, all studies conducted since 1972 on the repositioning of empty containers were reached; and the studies conducted were analyzed under two main titles in terms of the studies addressing the issue in mathematical modelling and heuristic modelling. For further studies, it is suggested to present the parameters that are the cause of the problem and to perform more diversified profiling.

Furthermore, it is intended to study on foldable container that is considered as one of the most convenient solutions in terms of empty container supply. Today, brands such as Starbucks stock their products in foldable boxes in their stores; and the lack of space in the stores ceases to be a problem when the emptied boxes are folded at their sides. Similar practices are also available for containers. It is planned on studying on foldable containers in order to improve the subject and offer convenient solutions.

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