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MASTER’S THESIS

**THE IMPACT OF GLOBAL IMBALANCES ON
MARITIME SECTOR: STATISTICAL ANALYSIS ON
PORT THROUGHPUT EFFICIENCY IN TURKEY**

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DECLARATION

I hereby declare that this master's thesis titled as “**The Impact of Global Imbalances on Maritime Sector: Statistical Analysis on Port Throughput Efficiency in Turkey**” has been written by myself in accordance with the academic rules and ethical conduct. I also declare that all materials benefited in this thesis consist of the mentioned resources in the reference list. I verify all these with my honour.

24/01/2022

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ABSTRACT

Master's Thesis

The Impact of Global Imbalances on Maritime Sector: A Statistical Analysis on Port Throughput Efficiency in Turkey

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Maritime sector has a crucial role in international trade, acts as a main enabler while carrying 90% of the world merchandise goods. That is why global economic and trade activities, or any imbalances affect maritime sector directly.

Although Turkey has natural maritime advantages, it fell behind of the global seaborne trade. Insufficient attention and weak policies created today's problems that put Turkish maritime sector in more vulnerable position against global imbalances. To eliminate these problems and to increase Turkey's share in international maritime sector, the first station is Turkish ports and increasing their efficiency. Because if maritime transport is running the circulation system of global trade, ports are best spots to measure the blood pressure.

In this study import and export port throughput efficiencies of the Turkish ports was determined, and results were evaluated to measure the impact of global imbalances occurred in the last 15 years which are 2008 Global Economic Crisis and US-China Trade Wars. The efficiency analyses were carried out by Data Envelopment Analysis method.

In the literature port efficiency analyses mostly used port's physical features and as the distinguishing feature, this study looks from the wider frame to this point and use both physical and economic parameters to evaluate port throughput efficiency.

By revealing the results, relatively efficient/inefficient periods and underlying reasons were highlighted. Export port throughput efficiency were

found highly sensitive to the global economic and commercial imbalances, and the sensitivity of the import port throughput is found more related with the national economic structure and conditions. The results indicate a clear path for policy implications that were suggested for primary economic and financial instabilities and structural problems to increase the port throughput efficiency, to provide safer environment for members and candidates of maritime sector, to operate more efficiently in the time of global imbalances.

Keywords: Maritime Sector, Global Imbalances, Economic and Financial Crisis, Trade Wars, Turkish Port Throughput Efficiency, Data Envelopment Analysis (DEA),

ÖZET

Yüksek Lisans Tezi

Küresel Dengesizliklerin Denizcilik Sektörüne Etkileri: Türkiye’deki Limanların Yük Elleçleme Verimlilikleri Üzerine İstatistiksel Bir Analiz

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İngilizce Dış Ticaret Programı

Denizcilik sektörünün uluslararası ticarete hayati bir rolü vardır. Dünya ticari mallarının %90’ını taşıyarak, dünya ticaretinin mümkün kılan bir rol üstlenmiştir. Bu yüzden, küresel ekonomik ve ticari aktiverler ve aynı zamanda küresel dengesizlikler denizcilik sektörünü doğrudan etkilemektedir.

Türkiye doğal denizcilik avantajlarına sahip olmasına rağmen deniz kökenli ticarete geriye düşmektedir. Yetersiz ilgi ve zayıf politikalar bugünün problemlerini yaratmış ve Türkiye’yi küresel dengesizliklere karşı daha kırılgan bir yere koymuştur. Bu problemleri ortadan kaldırmak ve Türkiye’nin dünya denizcilik sektöründeki payını artırmak için, ilk durak Türk limanları ve onların verimliliğini artırmaktır. Çünkü deniz taşımacılığı dünya ticaretinin dolaşım sistemini oluşturuyorsa, tansiyonun en iyi ölçüleceği yerler de limanlardır.

Bu çalışmada Türk limanlarının ithalat ve ihracat yük Elleçleme verimlilikleri tespit edilmiştir ve bulgular son 15 yıl içinde gerçekleşmiş olan 2008 Küresel Ekonomik Krizin ve ABD-Çin Ticaret Savaşlarının etkilerini ölçmekte kullanılmıştır. Elleçleme verimlilikleri Veri Zarflama Analiziyle ölçülmüştür.

Literatürde liman verimlilik analizleri genellikle incelenen limanların fiziksel özellikleriyle ölçülmüştür. Bu çalışmanın ayırt edici özelliği ise, konuya daha geniş bir çerçeveden bakarak hem fiziksel hem de ekonomik değişkenler kullanarak verimliliği ölçmesidir.

Sonuçların elde edilmesiyle birlikte, göreceli olarak verimli ve verimsiz dönemler ve bu sonuçların altında yatan sebepler bulunmuştur. İhracat liman

elleçleme verimliliği, küresel ve ticari dengesizliklere karşı hassasiyet göstermiş olup, ithalat liman elleçleme verimliliği ise daha çok ulusal ekonomik yapı ve durumlara karşı hassasiyet göstermiştir. Bulgular, izlenmesi gereken politikalarla ilgili önerilerin bulunmasını sağlamıştır. Çalışmanın sonunda, liman verimliliğini artırmak, denizcilik sektörü üye ve üye adaylarına daha güvenli bir ortam sağlamak, küresel dengesizliklere maruz kalındığında daha verimli bir şekilde çalışmak için, ekonomik ve finansal dengesizliklerin, yapısal problemlerin çözümüne yönelik önerilerde bulunulmuştur.

Anahtar Kelimeler: Denizcilik Sektörü, Küresel Dengesizlikler, Ekonomik ve Finansal Kriz, Ticaret Savaşları, Türk Liman Elleçleme Verimliliği, Veri Zarflama Analizi (VZA)

**THE IMPACT OF GLOBAL IMBALANCES ON MARITIME SECTOR: A
STATISTICAL ANALYSIS ON PORT THROUGHPUT EFFICIENCY IN
TURKEY**

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ABBREVIATIONS

| | |
|-----------------|---|
| ABS | Asset-Back Securities |
| BCC | Banker, Charnes and Cooper |
| BDI | Baltic Dry Index |
| BHSI | Baltic Handysize Index |
| CCR | Charnes, Cooper and Rhodes |
| CDO | Collateralized Debt Obligations |
| COSCO | China Ocean Shipping Company |
| CRS | Constant Return to Scale |
| DEA | Data Envelopment Analysis |
| DEAP | Data Envelopment Analysis Program |
| DM-DTGM | T.C. Başbakanlık Denizcilik Müsteşarlığı Deniz Ticareti Genel Müdürlüğü |
| DMU | Decision Making Units |
| DRS | Decreasing Return to Scale |
| EEC | European Economic Community |
| EU | European Union |
| EUROSTAT | European Statistics |
| FDI | Foreign Direct Investment |
| FED | USA Central Bank |
| GDP | Gross Domestic Product |
| GPS | Global Positioning System |
| ICS | International Chamber of Shipping |
| IMF | International Monetary Fund |
| IMO | International Maritime Organization |
| IPI | Industrial Production Index |

| | |
|-------------------|---|
| IRS | Increasing Return to Scale |
| ISTFIX | Istanbul Freight Index |
| LNG | Liquefied Natural Gas |
| LPG | Liquefied Petroleum Gas |
| MBS | Mortgage-Back Securities |
| OECD | Organisation for Economic Co-operation and Development |
| OPEC | Organization of Petroleum Exporting Countries |
| PTE | Pure Technical Efficiency |
| REER | Real effective exchange rate |
| RTS | Return to Scale |
| SE | Scale Efficiency |
| TE | Technical Efficiency |
| TEU | Twenty-foot equivalent units |
| TURKSTAT | Turkish Statistical Institute |
| UNCTAD | United Nations Conference on Trade and Development |
| UNCTADSTAT | United Nations Conference on Trade and Development Statistics |
| VLCC | Very Large Crude Carrier |
| VRS | Variable Return to Scale |
| WCO | World Customs Organization |
| WTO | World Trade Organization |

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INTRODUCTION

Globalization is the main enabler of international free trade. After the globalization era started, important changes are observed in supply chain, production system, and economic operation. Globalization give any firm or country the ability and a chance to produce any products –includes raw materials, semi finishing or final product- and it also gives customers the chance to manage their own living ways and standards while providing options to refuse what homeland offers and opening a door to world blessings. However, the unbalanced distributions of the raw materials and resources over the world created the needs for transportation of these goods between the sources to receivers and the distance between the source and final destination might not be close or accessible in any transportation methods. The fascinating process of a single product to travel all over the world to reach the final destination can be conducted only by maritime transportation while ensuring cheapest and most efficient way. It is not important only because of the lower cost comparing with other transportation methods, it is also important because of capability to carry huge amount of goods at once with high accessibility to anywhere in the world.

Maritime transportation has been a backbone of the international trade since the beginning of the maritime history, starting 5000 years ago (Daniel & Yildiran, 2019: 7). In 2018, world trade volume reached 19.67tn in US dollars and approximately 90% of these world merchandise goods are transported by maritime transportation (International Chamber of Shipping [ICS], n.d.) which put maritime sector in a highly crucial position as a main enabler of international trade (Jacobs, 2012: 223). Because shipping service is derived from the demand for merchandise goods all over the world (Slack, 2010: 5; Açık & Baran, 2018: 1091; Asyalı et al., 2009: 13; Pocuca & Zanne 2009a: 477) any imbalances in global trade affect maritime sector deeply. So it is impossible for maritime sector not to be affected by the changes in global economy, its position and importance is directly reflected by the global economic activities or global trade (Belova & Mickiene, 2015; Pocuca & Zanne, 2009a: 477). If there isn't any demand there is no point of production, and if there isn't any product, there is no point of the need for transportation of any product from a point A to a point B. So, proportionally, the demand for maritime transportation

increases as the demand for raw materials getting higher by expands in global economy (Açık & Baran, 2018: 1091). That is why maritime sector has always been affected by sudden and unnatural events in global markets that affect global production and trade; in other words, many variables are belonged to macro level economy and trade affect maritime sector directly in a very short time. These sudden and unnatural events might be political, economic (exchange rates, interest rates, recessions, depression, crisis, insecurities), Financial (funds and liquidity shortages, confidence level in financial system), environmental (global warming, climate change), market related (oil prices, raw materials and commodity prices, freight rates, price, and stock market crashes).

The speed of the globalization boosted the global demand for products and in a short time maritime sector, as a vascular system of the international trade, had to be developed and be flourished technically, operationally, and administratively. The great growth in maritime sector also caused a many new professions to be born and the sector became more complicated, detailed, and interconnected system. Nowadays maritime sector is a multi-billion dollar, one of the most international sectors, contains a great variety of sub-sectors that are strategically deployed and continuously developing to ensure best efficient and effective conditions. All players have a critical role in turning the wheel and each of them has the capability to add value into the chain. However, in this great network, the role of ports is one of the most curtail ones indisputably. Ports are the doors opening to international trade, without a door there would be no path from point A to point B, without an access path there would be no seaborne trade, no industrialization, and no globalizations. But the need for maritime transport will always remain same. So, if the maritime transport is consisted of vascular system of global trade, ports are the points of blood pressure.

Turkey is a country that is surrounded by the four seas and approximately 55% of the total population is living the cities that have a coast to these four seas (Korkmaz, 2012: 101). Also Turkey is in a critical place economically, geographically and geopolitically as being in the middle of the global economy; as a bridge between Asia, Middle East and Europe; as the only gateway between Black Sea and Mediterranean Sea. Although Turkey has these unique natural advantages, it fell behind of the global seaborne trade, especially when comparing with the other Mediterranean and Black Sea countries (Kurt, 2010: 199; Korkmaz, 2012: 108) However Turkish maritime

commercial fleet occupied only 1% percent of the total world fleet capacity and getting only 1% percent of the global maritime treasury that is about 300 billion US dollar capacity annually (Aymutlu, 2007: 13) while Greece has the 18% of the world maritime fleet capacity and gain 60 billion US dollar annually... Also, Turkish fleet meet only the %30 percent of the Turkish foreign trade amount (Kurt, 2010: 201). Consequently, the main portion of the freight paid is feeding the foreign maritime companies causing a transfer of money to abroad.

Insufficient attention and weak policies created and cumulated consist of the today's maritime sector problems. These are insufficient fleet capacity; insufficient port infrastructure, capacity technological facilities; insufficient logistic integration with other transportation methods enabling ports to connect efficiently and effectively to other transport; demanding bureaucratic operations; insufficient financial sources; insufficient qualified sea or land side stuff...etc. All these problems are challenges for the future and musts to be eliminated one by one to increase Turkey's share in international maritime system and to turn the capital flow back to the homeland. To reach this goal, the first station is Turkish ports and increasing their effectiveness and efficiency, because ports are the infrastructure of the maritime system acting like a blood pressure points in the vascular system.

In this study port throughput efficiency of the Turkish ports will be determined and results are evaluated to measure the impact of global imbalances on Turkish ports' throughput efficiency. The reason to focus on this area, although Turkey has unique natural advantages to enhance its maritime activity, it fell behind of the global seaborne trade. This woeful problem put the Turkish maritime sector even more vulnerable in the time of global imbalances. So, this study will determine the efficiency of Turkish ports throughput to see the impact of global imbalances during 15 years period of time that includes two important global imbalances; 2008 Global Economic Crisis and so called US-China Trade Wars. The efficiency analysis will be carried out by the method called as Data Envelopment Analysis (DEA). It covers the data of the years from the first quarter of 2005 to the last quarter of 2019.

In the first chapter, the considerations on global maritime sector and the past global imbalances will be examined. In the second chapter, the main reasons and primary consequences of the 2008 Global Economic Crisis and then impacts of these

consequences on different parts of maritime sector will be determined. In the third chapter, the outline, underlying factors, reasons and primary global consequences of the recent US-China Trade War and then impacts of these consequences on maritime sector will be determined. The contributions of these chapters are that they examine the impacts and these global imbalances causations by associating maritime sector, global economy and international trade terms by a great literature review and it synthesizes and distils those findings in a more harmonized manner regarding with global economy, international trade, maritime economics, maritime sector and it's characteristic. In the fourth chapter, the method of the statistical analysis will be examined, and empirical analysis will be carried out.

In the literature there are many studies on port throughput efficiency using physical features belongs the ports they analyzed and many of them were conducted their studies to compare port samples and define a benchmark for other inefficient ports either in national studies or international studies. However, distinguishing features of this study, efficiency of the port throughput will be evaluated by considering both physical and economic parameters.

Many studies are using physical inputs to describe the production function of ports. However, performance of ports cannot be evaluated by only port facility related variables, and developing a system includes both micro and macro parameters is best way to evaluate port efficiency (Bergantino et al., 2013: 46; Cui et al., 2015: 1401). That is why this study chose another path to describe it which is economical. Because of the purpose of ports founded to meet certain needs of trade, to transport goods by transmarine ways, so it is a derivative demand of commercial and economic activities internationally and internationally (Belova and Mickiene, 2015; Cristina-Steliana, 2009; Wildenboer, 2015: 11; Wang, 2014). Importance of economic activity inland and outland, the macroeconomic indicators are play a very significant role on analyzing port performance (Belova and Mickiene, 2015: 26; Cristina-Steliana, 2009: 87; Wildenboer, 2015: 11; Tongzon, 1995; Chou et al., 2008; Sun and Chen, 2008; Vanoutrive, 2010) as the sources of all commercial activities and directly port activities. So this study is looking from the wider frame to this point and use economic variables.

By revealing the results, this study aims to highlight the relatively efficient and inefficient periods of the Turkish ports and their reasons to become a guideline and to give signals for the members of the Turkish maritime sector and trade to adjust their policies nationally and internationally (Bergantino et al., 2013: 43) and operate more efficiently in the time of global imbalances.

So, in this study the following questions will be answered; (1) What are the impacts of 2008 Global Economic Crisis and US China Trade Wars on maritime sector? (2) Which economic parameters have the most impact on the merchandise goods handled by maritime ports? (3) Which physical parameters have the most impact on the merchandise goods handled by maritime ports? (4) Which years/periods are selected as most efficient years/periods (benchmarks) and which ones are inefficient relatively to these benchmarks? (5) What are the target output values for inefficient years to ensure efficiency? (6) What are the economic reasons behind the efficient and inefficient ports to become efficient and inefficient and what are the policy implications to increase the port throughput efficiency, to provide safer environment for members and candidates of maritime sector, to operate more efficiently in the time of global imbalances?

CHAPTER ONE

CONSIDERATIONS ON GLOBAL MARITIME SECTOR AND GLOBAL IMBALANCES

1.1. THE GROWTH AND IMPORTANCE OF MARITIME SECTOR IN DEVELOPING AND GLOBALIZING WORLD

Globalisation is the main enabler of international free trade. That is why especially after the globalisation took over the world, important changes are observed in supply chain, production system, and economic operation. Globalisation give any firm the ability and chance to produce uncommon products –includes raw materials, semi finishing or final product- and it also gives customers the chance to manage their own living ways and standards while providing options to refuse what homeland offers and opening a door to world blessings. Of course, it is not only about the uncommon products, but also about the products highly common and demanded in a degree that forces the countries to establish the production in their countries for cost and logistic needs like raw materials for industrial sectors, main food products, finished packaged products... However, the unbalanced distributions of the raw materials and resources over the world created the needs for transportation of these goods between the sources to receivers and the distance between the source and final destination might not be close. Naturally, the transportation and service charges given –freight- become one of the important considerations in costing that product (İnce & Tari, 2019: 18). Comparing with the other transportation methods maritime logistic is the most demanded one not only due to the cost-effective freight prices but also they can carry huge amount of goods at once with high accessibility to anywhere in the world.

Since the very beginning of the world trade, maritime transportation had a big part to play. The first line of merchandise by sea was between Mesopotamia, Indus River and Bahrain (İnce & Tari, 2019: 3) but know there is not even a single puddle not to be visited by sea vehicles, humans even dig, tear and split the earth to make new waterways for transportation. Especially after 19th century, with the industrial revolution, the production capacities of the countries have been increased to a degree enables them to produce more than they need domestically. The rising capacities of

the world production paid the way for the international trade to grow caused by the countries who eager to make export in order to use their full capacity efficiently. Naturally, the need for maritime transport was increased gradually as the apple of the foreign trade's eye. As a cycle, demand gave birth to production, production to international trade and international trade to maritime transportation... It should be noted that industrial revolution not only caused the development in coastal production system and technology but also let many new inventions for the ships like steam powered vehicles, bigger and more durable ships made by steel instead of wood, cable lines laid down for communication between mariners (İnce & Tarı, 2019: 4). The amount of merchandise goods carried by sea increased 7 times from middle to end of 19th century and in the 20th century it reached another dimension... Development areas weren't only about the ship size or speed but also about the specialization in ship types and operation, integration with other transport methods, simplification methods for cargo handling and carrying... In the middle of the 20th century, the ships were made in able to carry different kind of cargoes, by that way the operators can involve both tramp and liner shipping activities easily. However, by the increase in global trade volume, operators individually and whole maritime system globally had to evolve systematically into more specialized areas. Because specialization brings efficiency and increasing efficiency is much sound, constructive, cheaper and effective way than increasing ships size and numbers... The operators satisfied by efficient trade became more open to improvements and meet the requirements of the cargo owners in faster and more trustable manner. Of course, these new improvements has a mandatory spill over effect to the other branches of the maritime sector; ports had to be specialized to efficiently handle the specialized cargoes; agents were sprout out to follow the cycle and handle the operation getting complex and dense between cargo and ships.

Undoubtedly, invention of containers is one of the most important developments in 20th century. It starts with 58 pieces container from New Jersey to Houston and in 2019, approximately 60 years later, world container port throughput reaches 811 million of twenty-foot equivalent units (TEU). The main benefits of the containerisation to maritime sector are lower transport and handling costs, velocity increased in ports while handling, simpler and less expensive packaging, stacking capability, reducing possibility of spoilage and losses, and flexibility of the cargo

options (might be bulk, liquid, manufactured, refrigerated...etc). New building ships were designed to carry containers resulted a clear line between the tramp and liner shipping.

The importance considered for maritime sector was increased and countries increased their budget for new investments in this sector. The new investments paid the way for new inventions technologically like Global Positioning System (GPS) and container which carry the position of maritime transportation in another dimension (Kol, 2010: 8). Any developments in maritime sector also simultaneously developed the service quality and logistic system globally which boosted importance even more.

On the other hand, countries and enterprises not just becoming global but more developed too. The way of thinking, attitudes and behaviours regarding nature, safety and security also became the important subjects too. Many official and regulatory organisations come into existence to set rules to control aggressively growing industrialization and globalisation. These rules set by globally acknowledged organisations control the international relations, politic, economic and trade related strategies and plans. In short, there weren't just new developments and inventions for the maritime sector, but also there were many new challenges accompanied maritime sector who face with many new requirements to be met technically, operationally, bureaucratically, and always will be...

1.2. THE WIDE AND DEEP BRANCHES OF MARITIME SECTOR

In the past, ship owners named also as merchants. The ones who have a ship have used their ships to make trade by selling goods to point B that had purchased from point A. The difference between being a shipowner and a merchant was becoming clear through the end of the 18th century (İnce & Tari, 2019: 4). The globalisation trend and containerisation process over the past fifty years have been transformed the maritime sector from the bottom to top, affecting the producers, consumers, and the numerous transportation intermediaries connecting them. The changes, developments, inventions and naturally new requirements shaped the whole system like the vein of a piece of leaf. Every need opened a door to a new sector branch; existing organisations split to become more specialized areas and create sub

branches... Nowadays maritime sector is one of the most international sectors (Lützhöft et al., 2011: 282), contains a great variety of sub-sectors such as ports, shipyards, forwarding & brokering agencies, maritime companies, banks and other financial institutions, public institutions, insurance companies... Many more others that are strategically deployed and continuously developing to ensure best efficient and effective conditions. All players have a critical role in turning the wheel and each of them has the capability to add value into the chain.

All activities are carried out to transfer the demanded goods from the point of supply; these activities involve communication, agreements, carriage, financial transactions, documentation...etc. It might be mistaken that maritime sector is just concerning the actual carriage of goods but it isn't, to make the actual carriage supportive and regulatory sectors needed to control the transaction from the start to beginning. The main areas of activity can simply be divided into three areas that are sea, port and land; and the main partners who have a role in driving the wheel of maritime sector are listed and explained as below;

(1) The main players in the sea side are ship owners/ shipping lines, ship crew, shipbuilders, shipyards and second hand/ demolition market.

Ship owners, shipping lines/shipping companies are the players who own, lease or operate a vessel to carry cargoes. A ship owner means a company or a person who own ship(s) and he might lease his vessel for a certain time or voyage to one or number of cargo owners. On the other hand, shipping lines might operate their own vessels or lease a one to actually carry the cargo from port to port. So, they both are at the sea side involving the operation and carriage.

Ship crew consist the labour force of the carrying part. They are responsible to ensure the cargo and the ship is in good and safe manner during sailing, maintain in shipyard, at anchorage, at berth or handling the cargo, shortly; anytime, anywhere and under what circumstances.

Shipbuilders are responsible for designing or constructing a sea vehicle. While the international trade become competitive, shipbuilders are expected to build cost effective ships ensuring both high carrying capacity and more fuel efficient. Also being eco-friendly is one of the concerns of the shipbuilders now...

Shipyards are the places where new ship construction, repair and maintenance are handled. The service time is highly crucial for ship operators due to non-profit duration, it is expected from shipyards to have competitive technological equipment and adequate work force to satisfy the ship owners.

New building/Second hand/demolition markets involve purchase and sale of the ships. Shipping companies, investors like banks might require new and second-hand ships to operate or further sales. According to the (Olesen, 2015) due to the speculative market characteristic, demand is unsteady cause high risk exposure, however right investments might cause more profits than the profits earned from transportation.

(2) The main players in the port side are ports/terminals, ship agents, customs.

Ports/terminals are the most necessary players acting like a bridge between sea and land to facilitate cargo flow. After the mid-20th century port structures are designed specially to handle, stow wide variety of cargo like general cargo, container, dry or liquid bulk, chemical, liquefied natural gas (LNG), liquefied petroleum gas (LPG) cargoes, car, and passengers (Olesen Maritime, 2015: 18). There are many professions to handle different kind of operations such as loading or unloading cargo to to/from land or another ship; transportation within port area; stowing and stacking; service providing...etc. Some of these professions are responsible for managing, regulating the safe, secure profitable port operations and facilitating port structure like harbour master, port authority; and some of them are service providers like terminal operators, stevedoring firms, cargo handling companies, tugboat operators, mooring service providers (Olesen, 2015: 27), pilotage service, providers bunker and provision suppliers...

Ship/port agents are the designated firms to handle all statutory, safety, service issues of the ships before coming to and after leaving the port. They are the representative of the ship owner/operators in the port calls ensuring all paper works with custom and other regulatory bodies are done; the need of the crew and the ship are met and purchased; all charges and fees are paid; berthing, booking, tug services, cargo handling services are provided...

Customs is act like enforcers of the regulation. They are responsible to control everything is legal and match with the declarations of the exporter, importer and ship operator.

(3) The main players in the land side are shipping companies, freight forwarders, brokers, charters, liner agents, insurance companies, class & survey bunkering/provision companies, regulatory authorities, and financial authorities.

Freight forwarders offers the cargo owner service for cargo flow from the point of supply to the demand. They offer the best route of transportation in land and sea working with transportation companies; handle the booking the goods, custom clearance formalities; provide insurance for cargo during transportations; advise for packing... They act like a cargo owner representative to organise operation between the designated points of demand.

Brokers are the commissioners in shipping. Their job is, to find a cargo for the ship owners or a ship for cargo owners or ship operators usually for a period of time or a voyage; to assist in purchase and sale in second hand market; to apply the articles in the contract (Olesen, 2015: 24), all in exchanges of commission of the freight.

Insurance companies financially protect the ship owner or cargo owners against loss or damage to ship or cargo. Maritime sector is considered a high-risk sector and insurance is a must for financial protection of the shipping companies against damage or loss of cargo, damage to ship (hull or machinery), personal injury, oil pollution, wreck removal and casualty management.

Ship classification societies (Maritime Industry Foundation, n.d.) are organisations that establish technical standards for ship construction, ship operations. They ensure the ships are built properly meeting with the class requirements, and ships are maintained those technical standards while they are operating. Class societies undertake surveys in designated time arrivals and ensure the ships are meeting their standards. The class approval is important for a ship not just safety issues but also for obtaining insurance, entering some ports or waterways, having prestige to appeal the cargo owners and regulatory authorities in a trustable manner.

Bunkering/provision companies provide ships what they need. The main supplies are bunker, fresh water, provisions for crew (food, drinking water, outfit,

safety equipment, entertainment stuff...), tools, parts or materials needed for maintenance or repair...

Financial authorities/banks supply capital into the sector, manage financial flow and ensure the needs are met. The main actors are investors who make investments on maritime properties like ships; banks who supply credit for maritime sector; companies carried out financial surveys for shipping companies. Because of the capital-intensive characteristic of the maritime sector, there are always need for external financing into the hearth of each businesses from shipbuilding to shipyards, from shipping companies to port authorities or from insurance companies to brokers...etc. They all need high liquidity, short or long sources of financing... Without liquidity suppliers the system will collapse, and no operation can be carried out.

Regulatory authorities set international standards and rules for maritime sector. Because of the global identity of the shipping, act of one country affects the rest of the worlds that is why harmonised set of rules are needed for fair and legal trade conditions, safe and secure operations for ships, cargoes, and environment. The main rule-makers, bases of maritime regulatory framework are International Maritime Organization (IMO), World Trade Organization (WTO) and World Customs Organization (WCO) whose rules and standards built the modern maritime world.

1.3. THE REASONS OF WHY MARITIME SECTOR HAS A GLOBAL IDENTITY AND WHY IT IS IMPACTED BY GLOBAL IMBALANCES

Approximately ninety percent of the total international trade has been handled by water transportation (International Chamber of Shipping, n.d.). Not only due to the cost-effective freight prices but also, they can carry huge amount of goods at once with high accessibility to anywhere in the world. It was well known that demand for maritime transport service is a derived from the demand for merchandise goods all over the world (Slack, 2010: 5; Açık & Baran, 2018: 1091; Asyalı et. all, 2009: 13; Pocuca & Zanne 2009a: 477). Being main enabler of global trade (Jacobs, 2012: 223), puts maritime industry in a position deeply interconnected with all events in international level. That is why, it is impossible for maritime sector not to be affected

by the changes in global economy, its position and importance is directly reflected by the global economic activities or global trade (Belova & Mickiene, 2015; Pocuca & Zanne, 2009a: 477). The global production is the main fuel of maritime transportation, and this simply and clearly can be explained as; if there isn't any demand there is no point of production, and if there isn't any product, there is no point of the need for transportation of any product from a point A to a point B.

As mentioned before, when the countries started to produce more than they actually need domestically, they turned toward to other countries that need that excessive product. Production is a must for every county in the world, to be dependent on the final products from abroad means a country doesn't produce anything valuable, or in other words value added products. And there is one thing certainly shouldn't be trusted on is that unsustainable resources, such as energy sources, iron, other raw materials. Production, generating value, creating for human welfare and will is the valuable and efficient process as fundamental necessity for each society. That is why the one of the main needs in the world is raw materials to be further added value. Industrialization makes the world production capacity to increase aggressively that cause the hunger for raw materials even greater. The world needs from excessive supplies feed and enhance the globalization that makes things easier due to the system shaped by the needs. Maritime transport, as the best way to carry large amount of quantity raw materials to anywhere in the world at best prices all comparatively, bloom in the globalized world as the precious flowers given by industrialization. Proportionally, the demand for maritime transportation increases as the demand for raw materials getting higher by expands in global economy (Açık & Baran, 2018: 1091). Jercea in 2012, Sambracos and Maniati in 2015 emphasized this argument by saying the demand for bulk carrier is a good indicator for assuming the world production volume.

Maritime sector has always been affected by sudden and unnatural events in global markets; these events might be;

- *Political* (war, embargo, tariff policies, and trade agreements) the effects might be local or global depending on the spill over effect created by the interconnectedness of the starring characters with the rest of the world. For example, in US-China trade war not just affected the both two but the rest of the world too due

to the large portion of the trade activity and amount of the main characters. Eventually affects the maritime sector due adverse condition in international trade.

- *Economic* (exchange rates, interest rates, recessions, depression, crisis, insecurities) & *Financial* (funds and liquidity shortages, confidence level in financial system); in the time of economic and financial problems, uncertainties people and enterprises tend to spend, invest, grow less. Hard or adverse economic conditions encourage customers to save money and not to spend that cause demand to decrease and the firms produce less, delay their new investment and growth plans. Or same as adverse financial conditions firms cannot find capital to continue their business that cause production capacity to drop and less need for international materials.

- *Environmental* (global warming, climate change); this is the most unheeded but most dangerous factor unless nobody take action. Sarwar (2006) studied about the impact of global warming and climate change on maritime sector and he found that climate change will affect the agricultural activity that cause shipping routes to change; higher sea temperatures cause adverse meteorological condition that endanger the overall safety and growth of shipping industry; regulations set for carbon emission will increase the operational cost of the ships...etc.

- *Market related* (oil prices, raw materials and commodity prices, freight rates, price, and stock market crashes) (Alkan et al., 2016: 874; Koca, 2018: 82; Cristina-Steliana, 2009), the decline in stock markets indicates the production to be lowered. This in return cause need for raw material and energy sources to be lowered too. On the other hand, stock market declines mean lower incomes, thus consumers are discouraged to spend money and decides to save for worse days. In both perspective, demand for production and consumption will be decrease so does the demand for maritime transport and freight rate to decline.

- *Meteorological* (severe weather conditions) etc, that puts maritime transport in a more-risky situation than other transportation types (Alkan et al., 2016: 874). Adverse metrological conditions increase the operational cost, endanger the safety of human life, environment, goods, ship itself. Bigger risk means more capital for insurance, precautions, compensation that discourage shipping firms to operate, customers to trust maritime transport.

Thus, these events have effect on the demand directly and maritime sector indirectly. The sector itself experienced the worst scenarios in the economic events, such as oil crises in 1973 and 1979, Asian crisis in 1997/98, stock market collapse in 2000, and of course global economic crisis in 2008.

To sum up, since the 1970's the globalization trend took over the world and the role of international trade and shipping is huge (Asyalı et al., 2009: 2; Koca, 2018: 83). The speed of globalization process also boosted the global demand for products and in a short time maritime sector, as a vascular system of the international trade, had to be developed and be flourished technically, operationally and administratively. The great growth in maritime sector also caused a many new professions to be born and the sector became more complicated, detailed and interconnected system. Although this interconnectedness is a must in a globalized world, however it also causes chain reaction in the time of global imbalances.

1.4. EXAMPLES OF THE PAST GLOBAL IMBALANCES' IMPACTS ON GLOBAL MARITIME SECTOR AND TURKISH MARITIME SECTOR

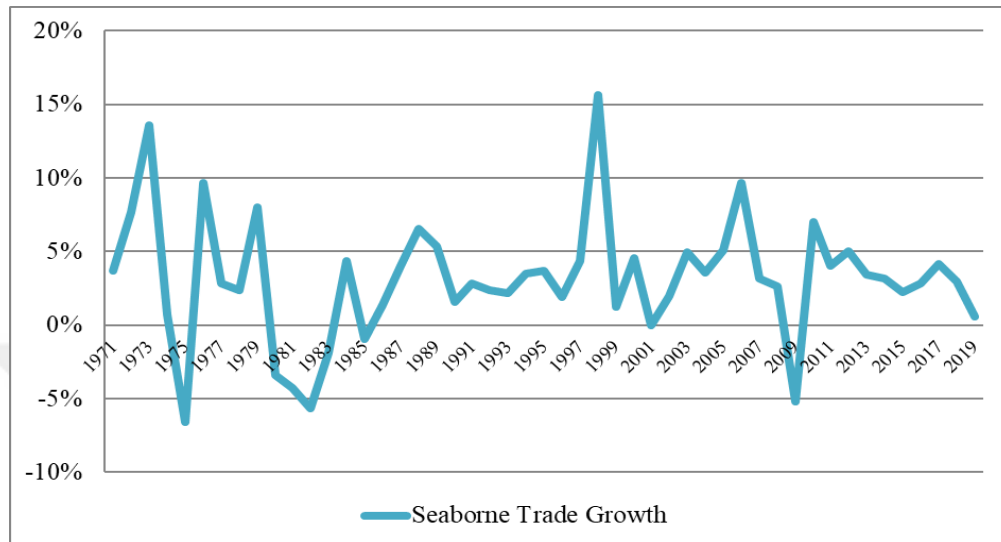
Until 2008 global financial crisis, there were some important crises and imbalances in global economy dominated the world (Mesa-Arango et al., 2019: 384). These past crises are searched to be guided by the history and to get lessons from the past global events. Thus, the impact of the latest crises can be synthesized, understood and interpret in a more reliable and significant manner.

As mentioned before, globalisation in maritime sector was mostly accelerated after 1960s due to containerization era. We will look after that era, because modern maritime system foundations are established after then, so in order to examine the impacts of the recent crises, examining the period after 1960s first will be more realistic and efficient.

When we looked at the Figure 1, it is shown that the growth of seaborne trade is very unlikely to be steady. Because its high relevance of world economy and production, it is expected that it is affected by any change in the balances of the world economy. However, there are a few points are attracted attention by the sudden and

sharp change in growth rates; in 1973/1980s; in 1998/1999; in 2008/2009; in 2019 as the recent one...

Figure 1: Seaborn Trade Growth



Source: Compiled by Author by using data of UNCTADSTAT. (n.d.). *Maritime Transport Indicators 2019, World Seaborne Trade by Types of Cargo and by Group of Economies (Metric Tons Annually)*. <https://unctadstat.unctad.org/wds/TableView/tableView.aspx?ReportId=32363>, (06.06.2020)

The first crisis has a global effect is 1973-94 oil crisis. In the first place the intention was to stop supplying US oil. The decision was made by Arabian members of the Organization of Petroleum Exporting Countries (OPEC) during Arab-Israel war, because US supported Israel and tried to gain advantage when the war is over. The same embargo was imposed to other countries who share the same intention and attitude of US such as Netherlands, Portugal, South Africa and partially to the member states of European Economic Community (EEC) (UNCTAD, 2018a: 24). After imposing the embargo, the oil prices doubled and then quadrupled in a very short time affecting the industrial and individual costs and economies across the world in a very aggressive degree. The devaluation of the dollar magnified the impact and left the global economy no chance to avoid recession.

The embargo caused the target countries to realize how they depend on the Middle Eastern oil to grow and this awareness force them to change their energy

policies from energy sources production to efficiently consumption of oil. With lowering consumption impact the international oil trade to fell whose affect felt in 1974/1975. In these years global oil trade reduced from 1,867 million tons to 1,438 million tons that means a 23% drop, and this reduce in demand continued until the 1985 with an annual average reducing rate, 7% (Tenold, 2011: 2). However, the world tanker fleet capacity has been already increased to meet the high demands before the crisis boomed. Naturally the numbers pointed out an imbalance between ship supply and demand for transportation (Thanopoulou, 1995). After very long time in 1983-1985, the demand was able to reach the same level as it was in 1968, but with doubled tanker fleet supply (Tenold, 2002, 2011: 5). Tanker business got the first and most damages but other areas of maritime sector also affected especially after the second half of the 1970s (Tenold, 2002: 1). Crisis caused freight rates (Tenold, 2011: 1; Thanopoulou, 1995: 51), ship values to drop; world fleet to be idle (Tenold, 2011: 1) approximately from 0.1% to 11.2%; shortage of incomes and financial problems; slowdown in growth and development; bankruptcies...etc. (Tenold, 2002: 136; UNCTAD, 2018a: 14)

The reason of the excessive supply of world fleet was the boom before the 1970s. The increased demand for maritime transportation due to containerization, globalisation trends, also caused ship financing enterprises, organisations, authorities and framework to be developed and enhanced. Apart from the need, also investment in shipping became attractive due to the value and the function of the vessels was considered as a “floating real-estates”. That is why enlarging the world vessel capacity seemed a good investment method for financial institutions and a chance for ship-owners to grow their fleet. However, this sharp enthusiasm came back like a boomerang after crisis and a huge imbalance between supply and demand for transportation which cause freight and charter rates to drop, and huge decreased in second hand ship and new ship market. According to the (Tenold, 2002: 141), the decline in second hand prices of large tankers was about 80% and of bulk carriers was about 40%.

Before 1980s, amount of oil and gas transported internationally was the greatest one among the other cargo types; the ratio was about 55% of total seaborne trade (UNCTAD, 2018a: 5). However, the decrease in oil consumption due to oil crisis

cause this ratio to drop and let main bulk cargoes such as coal, grain iron ore to increase in the total seaborne trade share that became 60% (UNCTAD, 2018a: 5). The last decade's trend in the bulk sector is dry cargo other than bulks (see Table 1).

Table 1: International Seaborne Trade by Type of Goods

| YEAR | CRUDE OIL, PETROLEUM PRODUCTS & GAS | MAIN BULKS | DRY CARGO OTHER THAN MAIN BULKS |
|------|--|------------|---------------------------------------|
| 1970 | 55% | 17% | 28% |
| 1980 | 51% | 16% | 33% |
| 1990 | 44% | 25% | 32% |
| 2000 | 36% | 22% | 42% |
| 2005 | 34% | 24% | 42% |
| 2006 | 35% | 22% | 43% |
| 2007 | 34% | 23% | 43% |
| 2008 | 33% | 24% | 43% |
| 2009 | 34% | 26% | 41% |
| 2010 | 33% | 27% | 40% |
| 2011 | 32% | 27% | 41% |
| 2012 | 31% | 28% | 41% |
| 2013 | 30% | 29% | 41% |
| 2014 | 29% | 30% | 41% |
| 2015 | 29% | 30% | 41% |
| 2016 | 30% | 30% | 41% |
| 2017 | 29% | 30% | 41% |

Source: Compiled by Author by using the data from “UNCTAD, (2018a). *50 Years of Review of Maritime Transport, 1968-2018: Reflecting on the past, exploring the future*. Retrieved from: https://unctad.org/system/files/official-document/dtl2018d1_en.pdf”

When we looked at the general consideration of the oil crisis on maritime sector, it is obvious that there is a great similarity with the 2008 crisis effects. A crisis booms after a high profit and fast developing era. The effects magnify with the high involvement due to expectation of high profits. The demand for transport is very low due to both imbalances and demand of raw materials in recession as a root cause. On the other hand, the political background of the crisis is a common point with the US-China trade war. Although the disputes were between a few countries, effects have a spill over effect all over the world due to globalisation and interconnectedness, same in the US-China trade war.

The one of the recent crises endangered the global economy for a while is Asian Financial Crisis occurred in 1997/98. Asian crisis is one of the crises couldn't stay in

its pots of origin and spread across the world (Mesa-Arango et al., 2019) originated in Thailand, spread Southeast Asia and soon reach even Mexico and Brazil as transoceanic countries.

Indonesia, South Korea, Malaysia and Thailand are most injured countries. Before the crisis these four countries were growing enormously that caused economist called this aggressive growth as “Asian Miracle”. Their growth is mostly based on export as many other developing countries. With increasing export-rates they had more reserve for further opportunities and enhanced living standards but also attract attention of the foreign investors who will be invest for more export. There were two main mistakes of the Asian counties; first was using fixed currency regime by fixing their currency to dollar for a long time; second is similar like 2008 crisis that is low credit standards adopted by banks to encourage the investments of private sectors. Their comparative advantage was started to diminished by the appreciation in US dollar; excessive credit standards caused high leverage, or debt to equity ratios in the end; banks borrowed in short term but many investments had long term returning causing maturity mismatches, and these borrows are mainly on foreign currency increased the foreign currency exposure risk; these Asian countries over depended on the hot money sources like short-term foreign capital and caused a great loss of in short time while increasing the need for foreign currency situation even worse. As a result of these underlying reasons, economy shrinks, reel economy and stock market collapsed, unemployment rate increased, the credibility fell and enterprises and banks went bankrupt. The Asian financial crisis was a twin crisis both containing banking and currency crisis. It might be started in Thailand and contaminated the other countries on a global scale; recession in one country can reduce demand for other countries’ exports, and devaluation in one can increase competitive pressure on others’ exports in world markets.

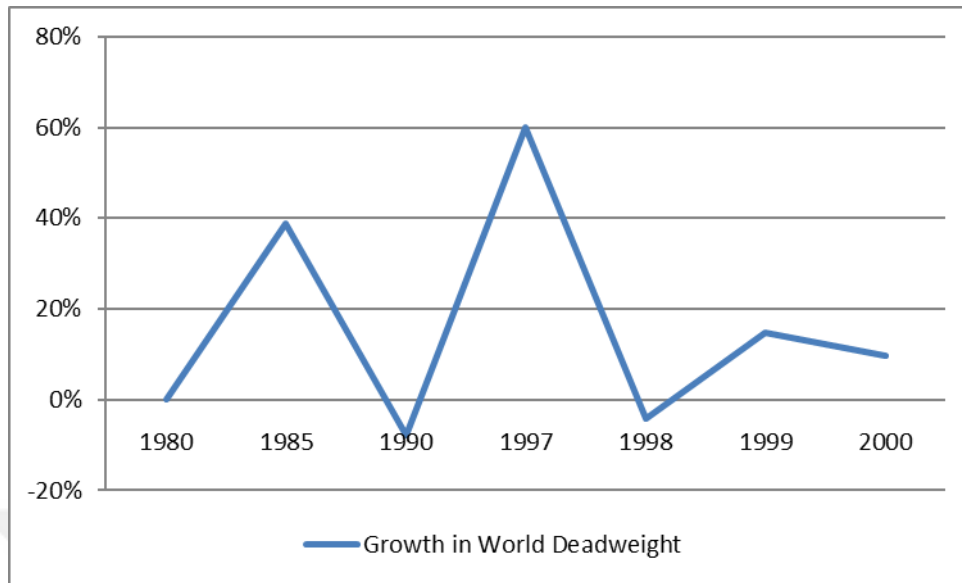
The world economic activity has been continued in spite of the crisis effect; however, the GDP growth dropped from %3.46 to %2.55 in 1998. The decreased in GDP growth means the decrease in bulk sector due to the decreased in raw material demand. According to the UNCTAD research (1998) Asian financial crisis adversely affected the dry bulk demand and charter market especially in Western Europe and U.S. that their economic growth had been increased conspicuously before the crisis.

Imbalance of the container traffic was another effect of the crisis. After the crisis has been boomed, the eastbound container traffic has been decreased %20 and westbound increased approximately 16%; in 1998 the imbalances ratio of containers was higher 50% of the average imbalance ratio (Pham, 2000: 39). This imbalances between the trade routes from/to Asia, caused container operators to have demanding management efforts and huge expenses to handle and to reposition those excessive empty containers.

The impact of Asian crisis on maritime sector showed parallelism with the 2008 crisis and US-China trade war. The collapse of Asian banks' balance sheets during Asian crisis caused a huge impact on maritime sector that is highly capital intensive that needs high amount of capital for new ships, and other needs...etc. For example, Korean shipbuilding industry is highly affected by the crisis due to damage of Korean banks leading bankruptcies in several industries, and shipbuilding industries was one of them (OECD, 2017: 45). To sum up, the financial background and the problems in banking systems drag the global economy into an imbalanced condition during Asian Financial Crisis and also in 2008 crisis.

But there is a common stomach-ache for all these crises that is imbalances in supply and demand. Sanchez and Perez (2009) define this chronic condition as the shipping cycles consist of fluctuations between supply and demand for shipping services. For example, if the demand for sea transport is increased, the freight rates will be increased also; by the increase in freight rates number of new ship buildings will be increased. But then in a point ship supply will be excessive and freight rates begin to decrease, this decreases the number of new building ships and increases the number of scrapped ships. And both two crises have the same overcapacity problem in the post crisis period due to the excessive increase of the new deliveries (Figure 2).

Figure 2: Growth in Deliveries of Newbuildings



Source: Compiled by Author by using data from UNCTAD. (2005). *Review of Maritime Transport 2005*. New York and Geneva: United Nations. https://unctad.org/system/files/official-document/rmt2005_en.pdf.

1.5. THE IMPORTANCE AND THE POSITION STRUCTURE OF THE MARITIME SECTOR IN TURKEY AND EXAMPLES OF THE IMPACTS OF PAST LOCAL & GLOBAL IMBALANCES ON TURKISH MARITIME SECTOR

1.5.1. The Importance and the Position Structure of the Maritime Sector in Turkey

About eighty percent of total world trade are transporting by sea, this number isn't different in Turkey too. Maritime transportation occupied 88% of the Turkey foreign trade in tons (Kol, 2010: 77). According to the Turkish Statistical Institute's (TURKSTAT) data of foreign trade volume in terms of US dollar from last 20 years, the percentage of the maritime transport among other transportation methods is 54% and 52%, import and export respectively. This percentage has been changed into 58% and 56% in last ten years. These numbers tell the importance of the maritime sector for Turkish foreign trade in its welfare and development. Kol (2010: 79) stated the

importance of maritime transportation for foreign trade of a country saying that the countries who have a strong foreign trade are the one who already have a strong maritime transportation system.

Turkey is a country that is surrounded by the four seas and approximately 55% of the total population is living the cities that have a coast to these four seas (Korkmaz, 2012: 101). Also, Turkey is in a critical place economically, geographically and geopolitically as being in the middle of the global economy; as a bridge between Asia, Middle East and Europe; as the only gateway between Black Sea and Mediterranean Sea. Although Turkey has these unique natural advantages, it fell behind of the global seaborne trade, especially when comparing with the other Mediterranean and Black Sea countries (Kurt, 2010: 199; Korkmaz, 2012: 108). Turkish maritime commercial fleet occupied only 1% percent of the total world fleet capacity that means Turkey is getting only 1% percent of the global maritime treasury that is about 300 billion US dollar capacity annually (Aymutlu, 2007: 13). Aymutlu (2007: 13) gives Greece example to understand the loss much better. In spite of high elderly population ratio, limited natural resources, inadequate industrial development, Greece has the 18% of the world maritime fleet capacity and gain 60 billion US dollar annually... Even only one example under Turkey's nose, tells many things... Turkish fleet meet only the %30 percent of the Turkish foreign trade amount (Kurt, 2010). Consequently, the main portion of the freight paid is feeding the foreign maritime companies causing a transfer of money to abroad.

When a comparison is made between the data of Turkish fleet capacity and total amount of cargo handled in Turkish port, it is seen that although the amount of cargo increased, the fleet capacity remained same. This means that Turkish fleet doesn't meet the requirements of Turkish ports further creating a need for foreign service causing more capital leaving the country (Kurt, 2010). According to data of ministry of transportation, from 2005 to 2019, Turkish fleet deadweight capacity (cargo carrying capacity) has been decreased about 11, however total handled cargo amount in tons has been increased almost 127%.

Until the middle of the twentieth century, policies for the development of maritime transportation has been followed, however after 1950's, attention flowed away from maritime to road transportation leaving Turkish maritime system behind...

Insufficient attention and weak policies created and cumulated the today's problems these are; insufficient fleet capacity; insufficient port infrastructure, capacity technological facilities; insufficient logistic integration with other transportation methods enabling ports to connect efficiently and effectively to other transport; demanding bureaucratic operations; insufficient financial sources; insufficient qualified sea or land side stuff...etc.

All these problems are challenges for the future and musts to be eliminated one by one to increase the Turkey share in international maritime system and to turn the capital flow back to the homeland. To reach this goal, the first station is Turkish ports and increasing their effectiveness and efficiency, because ports are the infrastructure of the maritime system acting like a blood pressure points in the vascular system.

1.5.2. Examples of the Impacts of Past Local & Past Global Imbalances on Turkish Maritime Sector

In the fourth section global economic imbalances was reviewed however in this section important local crisis will be examined and both global and local crisis effects on Turkish maritime sector will be discussed.

When we looked at the financial and economic crisis in Turkey, there are 3 significant crises after 1980. The research is made after 1980 because of the starting the liberalization era for Turkey. Until then Turkey followed more closed economic strategies however with the 24th of January Decisions in 1980, Turkey focused on an export-oriented trade and economic strategies for growth. Thus, the obstructions on the way of free trade were removed. The foreign trade regime started to be liberalized and the new regime was supported by the financial liberalization in 1989. Liberalization in trade resulted a huge foreign trade increase in ten years period, the export volume was increased almost 4 times and import was doubled and current account deficit decreased almost a half (Solmaz and Avcı, 2011: 38). Due to the high relevance of the maritime transport with the foreign trade, the crisis after 1980 will be examined.

1994 crisis was the deepest crisis in the 1990s, caused by various economic unbalances. One of them is unbalanced public spending. Public sector spent more than

it earned, and this debt was financed by central bank that further caused a hyperinflation in the first time. Other factors are increasing current account deficit, volatility in the foreign currencies, unbalanced and unsteady growth dragged Turkey the crisis.

After 1994 crisis, the new strategies, decision adapted to overcome the crisis impacts. However, these new decisions weren't structural and long termed but artificial and temporary, thus post crisis era wasn't so different than it was before (Solmaz and Avcı, 2011: 38). The consolidated budget deficit continued to increase and these debts were tried to be finances by domestic borrowing with high interest rates. In this point, banks are also played an important role by losing their financing obligation for country development in order to make hot and easy money from public credit gains (Kayarkaya, 2006). In 2000 the consolidated budget deficit/GDP ratio has increased almost 3 times of it was in 1995, from 4% to 10,7%, while public debt increased from 7% to %16 (Solmaz and Avcı, 2011: 39). On the other hand, foreign trade deficit is also increased between 1995 and 2000. At first with the devaluation of the TL, export increased but with short termed capital move into the country has led the TL evaluated again and caused an increase in the foreign trade deficit.

1999 earthquake occurred in Turkey magnified the impacts and forced Turkey to adapt a new economic policy with International Monetary Fund (IMF), the main purpose was to control and reduce inflation. To do that lower interest rate and currency peg strategies were imposed to control short term inflation expectation. However, these approaches caused TL to evaluate and import of consumption goods to increase. As a result, foreign trade deficit increased aggressively.

In addition, planned structural reforms couldn't be imposed successfully; political disputes rose in government; banks were filled with debt instead of money and haven't fulfilled their obligations; international credibility decreased. All these results drag Turkey into the worst economic crisis experienced before.

These two crises have caused a serious impact on Turkish economy and consequences were reflected in various macroeconomic variables like stock market, production, interest rate, GDP, employment, currency strength and stability, inflation...etc. However, these crises were local, and the impact was also felt in the sectors whose activities carried out in domestically. As explained in the first three

sections of this chapter, maritime sector is one of the most international sectors whose strength and stability mostly depends on the international and global macroeconomic variables. That is why the impacts of these local crises were soft relatively when comparing with the global crisis impacts.

After 1994 crisis, Turkey's economy has impacted by the global imbalances happened during 1997 and 1998 years in Asia and Russia respectively. The Asian crisis and Russia Crisis caused a huge amount of hot money leaving the domestic borders that Turkey trusted for profit for recent years since 1994 crisis.

In Asian crisis, the main damaged Asian countries currencies devaluated and cause to gain a comparative advantage in export over their trade partners. But this advantage is spoiled by the increased cost due to imported intermediate products used in production. Although these main damaged Asian countries (Malaysia, Indonesia, S. Korea and Thailand) had a huge price advantage on Turkey, their export ratio occupied only 3% of Turkey total export value, on the other hand their import ratio occupied 1.6% of Turkey total import value (Aydın, 2003: 159). That is why the impact on Turkey foreign trade volume remained no so significant. However, when we looked at iron-steel sector that is a key raw-materials in construction sectors, Asian countries had significant import volume from Turkey. The ratio was 65.9%, 56.0% and 43.3% in the years 1994, 1995, 1996 respectively (Aydın, 2003: 159). Especially with the crisis many infrastructures, construction projects were ceased, cancelled or delayed and this decreased the demand from Turkey to supply raw materials to Asian markets so does the Turkey's export.

Another crisis that effect Turkey the one happened in Russia in one year after the Asian crisis boomed. This crisis carried the same underlying reasons and symptoms as Asian crisis. In years, capital came from the abroad weren't used for a real productive-investments but for luxury expenditures. Increased debts, current account deficit, and weak monetary and fiscal policy drag Russia an economic crisis that will further affect Turkey. Russia is one of Turkey's most important trade partners for years. As being one of them makes Russia one of the main influencers of the Turkey's foreign trade, business and local markets. Due to crisis Russia is announced the moratorium decision and delay all the debts it had back then. Turkey suffered much due to unpaid receivables. Export to Russia decline 1 billion dollar, about 7 billion

receivables of real sector put them in a difficult financial position (Aydın, 2003: 152). Also, there are indirect effects of the crisis through Russia-Turkey common trade partners like European Union (EU). EU is one of the biggest lenders of Russia, and postponed payments cause EU even worse position and create a short-term recession in the markets. This also decline Turkey export to EU countries.

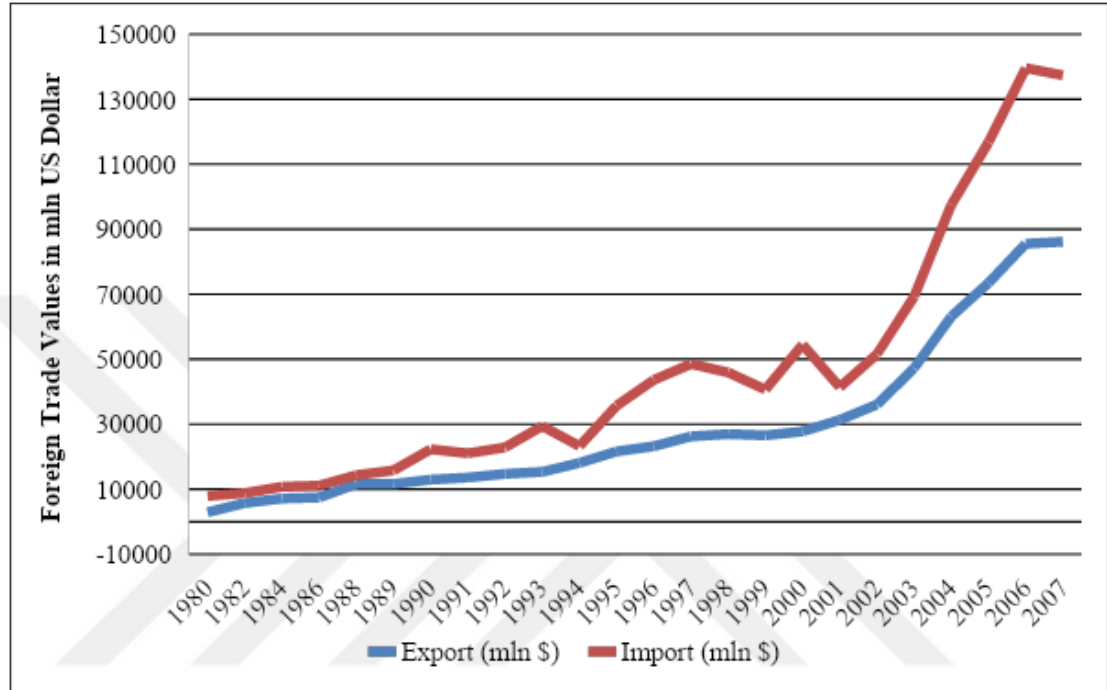
Eighty-seven percent of foreign trade volume of Turkey have been carried out by maritime transport (Takım and Ersungur, 2015: 374) and any decreased in the foreign trade volume statistics means a spontaneous decline in the maritime sector service volume due to the most demanded transport method for foreign trade. In the Table 2 and Figure 3 shows the Turkey 27 years foreign trade history.

Table 2: Turkey Foreign Trade Volume Growth

| YEARS | TOTAL FOREIGN TRADE (MLN \$) | FOREIGN TRADE GROWTH (%) |
|--------------|---|---|
| 1980 | 10.819 | - |
| 1982 | 14.587 | 35% |
| 1984 | 17.889 | 23% |
| 1986 | 18.560 | 4% |
| 1988 | 25.957 | 40% |
| 1989 | 27.416 | 6% |
| 1990 | 35.261 | 29% |
| 1991 | 34.640 | -2% |
| 1992 | 37.590 | 9% |
| 1993 | 44.773 | 19% |
| 1994 | 41.375 | -8% |
| 1995 | 57.346 | 39% |
| 1996 | 66.850 | 17% |
| 1997 | 74.819 | 12% |
| 1998 | 72.894 | -3% |
| 1999 | 67.258 | -8% |
| 2000 | 82.276 | 22% |
| 2001 | 72.733 | -12% |
| 2002 | 87.612 | 20% |
| 2003 | 116.591 | 33% |
| 2004 | 160.706 | 38% |
| 2005 | 190.250 | 18% |
| 2006 | 225.110 | 18% |
| 2007 | 223.515 | -1% |

Source: Compiled by Author by using the data of Sezgin, Ş. (2009). The Relationship of Foreign Trade and Economic Growth in Turkey Between 1990-2006. *Sosyal Bilimler Dergisi*. 22: 175-190.

Figure 3: Turkey Total Export and Import



Source: Compiled by Author by using the data of Sezgin, Ş. (2009). The Relationship of Foreign Trade and Economic Growth in Turkey Between 1990-2006. *Sosyal Bilimler Dergisi*. 22: 175-190.

According to the Table 2 and Figure 3, there are 4 years observed negative growth in foreign trade and decrease in import value those are 1994, 1998, 1999 and 2001 and one year observed a decrease in export value that is 1999. As a common consequence of all crises mentioned in this section, it is clearly observed that there are negative impacts on foreign trade during the crises. Due to the derived demand feature of the maritime sector, it can be said that maritime sector activity decreased and diminished during these years.

In 1994 crisis, foreign trade growth volume decreased about 8%.; although export volume increased about 18%, import volume decreased about 21% that cause a shrink in the foreign trade growth. On the other hand, in 2001 crisis, export volume

increased about 12.8% and import volume decreased about 24% that cause a shrink in the foreign trade volume that was 15% (Sezgin, 2009: 181).

When we looked at the foreign sourced crisis occurred in 1997 and 1998, however unlike the local crisis, their impacts are felt next years in 1998 and 1999. During these years foreign trade growth volume decreased about 3% and 8% respectively. In these crises the decrease in export and import volumes is attracting attention. Because in the local crisis, there was an increase in export but decrease in import due to devaluation and lowering purchasing power of the enterprises and individual due to negative growth. However, export of a country is mostly related with the economic condition of its trading partners that is why in these global and foreign sourced crises, Turkey experienced a decrease in export due to recession in trading partners and another decrease in import due to recession in domestic markets.

CHAPTER TWO

2008 GLOBAL FINANCIAL CRISIS

The world international merchandised goods have been reached \$19.67tn in 2018, and approximately ninety percent of the total international trade has been handled by water transportation (International Chamber of Shipping, n.d.). Not only due to the cost-effective freight prices but also, they can carry huge amount of goods at once with high accessibility to anywhere in the world. After the 2008 crisis has been boomed in USA it immediately began to spread all over the world for many reasons and had a global identity. An instant downturn has been observed in many financial and commercial markets and enterprises. The impacts of the crisis are observed not just on financial industries but also on international trade, transport and logistics industries (Adolf & Liu, 2010: 1). When it became global, it affected the international transaction especially in commercial terms. An instant downturn has been observed in financial and commercial markets which cause a recession in global economic activities and trade. The world trade volume declined more than 11% in 3 months period from 2008 to 2009 (Adolf & Liu, 2010: 1). Demand for imports fell dramatically around world which causes exports to fell also. Because of the fact that shipping service is derived from the demand for merchandise goods all over the world (Slack, 2010: 5; Açık & Baran, 2018: 1091; Asyalı et al., 2009: 13; Pocuca & Zanne 2009a: 477) any downturn in global trade affects maritime sector deeply. Being main enabler of global trade (Jacobs, 2012: 223), puts maritime industry in a position deeply interconnected with all events in international level. The data provided by UNCTAD reports is stated that the total cargo loaded during 2009 is 7.8 billion tons down from 8.2 billion tons recorded in 2008 which indicates a 4.5 percent decline in 2009 (UNCTAD, 2010: 6; UNCTAD, 2018b: 5). Even now shipping industry has not yet fully recovered from the impact of the crisis yet (International Chamber of Shipping, 2018).

There are many studies in the literature which analysis the effects of the past global financial crises on the maritime sector. Wang (2014) analysed the impact of the economic crisis on ports, and he measures the impact by analysing the port throughput of three selected ports. Meenaksi (2009) analysed the crisis impact on shipping

markets to guide investment decision in ships. In his research the government intervention under crisis is highlighted, and it is suggested that to have a more effective information flow and more improved risk management strategies to be preserved from the future crisis. Slack (2010) researched the major impacts of the financial crisis on the maritime industries, and identified four major issues, of which they are believed to play key roles in shaping the maritime industries which are “the changing patterns of global trades, the importance of being green, the changing government–industrial relations and the need for transparency”. In 2011 Rademacher and Braun examined the impacts the economic slowdown on the global seaborne hard coal market. Köseoğlu and Mercangöz (2012) analysed the effects of 2008 global financial crisis on Istanbul Freight Index (ISTFIX) -for small tonnage vessels- and Baltic Handysize Index (BHSI), according to the research results it is found that all the small tonnage vessels revenues are affected negatively by the crisis. In 2013 Kalaycı focused on the solutions to recover the negative effects of the crisis and offered a few strategies for Turkish maritime sector such as increase the attention on and budget of shipbuilding industry; improve the studies on bio-technology and fully adapted with UN maritime policy. Kalgora and Christian (2016) focused on the impacts of the global financial and economic crisis of 2008 on the container-ships market and mainly drew lessons from them in their paper. Some other authors have also researched the effect of the crisis on container/liner shipping market (Min et al., 2009; Samaras & Papadopoulou, 2010; Grama, 2012); on the other-hand some others have analysed the impacts on dry bulk shipping industry (Pucuca & Zanne, 2009; Sambracos et al., 2015). Pocuca and Zanne (2011) analysed the effect of the crisis on ships’ operating costs, they found out the crisis consequences which directly affect the ships’ operating costs. In her study, Cristina-Steliana (2009) analysed the impact of the crisis EU maritime sector, but she didn’t just focus on the impacts and consequences but also what should be done during the crisis for cushioning the negative impacts or even for improving. On the other hand, Kurun and Erkmen (2017), analysed the financial system of the Turkish maritime sector after the crisis, including the funds, liquidity, liabilities, and profitability.

In this chapter firstly, the main reasons and primary consequences of the crisis and then impacts of these consequences on different parts of maritime sector will be determined. The contributions of this chapter are that it examines the impacts and their

causations by associating maritime sector, global economy and international trade terms by a great literature review and it synthesizes and distils those findings in a more harmonized manner regarding with global economy, international trade, maritime economics, maritime sector and its characteristic.

The chapter is organized as follows; first focus will be on 2008 global economic crisis and its effects on global economy and international trade, second focus will be on the relation between maritime sector and global economy, international trade and clarifies the maritime sector's importance in global platform, then it explains the impacts of the crisis on maritime sector.

2.1. A GLANCE AT 2008 GLOBAL FINANCIAL CRISIS

2.1.1. The Process of the Crisis

In the beginning of the years after 2000, USA central bank (FED) decreased the interest rate to 1% level from 6.5% (Göçer & Özdemir, 2012: 193) in order to increase the consumption for economic recovery after the recession. But these decreases in interest rates not just increase the credits for productive consumption but also and mainly increase the housing credits. And this trend made the real estate prices increase that makes them a charming investment for who has already had their own houses and seeks others for profit. In the beginning the credits were given to the citizens who have good credit score (prime mortgage), but then the low-quality customers with low credit scores were also provided with credit (subprime credits). The main reason of the crisis seems to be the great number of mortgage credits given to the citizens without a comprehensive investigation process –to support the increase in home ownership, even low-income citizens got the bank loan- and non-returning payments to the banks from those citizens who had wished to have a house and charmed by the positive atmosphere created by government, and greedy financial institutions. Because of the low interest rate past statistic of USA, many subprime mortgage debtors chose adjustable-rate mortgage expecting lower rate in the future. However, FED increased the interest rate to control the inflation, and it makes those debtors had troubles in paying back to the bank (Göçer & Özdemir, 2012: 193).

Before the crisis, the banks that provided mortgages introduced derivative financial instruments backed to these mortgages for finding new funds. Besides the increase in real estate prices, another fundamental reason of the crisis is these derivative instruments (Göçer & Özdemir, 2012: 193). At first, they acted as a security of the mortgages to mitigate the risk, but later the value of these derivative tools exceeded the real value of the mortgage that they backed to, detaching their real values and creating credit balloon. The negligence in supervising of the shadow banking to improve the financial market volume also let the situation worse. These derivative tools spread in a huge financial network, buying and selling in a short time between huge numbers of enterprises (Göçer & Özdemir, 2012: 193).

The crises boomed in June 2007 and it immediately began to spread all over the world in a very short time (Koca, 2018: 83). And it is much more complicated than being just a mortgage crisis; it maybe first started as a mortgage crisis but then turn into liquidity crisis (Uçan & Çebe, 2018: 9). Mortgage crisis was a crisis which involved the government, most of the financial institutions, and many individuals directly and many other –foreign or domestic- countries, enterprises, markets and individuals indirectly. Banks, other financial institutions, insurance companies, credit rating enterprises, investors who invest their money to derivative markets like, mortgage-back securities (MBS), collateralized debt obligations (CDO), asset-back securities (ABS); toxic banking products) and many others have played a role which made the situation more complicated and twisted. The twisted structure or the interconnectedness (Samaras & Papadopoulou, 2010: 6) caused a domino effect that dragged each these actors to the disaster. The crisis caused a great collapse of even rooted financial institution which many of them survived by government financial aids and also caused great decline in stock markets around the world (Jercea, 2012: 183). By collapse in the balance sheets of financial institutions immediately affected the other economies that have funds in those institutions (Kalaycı, 2013: 82).

The sectors who mostly rely on the financial system to conduct their operations by credits and other consumer or housing lending are the ones mostly affected by this crisis (Samaras & Papadopoulou, 2011: 1). By the recession and even collapse of many financial institutions, access to domestic and foreign funds was limited which created a financial shortage in real sector. Decrease in demand cause the production volume to

shrink that cause the unemployment rates to increase all over the world (Uçan & Çebe, 2018: 7).

After the second half of the 2008 (Uçan & Çebe, 2018: 10), the effects of the crisis started to be observed and economic shrinkage was increased. The negative situation in Turkey is mainly caused by the limitation in foreign fund access that caused a squeeze on export. After the 2001 crises, Turkish financial and banking system was audited firmly, monetary and fiscal policies are followed carefully and many structural changes have been adopted (Uçan & Çebe, 2018: 9). We cannot deny the positive effects of the 2001 crisis on 2008 crises consequences in Turkey. Another important point that Turkey has affected more slightly is that Turkish banks weren't contaminated by the papers from derivative markets like CDO, MBS and ABS... The situation might be even worse and the recovery might not be slightly. Because of the dependent characteristic on foreign funds to grow, the shrink in the real and financial sector came along with the crisis determines the decline in economic growth (Batrincea & Ana-Maria, 2012: 26).

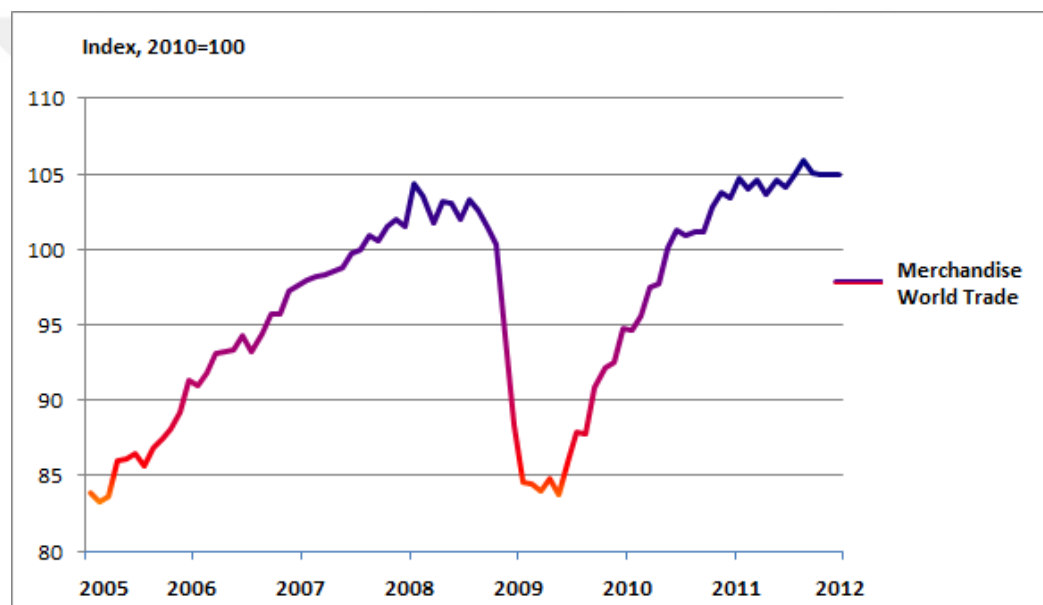
2.1.2. The Impact of the Crisis on Global Economic and Commercial Activities

Starting from the third quarter of 2008 (Shelburne, 2010: 1), the world moved into a recession period; international financial system rocked from the bottom to top and lost its reliability, demand has decline sharply and international trade declined in an aggressive speed and volume, many sectors in large variety ceased their operations which cause bankruptcy of many enterprises and job loses of millions of people around the world (Asyali et al., 2009: 2).

Samaras and Papadopoulou (2010: 2), defines the crises as an enabler of the most synchronized global recession after the great depression bogging down the developed economies as epicentres (Arkolakis & Ramanarayanan, 2010: 5) in depression followed by the emerging economies. An instant downturn beginning in the third quarter of 2008 through the second quarter of 2009 (Shelburne, 2010: 1) has been observed in many financial and commercial economies, markets and enterprises all over the world; it affected the international transaction especially in commercial terms. During the economic crisis, individuals, industries and public tends to consume

less which all cause a decrease in investments and productions consequently in global trade (Cristina-Steliana, 2009: 89). The decline in trade volume started at the end of 2008 and boosted at the beginning of 2009. The decline from the highest point to lowest point of the global trade during the crisis is 20% that is highest decline since great depression (Arkoulakis & Ramanarayanan, 2010: 5). According to the World Bank (n.d./b) the total GDP was declined approximately five percent in 2009 (63,616tn\$ in 2008; 60,340tn\$ in 2009), the shrinking rate in import was 11.8% and in export was 10.1%, and the world trade volume declined by 12.2%.

Figure 4: Merchandise World Trade



Source: Compiled by Author by using data of CPB Netherlands Bureau for Economic Policy Analysis. (23.10.2020). CPB World Trade Monitor August 2020, Merchandise world trade, fixed base 2010=100. <https://www.cpb.nl/en/cpb-world-trade-monitor-august-2020>, (29.12.2020).

Trade is a derived function of demand, that is why any decline in trade can be explain in the decline in demand. GDP is count as main indicator of the demand. The real-world export of goods and services increased 6.3% annually on the other hand GDP increased 2.9% annually between 1980 and 2008 (Shelburne, 2010: 7). Which shows the growth in international trade is fast as twice of the growth in GDP. According to the World Bank, between the 2008 and 2009 the crisis the decline

international trade was about 20% however the decline in the GDP was about 5%. This can be simply explained by the protectionism but another aspect of this difference is about international trade dependence of a country and the needs for trade finance simultaneously (Shelburne, 2010: 21). The ones who deeply engage in international trade (including both export in production and import in consumption) are like to need trade finance more, and in the 2008 financial crisis the shortages in all financial tools and needs affect a country's trade severely more than its GDP.

At first side it can be seen that the crisis-affect the developed countries more than developing ones. And it is true that many developing countries didn't experience the negative growth but the decline in GDP and the growth in trade were similar to the decline in developed economies (Engin & Göllüce, 2016: 31; Shelburne, 2010: 3). However, it cannot be denied that the emerging countries who are intensive of foreign capital are more vulnerable because in the time of crisis international capital tend to move more reliable developed countries like the foreign currency, which affects the emerging countries to have severe financial shortages than developed countries (Göçer & Özdemir, 2012: 195).

There are many aspects of the crisis, this research aimed to mention each detail and points emphasized by the past researches. On the other hand, from the literature the reasons of this recession in international economy and trade were found out and listed below under the main 4 titles to explain the recession;

(1) *Global identity of the crisis* (WTO, 2009). Belova and Mickiene (2015: 20) defined the globalization as a reflected relationship of regional, trans-national and global networks. In increased globalize world economy, the distance between countries become closer and connections become more stronger which cause even a small-fluctuations infect the other globally. In the 2008 crisis, the case was the same. All kind of connections from communication to trade became much easier with globalization. However great things carry also the great risks, in 2008 crises we all understood what it means.

(2) *Poor demand* (Shelburne, 2010; WTO, 2009) was caused by excessive global savings (Samaras & Papadopoulou, 2010: 3). In the time of crisis public and

industrial consumptions decrease, thus influences of economic crisis are observed mostly on the total demand (Cristina-Steliana, 2009: 87) all around world. Another factor caused the decline in demand was mentioned by Rademacher and Braun (2011: 89), which was the “commodity market spinning”. The decline in commodity market prices were more severe than the manufactured goods (Shelburne, 2010: 20), also caused the developing countries markets had more severe experiences.

(3) Financial shortages (Shelburne, 2010; WTO, 2009). Almost ninety percent of world trade is funded by trade finance tools (Robinson, 2009: 180). Due to the collapse of global capital markets, many companies had troubles to get trade finance from banks even if they had it costs higher than it was and finally the capital shortages put them in a bad place while taking their chance to trade. Thus, many others had to cancel their future investments... Somehow if the manufacturer had produced the goods, customers wouldn't have been able to purchase these goods due to lack of financing (Shelburne, 2010: 9), and unfortunately, industrial actors and financial institution in developing countries are experiencing this capital famine more severely (Robinson, 2009: 180; UNCTAD, 2018b: 12).

By the crisis the studies on and the importance of the trade finance is increased. Arkolakis and Ramanarayanan (2010), emphasize that the firms make exports can have the access to trade finance. During the crisis the financial, the demand in USA as a main importer of the world has been decreased significantly that limits many international firms' access to trade finance.

Another aspect of financial shortages is foreign currency reserves. Most international trade exchanges are made with euros or dollars in the buyer's accounts, in the time of crisis capital tends to move from the emerging economies to more stable and reliable developed economies which cause a decrease in foreign currency reserves of the emerging countries might cause trade restricts in future (Shelburne, 2010).

(4) Protectionism (Shelburne, 2010; WTO, 2009). During the crisis most of the countries affected by the crisis ceased their neo-liberal policies (Kalaycı, 2011: 76) and followed a closed economic strategy to protect themselves from a potential fiscal deficit and also to protect its domestic sector by trade barriers ((Arkolakis &

Ramanarayanan, 2010: 5). After the crisis many researchers emphasize the protectionism as a false decision to make and a lesson to be learn for the future crisis. In this highly globalized world, the interconnectedness of the many firms, sectors, markets, and countries are so tight and deep and to break this bond caused severe consequences that is why many researchers call protectionism as a “murky protectionism”. To survive in protectionist environment, more stable and strong government and its support are needed. That is why it is more dangerous for the emerging countries (Asyalı et al., 2009: 2). As Smith (2007) said, each international trade contributes to the increase of the world wealth.

As a matter of course, Turkey also had its own share from the consequences of the crisis. Due to the fact that the crisis wasn't originated in Turkey (T.C. Başbakanlık Denizcilik Müsteşarlığı Deniz Ticareti Genel Müdürlüğü (DM-DTGM), 2010) its effects were felt in the late of 2009 (Koca, 2018: 87). As explained previously, the countries that had current account deficits when the crisis was boomed got through the period more severely, it took almost one and half year for Turkey to have current-account surplus (Koldemir et al. 2016: 247). The decline in export value was 22.6% and in import was 30.2% and the foreign trade volume decreased about 27.2% (Ministry of Trade of Republic of Turkey, 2019). According to these values, it can be inferred that the crisis impact on import was heavier than on export.

2.2. MARITIME SECTOR IN THE TIME OF THE CRISIS

2.2.1. Why Maritime Sector is Sensitive to the Crises?

It was well known that demand for maritime transport service is a derived from the demand for merchandise goods all over the world (Slack, 2010: 5; Açık & Baran, 2018: 1091; Asyalı et al., 2009: 13; Pocuca & Zanne 2009a: 477). Being main enabler of global trade (Jacobs, 2012: 223), puts maritime industry in a position deeply interconnected with all events in international level. That is why, it is impossible for maritime sector not to be affected by the changes in global economy, its position and importance is directly reflected by the global economic activities or global trade (Belova & Mickiene, 2015; Pocuca & Zanne, 2009a: 477). That is why maritime sector has always been affected by sudden and unnatural events in global markets, in other

words many variables that are belonged to macro level economy and trade affect maritime sector directly in a very short time and 2008 crisis is one of the biggest events in the history containing numerous macro variables such as global financial shortages in any enterprises, global decrease in demand, protectionism...

Belova and Mickiene (2015: 21) also pointed out that the effect of the any economic crisis on the maritime sector is observed half year later after the beginning of the crisis, this argument also is supported by the timeline of the 2008 crisis (second quarter of 2008) and its impacts on the maritime sector (last quarter of 2008). We can deduce the direction of the relationship between economic crisis and maritime sector, by this time gap.

Maritime sector is a multi-billion dollars sector which contains a great variety of sub-sectors such as ports, shipyards, forwarding & brokering agencies, maritime companies, banks and other financial institutions, public institutions, insurance companies... many more others. The sectors who mostly rely on the financial system to conduct their operations by credits and other consumer or housing lending are the ones mostly effected by this crisis, and shipping is one the sectors that are highly capital intensive (Samaras & Papadopoulou, 2011: 4). So maritime sector, as a great sector that need vast amount of capital and is largely funded by international banks (Jacobs, 2012: 223; Batrinca & Ana-Maria, 2012: 25) which means their presences are significant for the well-being of the maritime sector itself. For these reasons a global economic crisis like in 2008 which starts with the collapses financial sector and immediately caused a global recession effects the maritime sector deeply and inevitably (Kalgora & Christian, 2016: 39; Koca, 2018: 87).

Before the 2008 crisis has boomed shipping industry was living its golden age. By the aggressive growth in international commerce and global economy especially in developing markets (China, Brazil, Russia, India...etc.) the demand for shipping has reached to the sky. In fact, the growth in international trade was faster than the growth in global output (Slack, 2010: 5). Ship owners were enlarging their fleet rapidly; investors evaluate their many by investing in maritime sector; banks made the credits -even huge amounts- rain at tempting interest rates. In the beginning of the crisis become global, a huge collapse is observed in global trade due to reduce in demand,

which simultaneously caused the demand for international shipping transport decreased drastically (Arkolakis & Ramanarayanan 2010: 11).

2.2.2. Consequences of the Crisis on Maritime Sector

By the decline of the consumption in west and the production in the east (Kalgora & Christian, 2016: 40), the demand for sea transport fall from the sky and hit the ground very hard. The 2008 crisis left a very huge damage on whole maritime sector which contains a great variety of sub-sectors, all derived from thing; demand for sea transport... By interconnectedness of the maritime sector caused a domino effect and thus the crisis affected a huge area. Slack (2010: 5) describes the consequences of the financial tsunami on maritime sector as “disproportionate”. The consequences on maritime sector were defined just as a disaster. The recession on trade was temporary, but the scar of the maritime sector left by the crisis was deep (Pallis & De Langen, 2010: 2). Even so, some researchers saw a silver lining in the impacts of the crisis, hoping that this negative impacts make the players to re-think about what they and world need in capacity (Samaras & Papadopoulou, 2011: 1); the wrong methods drag them into the eye of the storm; the developments new technologies to ensure profitability; improving managerial and investment skills...etc.

At the beginning of the crisis, first trade volume was hit; in 2009 global trade was lower as 20% of the value in 2008. Because the 90% of the global trade is transported by maritime transport, the decline in the global trade volume means the decline in seaborne cargo volumes and any decline in the global market affects negatively to the well-being of the maritime sector (Slack, 2010: 5). The real-world export of goods and services increased 6.3% annually on the other hand GDP increased 2.9% annually between 1980 and 2008 (Shelburne, 2010: 7). Which shows the growth in international trade is fast as twice of the growth in GDP. According to the World Bank, between the 2008 and 2009 the crisis the decline international trade was about 20% however the decline in the GDP was about 5%. That is why the demand for transportation had decreased faster than the global output (Slack, 2010: 5).

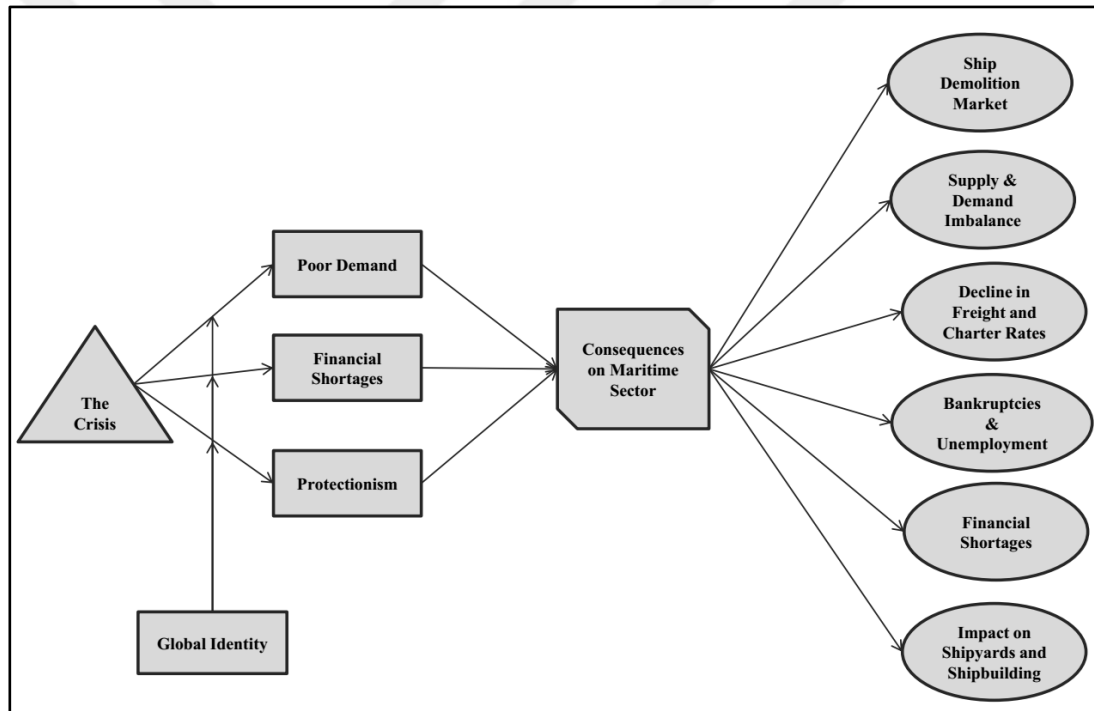
With the decline in seaborne cargo volume, many ships had to operate inefficiently (not in full capacity) at low speeds and many others had to be left idled or demolished by the ship owners who seek to decreased the fleet supply (Grama,

2012: 634; Pocuca & Zanne, 2011: 480). Ship-owners expenses were increasing but not their revenues too, this made their balance sheets snowballed negatively. The freight rates for each product types decline enormously, for example dry-bulk freights declined 11 times as the value before the crisis Baltic Dry Index (BDI) decline from 11,973 points to 684 points in 6 months period (Koca, 2018: 81), and the freight per TEU between Europe and Asia declined 60% between 2008 and 2009 (Slack, 2010: 5) which decreased the revenue to the sector aggressively. Moreover, the freight rates were at such low levels even lower than the operating cost of a ship that makes the operators ceased working, cancel leasing and their new ship orders not to operate at loss anymore (Min et al., 2009: 163). Because of the high capital-intensive characteristic of the sector, players seek for financing their operation by credits. However, the deterioration in the balance sheets of the banks due to the financial crisis, also the worsening situation in maritime sector and loss in reliance and credibility of shipping companies, banks became reluctant to lend money and lower their limits of credit into the maritime sector (Daniel & Yildiran, 2019: 8; Koca, 2018: 82). Another vital door closed to the sector makes the financing more and more difficult and complicated for the debtors to pay back their debts. On the other hand, besides all the negative effects, there are some other factors affecting the ships operation costs negatively. For example; the excessive supply of world fleet and low demand for transport not just decrease the freight rates but also ship sale and purchase prices. The depreciation in the ship prices directly lowered the asset value of the operators (Pocuca & Zanne, 2011: 423) even if they sell or not. The crisis also hit the demolition market by a huge decline in scrap prices. The ship owners didn't please with the offer made for their older ships because of the low steel price (Grama, 2012: 641), also the rising demand in ship demolishing make the demolished offer lower than the pre-crisis levels, which all effect the ship operators cost.

The one of the most specific and important aspect of maritime sector is shipping cycles. Although its meaning on supply/demand ratios and freight rates is well known since 1869 (Sanchez & Pérez, 2009: 3), many companies have ignored the consequences before the crisis boomed. Maritime transport was living its golden age and nobody follow the signals appeared at the end of 2007. If we look from the viewpoint of Sanchez and Perez (2009) the shipping cycles consist of fluctuations

between supply and demand for shipping services. For example; if the demand for sea transport is increased, the freight rates will be increased also; by the increase in freight rates number of new ship buildings will be increased. But then in a point ship supply will be excessive and freight rates begin to decreased, this decreases the number of new building ships and increases the number of scrapped ships. In 2008 crisis this obvious cause and effect relationship was disregarded and great number of ships pumped into the market with much more-new coming on the way. This increase dropped the freight rates significantly that have already declined with the global recession.

Figure 5: Reasons of the Crisis and Its Consequences on Maritime Sector



Source: Created by the author

On the other hand, when we looked at the statistics of DM-DTGM (2010), in 2009 the 93.6% of the import and 72% of the export were transported by sea. With the decreases in import (30.2%) and export (22.6%) ratios in turkey during the crisis, consequently, affected; the amount of exported and imported goods handled in ports, the total exported and imported cargoes handled in Turkish ports was decreased 5

percent (11bn tonnes) in 2009 (the contraction was 1.6%); the contraction in the number ships call to the Turkish ports were 0.8% in 2009.

2.2.2.1. Decrease in the Amounts of Cargo/Container Carried and Handled in Ports; Imbalance between Supply and Demand

During the crisis the one of the most vital consequences was the imbalance between ship supply and demand for transport. The ship supply became excessive when the amount of merchandised cargo decreased (crisis-based consequences). But another aspect that catalysed this imbalance was the new ships literally pumped into the seas (Kalgora & Christian, 2016: 40) due to the expectation that the world trade will grow even more (Grama, 2012: 634). When the crisis has been boomed, many ship owners ceased or cancel their new orders, but there are also others who were late to cancel. This irremediably issue was called as “ticking bomb” by the players knew that the situation will get even worse. For example, the total capacity of the new container ship orders in June 2008 was almost half of the existing container fleet capacity.

For example, the number of ships passed through the Suez Canal in 2009 decreased by almost twenty percent of number in 2008 (Savodnik, 2010). Many ships had to be idle, some was sent to demolition, the others continue with mainly empty slots for containers and half-filled hold in inefficient manner with high operating cost (Cristina-Steliana, 2009: 89). Those idle vessels are caused in a decrease in total capacity of world fleet (Slack, 2010: 6). Overall container traffic fell by 20% by the decrease in chartering rates and 8.8% of the world container fleet had been laid up (Slack, 2010: 6); the total cargo loaded decreased 4.5 percent in 2009 (UNCTAD, 2018b: 5) and also world container port throughput declined by an estimated 10 per cent in 2009 (UNCTAD, 2010: 94); the shipping companies, ports and shipyards had to delay or cancel their growth plans; almost ten percent of total global fleet includes every ship types (container ships, bulk carriers, tankers, roro ships etc.) had been laid up (Arkoulakis & Ramanarayanan, 2010: 11). On the top of these the new delivery vessels which were ordered before crisis made the overcapacity problem worse (Samaras & Papadopoulou, 2010: 4).

Ports were also severely affected by the macroeconomic storm. The world container cargo throughput was decreased 9.73% (UNCTAD, 2010: 96) and in 2009, the total cargo throughput handled in European ports was decreased about 30% comparing with 2008 (Cristina-Steliana, 2009: 87); and Slack (2010: 5) in his study also noted that the many ports all around the world have experienced off-peak times for traffic last for 12 months less approximately 15-35% than their normal traffic volume. According to the data of the Turkish Ministry of Transportation, the total exported and imported cargoes handled in Turkish ports were decreased 5 percent (11bn tonnes) in 2009. Also, many ports had to be cancelled their expansion plans or even ceased the operation of some terminals in their ports to decreased the operating cost, and lots of people lost their jobs due to the decreased in capacity.

2.2.2.2. Decline in Freight and Charter Rates

One of the best indicators to know what is going on shipping industry is looking at the freight rates. The funny thing about freight rates for maritime sector is that it is cause as well as the effect of the changes in the market. When the freight rates are high it stimulates the new ship orders to increase and increased capacity cause a decline in freight rate (Açık & Baran, 2018: 1091) that is further stimulate the number of ships demolished and left idle (shipping cycle). Generally, there are few main determinants of freight rates under normal conditions which are vessel supply, demand for the goods to be transported, number of competitors, the availability of alternative transport modes, short-term fluctuations in demand and supply (Grama, 2012: 633). After the crisis, due to the very high supply/demand ratio of maritime transportation, freight indices have suffered one of the biggest declines in the history (Castonguay, n.d.). Firstly, BDI started to decline, than it followed by container freight rates decline on all major routes (de Monie et al., 2016: 11). Container freight rates have fallen by 60% for the route between Europe and Asia (Slack, 2010: 5); in dry bulk freight rates, decline was by 75% from the highest levels during 2007/2008 (Rademacher & Braun, 2011: 89) also for overall tanker indexes the decline was approximately 65% (UNCTAD, 2009: 86), to sum up all shipping sectors has experienced aggressive decline in freight rate at approximately 25% of the last year rates (Grama, 2012: 633). Especially with the price decline in bulk commodities (usually industrial raw materials

like coal, iron ore, oil...etc.) was pointing out the global production was decreasing. By the decrease of freight rates companied with low amount of commodity, shipping companies have experienced high operate costs with very little profits barely enough for running costs.

2.2.2.3. Impacts on Shipyards, Shipbuilding Industry

As a nature, shipbuilding industry needs high capital to operate which is call capital intensive. To find the necessary fund and support for itself, it needs to have a strong relationship with government (Hossain & Zakaria, 2017: 247) and financial players like banks and investors. Before the crisis shipping industry has been living its golden age. As a matter of course shipbuilding industry gained lots of profit by plenty of new ship orders. However, after the crisis by the decreased in demand for shipping service many customers had financial problems and had to cancel their orders (Horowitz, 2009). According to the Lloyd's Register statistics, in October 2008 the number of new ship orders dropped 90% in one year period of time (Luo et al., 2009: 521) and shipyard operated at 30% of their capacity (Kalgora & Christian, 2016: 41). This might hamper the shipbuilding industry revenue but also prevent pumping more ships into already saturated global fleet and further decrease in freight rates. The crisis also affected the profitability of the sector by increased volatility in profit margins, production and operating costs (Erkmen & Kurun, 2017: 43).

However, shipbuilding industry's financial problems were caused not just because from new order famine but also insufficient financial support by banks. Banks raise the charges for loans and also lower the amount of fund per credit (Min et al., 2009: 162; Daniel & Yildiran, 2019: 8). According to the Lloyd's Register, the credit ratio before the crisis was 80% and became 50-70% after the crisis (Min et al., 2009: 162), which increased the need for hot many and costing of shipbuilders sharply. If the business was good and the problem was only the reluctance of the banks to provide finance, they might have managed to survive. But they also faced with low ratio of new orders plus cancellation coming incessantly.

2.2.2.4. Ship Demolition Market

The decline in price levels of some commodities didn't affect only the freight rates or heavy industries. The decline in price level of steel directly affected the ship demolition market too. The ship owners didn't please with the offer made for their older ships because of the low steel price (Grama, 2012: 641). Not just due to the steel price, collapse of the second-hand ship markets and high number of idle ships made the ship owners think for disposing of their ships. Rising demand also affect the ship demolition offers to get lower as well (Pocuca & Zanne, 2009b: 480; Grama, 2012: 634) than the pre-crisis levels, which all effect the ship operators cost.

The decreased in the offers to ship owners by high demand and low steel prices might affect the ship owners operating cost, but the high demand was a silver lining for the players on the demolition side (Min et al., 2009: 163). Indeed, ship demolition industry had the busiest times those days with historic growth (Kalgora & Christian, 2016: 43).

2.2.2.5. Bankruptcies, Unemployment and Living Standards of Seafarers

The crisis caused so many enterprises to go bankruptcy from a large variety of sectors and regions in the world. Especially for the sectors that are capital intensive and directly or indirectly related with financial and commercial activities. It is not surprising to see a company went bankruptcy after we saw the shocking collapse of great Lehman Brothers. Many enterprises experienced a financial bogging down, some found a way to out but unfortunately some drowned resulting bankruptcies. On the other hand, bankruptcy was a good solution for some companies to avoid further bogging down. But it is not good solution at all when we consider the labour market.

The decrease in global demand for goods and services directly caused a simultaneous decrease in production volume. In a world doesn't produce, there is no need to have a producer or a server also, that is why the shrink in demand also caused unemployment rates to increase (Mindur, 2018: 61). Also when we consider the financial destruction of the crisis many more companies went bankruptcy not just because they didn't produce but also, they couldn't manage costing and financing. Maritime sector is at the both two sides; sector who serve and who is capital intensive.

As mentioned before, major amount of ships in world fleet had to be laid up; even major ports had to cancel some parts of their facilities; companies went downsizing as a new policy; many more lower their capacity...etc. One of the common things for the maritime areas affected in the crisis is labour. The decreased in services quantity resulted a redundant in labour quantity simultaneously which cause unemployment rates to rise... The crisis also affected the salary rate to go down also (Kalgora & Christian, 2016: 41). For example, in the literature, it was mentioned that many shipping companies worsened the living standards of seafarers to reduce operating cost (Asyali et al., 2009: 9).

2.2.2.6. Financial Shortages

There are 3 main underlying reasons of the financial shortages in the maritime sector during the crisis; the first one is decreased in demand for transport due to the decline in consumption; the second one is decline in freight rate due to the oversupply of global fleet and decreased demand for transport; and the third one is collapse of financial sector all over the world. The other aspects can be considered as the sub-reasons of these main three reasons or the same examples from different areas of maritime sector.

Maritime sector has always been affected by sudden and unnatural events in global markets; these events might be political, economic, environmental, financial, market related, meteorological... All puts it in a risky position with “high debt ratio, high financial risks and unstable income.” (Samaras & Papadopoulou, 2011: 4). The crisis made it even worse with volatility in profit margin and increase in operating expenses.

Because of the capital-intensive characteristic of the maritime sector, there are always need for external financing into the hearth of each businesses from shipbuilding to shipyards, from shipping companies to port authorities or from insurance companies to brokers...etc. They all need high liquidity, hot or long sources of financings... However, the deterioration in the balance sheets of the banks due to the financial crisis, also the worsening situation in maritime sector and loss in reliance and credibility of shipping companies, banks became reluctant to lend money and lower their limits of credit into the maritime sector (Daniel & Yildiran, 2019: 8; Koca, 2018: 82). Another

vital door closed to the sector makes the financing more and more difficult and complicated for the debtors to pay back their debts.

The speed of globalization process also boosted the global demand for products and for their transport. Thus, in a very short time maritime sector, as a vascular system of the international trade, had to be developed and be flourished technically, operationally and administratively. This permanent and recent innovations and practices change the sector financial system simultaneously. The sector has been developed and diversified by the needs of growing financial needs. However, the sector still has limited source of financing mostly as a credit from the banks (Batrinca & Ana-Maria, 2012: 26).

Before the crisis shipping sector was living its golden era with enormous increase in global trade and transport. Shipping companies decided to increase their fleet capacity and a great majority made it by borrowing that increased their debt burden (Erkmen & Kurun, 2017: 43) and again a great majority of the debtors had troubles to repay their debts due to recession. Revenue famine and accelerating liabilities made their balance sheets snowballed negatively. These non-returning payments has caused many banks in maritime sector went bankruptcy (Kalgora & Christian, 2016: 40).

CHAPTER THREE

2018 TRADE WARS

Maritime transportation has been a backbone of the international trade since the beginning of the maritime history, starting 5000 years ago (Daniel & Yildiran, 2019: 7). In 2018, world trade volume reached 19.67tn in US dollars and approximately 90% of these world merchandise goods are transported by maritime transportation (International Chamber of Shipping, n.d.) which put maritime sector in a highly crucial position as a main enabler of international trade (Jacobs, 2012: 223). Anything imagined can be carried by world fleet and can transported across the world including all energy sources either solid, liquid or gas, food products either packaged or in bulk, raw materials from steel, rock to dust, and of course finished products ready to be in exhibit in the markets... The fascinating process of a single product to travel all over the world to reach the final destination can be conducted only by maritime transportation while ensuring cheapest and most efficient way... It is not important only because of the lower cost comparing with other transportation methods, it is also important because of capability to carry huge amount of goods at once with high accessibility to anywhere in the world.

After 2008 global financial crisis, many countries around the world have been suffered and had deep scares in their economic, financial, political and social lives and re-considered their foreign trade policies. Just exactly at this point, protectionism cropped up and became the new trend once again (Lee, 2012: 398) after all these years. Countries wished to get strong by foreign trade income without changing their liberal economic structure (Kalayci, 2011: 77).

While USA is a recovery process after the crisis, its trade deficit was getting increased like a snowball every day and it wasn't just because of China but EU and other countries too (Svyatov & Arystanbayeva, 2018: 104). On the other hand, China increased its global share, making its mission and vision classier and leaving the name "US's backyard" behind... Potential of China becoming the new export leader and global power (Mkwizu, 2019: 28) frightened the USA and automatically made china a target.

President Trump, after grumbling at the beginning of his political power, finally he started to take action after all the words, critics and threats and firstly imposed tariffs on \$50 billion of imports from China (Charoenwong et al., 2020: 1) and started a Trade War. The rising tariffs imposed by both USA and China as retaliation have a serious effect on global trade volume, industrial production (Kaya, 2019: 24), capital formation (Bordo & Levy, 2019) and global supply and value chain. Also, according to the World Bank data, world trade volume was 45.93% of world GDP in 2018 and 44.07% of world GDP in 2019, which shows 4% decreased in one year.

In maritime sector the effects of the trade war felt immediately (Wee, 2018), as known demand for transport is derived from the demand for goods will be transported from point A to B. As a main purpose of the trade war, demand for tariff-imposed goods decrease as the first consequence, especially demand for oil, agricultural products, recycling materials, and other dry bulk products (Wee, 2018), that cause maritime trade volume to decrease as a simultaneous reaction. In addition tariff changes not just affected the cargo volume but also the way and manner of the goods to be transported. According to the UNCTAD (2019) annual report, global maritime trade growth was slower approximately 35% in 2018 comparing with the 2017 numbers. 2017, 2018, and 2019 volumes were 4.1%, 2.7% and 2.8%, respectively.

Due to the limited times since the trade war boomed, there isn't various and numerous studies examine the impact of trade war on maritime sector. The studies in the literature usually focus on the impact of protectionism or US-China trade conflict on specific issues, bilateral relations, and commercial activities. The effects are usually discussed as an outcome not as a main issue. Because of the limited an insufficient data since 2018, its effects and relationship with maritime sector mainly are discussed in the electronic articles in maritime news and journals. Wee (2018) and Parker (2018), discussed the most important points of the trade war impact on maritime sector; mention both consequences and the reasons exacerbating these consequences, focusing both general and particular... Parker (2018) focused on the container volume in transpacific area after the trade war, while considering the main product between across pacific trade partners... Hand (2018), mentioned about the dry bulk freight

market after increase in tariffs, by the dry bulk vessel sizes. Gong et al. (2020) studied on the contagious relationship and dynamic dependence between shipping freight market and stock markets gathering evidence from the US-China trade war and they found strong, contemporaneous and bidirectional relationships between freight and stock market; they also found that US stock market are more sensitive to the freight market than Chinese stock market is. Burnson (2019), focused on the general port throughputs globally and some regions also the container volume imported and exported by top 30 ocean carriers in post war period. On the other hand, Cho et al. (2020) focus on the impact of US-China conflict on global logistics demand and examine the demand for maritime logistic based on the possible results presented as a three-catastrophe scenario from better to worse...

In this chapter firstly, the outline, underlying factors, reasons, and primary global consequences of the recent trade war and then impacts of these consequences on maritime sector will be determined. The contributions of this chapter are that it examines the impacts of the trade war and its causations by associating maritime sector, global economy and international trade terms in the light of a deep literature review and this chapter also synthesizes and distils those findings in a more harmonized manner regarding with global economy, international trade, maritime economics, maritime sector and its characteristic.

This chapter is organized as follows; first focus will be on the outline of the recent trade war and its effects on global economy and international trade, second focus will be on the relationship between maritime sector and the recent trade war, then it explains the impacts of the trade war on maritime sector.

3.1. A GLANCE AT 2018 TRADE WARS

3.1.1. Outline of the Trade Wars; Actors, Underlying Reasons

In a competitive world each country wants better living conditions, increasing welfare, continuous developments, to be one a global power, to surpass the others... Sometimes countries make political or commercial pressure on their rivals to increase the pressure on them in order to prevent further developments. Imposing of tariffs,

applying trade sanction to damage the rival country's economic condition usually end up with trade wars causing political and economic conflicts between involving countries (Mkwizu, 2019: 27). Trade war that maintains within or outside of the WTO and is consists of multiple disputes, and it can be distinguished from trade disputes that are usually solved or negotiated under WTO dispute settlement system (Hur, 2018: 395).

After 2008 global financial crisis, many countries around the world have been suffered and had deep scares in their economic, financial, political and social lives. And those countries who suffered enough re-consider their foreign trade policies and seek for other methods, hoping to rise again. Just exactly at this point, protectionism cropped up and became the new trend (Lee, 2012: 398) once again after all these years.

Countries wished to get strong by foreign trade income without changing their liberal economic structure (Kalayci, 2011: 77). But another reason was to stay away from the accelerant of the crisis itself; globalization (Bozduman et al., 2019: 420). The reason of the crisis that spreading too fast and deep was the interconnectedness of the countries, global financial and trade system and dependence to each other. That is why countries wanted to build a barrier around them and in this modern era the barriers are shaped not by stone but trade for "protectionism" purposes. It might be raising tariffs to protect specific domestic sector, devalue the domestic currency to gain competitive advantage...etc., (Bozduman et al., 2019: 424).

USA originated crisis damaged the USA most and ruin their growth prospects and made them cripple. The recovery process paid the way for the China to take over the throne as a new world leader and global power (Mkwizu, 2019: 28).

The relationship between USA and China was a good sample of how political, commercial and financial attitudes change over time by the changing in global balances. China was like a backyard of the USA; an artificial partner (more likely an adopted child) who is fed by USA until it becomes strong and independent. Up until then, USA used China as its outbuilding that takes care of the production cheaper and effort free. After China became a member of WTO in 2000, they started to dance in the same floor with equal words and rights. The friction between them was inevitable and at the beginning this friction showed itself as some special protection of textile products, US anti-dumping against China (Svyatov & Arystanbayeva, 2018: 104). It

is common for the developed countries to take protectionist measures for specific sectors. But it wasn't the only case for US; potential of China becoming a global power frightened the USA and automatically made China a target.

Becoming member of WTO accelerate the growth of China aggressively. In the meantime, the close cooperation with USA was going on and without knowing USA raised its own rival in its hand. China's foreign trade surplus was getting increased, and with that surplus they produce more and gain more. Their mission and vision were also getting classy, qualified enough to compete high-end markets. It began to take off its blue-collared suit and prepared new white-collared... Their motto evolved from "made in China" to "made by China".

On the other hand, USA was becoming more depended to China every day and trade deficit was getting worse like a snowball, while production was leaving the country territory. As a basic rule of economy, no gain if there is no production... USA trade deficit was getting worse year by year. It wasn't just about the China but also caused by the trade between EU and other countries (Svyatov & Arystanbayeva, 2018: 104).

After the USA presidential election, the new president Donald Trump started to study on the trade deficit issue just like he promised. Briefly, his election campaign was the promise to lower the trade deficit; increase the domestic production; gathering USA supply chain back into the mainland; increase the job opportunities while increasing industrial activity. His motto was "make the USA great again."

First years he grumbled about the unfair trade policy of China follows that creates unfair trade deficit. He accused China to increase trade volume by unfair methods like currency manipulation (to increase comparative advantage by devaluating the Chinese Yuan) (Kalayci, 2011: 92; Siddiqui, 2018: 64) and stealing know how and other intellectual properties from USA firms (Siddiqui, 2018: 64). USA also used these accusations as an excuse for increasing the unacceptable tariffs against WTO (Kalayci, 2011: 92). The main topics he complains and put light on were about competition, market access, forced technology transfers, intellectual property protection and development strategies (Pencea, 2018: 288).

At the beginning of 2018, he started to take action after all the words, critics and threats and firstly imposed tariffs on \$50 billion of imports from China

(Charoenwong et al., 2020: 1) and started a Trade War. Through the end of the 2018, Trump government imposed approximately \$283 billion of U.S. imports from China (rates ranging between 10% and 50%). As retaliation China also imposed approximately \$121 billion of imports from U.S. (with a rate approximately 16%) (Charoenwong et al., 2020: 5). The historical competition between them was begun with “Currency Wars” but in years, it evolved into “Trade War” when the first tariff was imposed by Trump (Ipek & Gercek, 2019: 224).

The aim was to attract the domestic producers in China, and making the manufacturing within the USA more appealing. This was supposed to solve the deficit problem; decrease the unemployment rate and also protect intellectual properties while keeping them inside the country (Lee et al., 2019: 2).

Not just against China, USA also raised trade barriers and imposed important steel and aluminium tariffs against EU, Turkey, China, Canada and Mexico (Welfens, 2019: 225). The main reason imposing high tariffs on steel and aluminium are that cheap raw materials imported out of USA lowered the market prices and left no chance for USA firms to survive in that extremely competitive environment. To protect USA steel and aluminium producers, USA government decided to increase tariffs to provide better conditions for its own producers, another expectation of this decision is decreasing the unemployment rate within this area (Onyusheva et al., 2019: 13).

This move might protect steel and aluminium producers however it hurts much more-wider area (Kaya, 2019: 24; Nuroğlu & Çekin, 2020: 79) in business and individual level, in US-China trade war hurts especially the industries who need these raw materials for production, such as automotive (Kaya, 2019: 24), shipbuilding, aviation, construction...etc. (Onyusheva et al., 2019: 9). Increase in the costs reflects to the prices and negatively affects the purchasing power of the local customers (Kaya, 2019: 24; Yılmaz et al., 2019: 314). On the other hand, it decreases the USA comparative advantage in international trade caused export volume to be reduced that is already damaged by the counter tariffs imposed by the countries against USA.

However, despite the purposes concerning USA welfare, global supply chain network and international trade, global financial and economic system that were built on the globalization era (Yılmaz et al., 2019: 313) and political dependence between countries leave no chance to any country has a high relevance and role in this

interconnectedness to retire into a shell without getting harm. According to the WTO, global GDP will be reduced 1.96% while trade volume will decrease 17% in 2022 (Bekkers & Teh, 2019: 17).

According to the statistics, only 6% of the firms conducting their manufacturing activities abroad decided to withdraw from abroad and continue homeland production in USA (Charoenwong et al., 2020: 5). Many others decided to stay abroad but in different countries other than China. They might weakened the Chinese centred supply chain networks however found new bloods like Indonesia, Vietnam, South Africa, and Central America... This is one of the most important consequences of the trade war; “trade diversion”. And counter to What Trump hoped (Kaya, 2019: 24), supplier relations within USA were moved downward; inducing firms to find domestic suppliers also discouraged the new entrepreneurs and investors to develop new supply chain relationships abroad (Charoenwong et al., 2020: 2; Nuroğlu & Çekin, 2020: 79; Yılmaz et al., 2019: 313).

US-China trade wars firstly boomed because of the trade deficit of the USA against China, and US President Donald Trump imposed high tariffs against Chinese imported goods and a few more goods imported from other countries to decrease the trade deficit and increased the homeland manufacturing to lower the dependence. However, trade deficits are not a barrier on the economic growth, contrarily trade war itself created negative effect on the US economy and consumers (Nuroğlu & Çekin, 2020: 79).

3.1.2. Impact of the Trade Wars on Global Economic and Commercial Activities

Although the current trade war seems to be related to mostly Chinese and American economic, trade and stock market issues, the reality is more complicated. Highly interconnected global supply chain network, international trade, global financial and economic system between countries cause all countries to suffer in different ways and degrees along with the China and USA (Mkwizu, 2019: 32). Since the conflicts started to rise up, both of them take actions to ensure their own welfare and benefits which actions have an impact globally (Açık & Özlen Başer, 2019: 1128). Also, in the centre there are world's two biggest economies that have a high correlation

with global markets (Lee et al., 2019: 5; Siddiqui, 2018: 63). Not in terms just considering the GDP amount of them but also, they are the top two exporters and importers (Gong et al., 2020: 1) among the international trade members and have biggest foreign direct investment amounts (FDI) in the world markets (Qiu et al., 2019: 150). The trade between these two represents 1.2% of global trade. Thus, any trade frictions and unilateral actions on trade between them have a spill over effect and affect the other countries as a whole (Teixeira, 2019: 178) in a degree increased by the international trade relevance of each of them (Kaya, 2019; Lee et al., 2019), global supply chain production (Kaya, 2019: 28; Qiu et al., 2019: 18) manufacturing employment and in GDP (Kaya, 2019; Lee et al., 2019). The degree and the direction of the impact might vary from country to country, might be huge or tiny or negative or positive (Olayungbo, 2019: 1).

These rising tariffs imposed by both USA and China as retaliation have a serious effect on global trade volume, industrial production and capital formation (Bordo & Levy, 2019; Kaya, 2019: 24). Also, according to the World Bank data (n.d./a), world trade volume was 45.93% of world GDP in 2018 and 44.07% of world GDP in 2019, which shows 4% decreased in one year. According to the forecast made by the International Monetary Fund, in a long term the world GDP will reduce 0.4% (IMF, 2018: 35). Trade wars also affect the development aims of the countries who affected the trade war in terms of insufficient goods and services imported by the rival countries (Teixeira, 2019: 177). Thus, the countries that cannot adapt urgently the new rules and develop some strategy to minimize the damage will face lower GDP growth in long term (Bozduman et al., 2019: 427).

In highly globalized world, countries who wish to take advantage of the world's blessings to ensure high-end living standards involve the international trade. To do this they give up some economic and political control as a degree parallel of dependency level (Welfens, 2019: 134). In return, they enjoy the free trade goods flows, like cheaper, more qualified, or unavailable services and goods; the free capital flow like investment opportunities in developing countries and foreign direct investment from other countries; new technologies and entrepreneur ideas that pay the way of developing.

On the other hand, protectionism is the opposite of the free trade and cause decrease in dependence level but also decrease in new investments, intellectual property flows, GDP growth and national welfare (Kaya, 2019: 19). Barriers to access to cheaper sources also cause the increase in production costs (Kaya, 2019: 24; Yılmaz et al., 2019: 314) which cause high inflation (Bozduman et al., 2019: 426). Protectionism also suppressed the comparative advantage of the emerging countries gained by low labour cost and devalued currency. That is why World Trade Organisation (WTO) enforces tight rules to set free the trade flows among members (Tabakis, 2005: 1) and to ensure multilateralism in trade (Theodore, 2019: 39) as a main objective of the liberal world economy.

The one of the main reasons of the protectionism policy of the US is that US is a self-sufficient country. The ratio of its foreign trade in its GDP is 20.84% in 2018 (World Bank Data, n.d./a [see Table 3]). On the other hand, at the end of the same year, this ratio was 33.26% in China and 73.72% in European Union. That means the sensitivity to the foreign trade related events is getting high if the dependence to foreign trade is getting high. So, the countries that have export-oriented growth strategy to be developed, seems to be damaged more (Koçakoğlu & Özaydın, 2020: 637).

Table 3: Merchandise Trade Ratio to GDP of the Selected Countries or Regions

| COUNTRIES/REGIONS | FOREIGN TRADE/GDP (% , 2018) |
|------------------------------|------------------------------|
| USA | 20.84% |
| CHINA | 33.26% |
| EUROPEAN UNION | 73.72% |
| MIDDLE EAST AND NORTH AFRICA | 67.55% |
| TURKEY | 52.94% |

Source: Compiled by Author by using data of World Bank, (n.d./a). *World Development Indicators, Merchandise Trade (% of GDP)*. <https://databank.worldbank.org/home.aspx>, (20.11.2020).

There are many aspects of the trade wars, this research aimed to mention each detail and points emphasized by the past researches. In this part, from the literature the

impacts of this trade war on international economy and trade were found out and listed below under the main 4 titles;

(1) Supply chain disruption (trade diversion) (Baldwin et al., 2020; Fusacchia, 2020; Lavenenthal, 2009; Nuroğlu & Çekin, 2020; Yılmaz et al., 2019): As mentioned many times above, in a globalized world, international product and service firms, sectors, consumers are interconnected in many ways. Thus, tariff changes in one country affect the production and consumption activities in other countries (Fusacchia, 2020: 442; Lavenenthal, 2009: 2; Nuroğlu & Çekin, 2020: 79), also change the trade paths and the style (Lavenenthal, 2009: 2). The deeply and widely spread supply chain networks of China and US magnify this effect on raw materials, intermediate or final goods and services provided by second and above tier suppliers (Fusacchia, 2020: 442). Increasing tariffs cause reallocation among the suppliers, the results are relative among the players who affected positive or negative way. For example, for the new firms that became an actor in international trade... As a more macro example, decreasing US imports from China was offset by the imports from Mexico and Vietnam.

With the disruption of the supply chain, like the ones affected directly some affected indirectly. Literature calls it as “third country effect”. For example, in the case of Canada that has heavy trade relationship with USA, suffered because their most of the products are gathered in China against where US declared war (Wang Z., 2019: 5). On the other hand in Europe, at first it might seem that trade war can give a comparative advantage to European exporters over US exporters in Chinese market. European exporters can export to China the goods imported from US before the increased tariffs. But same as Canada third country effect might increase the costs of the European producer because of the raw materials or semi-products used in production and coming from a victim of the high tariffs (Theodore, 2019: 39).

The offset actions are usually retaliation and change in monetary policies of the countries. Monetary policies might help in stabilizing the aggregate demand but won't have a significant effect on the pressure of the supply side (Bordo & Levy, 2019). Thus, the weight of the tariffs is heavier in many cases and balance cannot be ensured by classical moves. To ensure prosperity, members of the international trade

will end up finding new suppliers and clients. The competition between the countries to take a slice of the pie forces the whole world to redress the new balance of the new world economy (Nuroğlu & Çekin, 2020: 79).

(2) **Stock market decline** (Lee et al., 2019), in the beginning of the tariff imposition, not only Chinese nor American stock markets affected by the news but also global stock markets too (Lee et al., 2019: 17). Stock market is served as barometer to GDP (Gong et al., 2020: 2). It shows short term volatility in the markets and long-term economic situation (Gong et al., 2020: 2). Any declines or rises in the market values taken as a reference in interpreting the current situation in production and consumption. A decline in stock exchanges markets usually represents the global production to reduce that further cause reduction in raw material demands (Gong et al., 2020). Also the same decline indicates lower income conditions for consumers which cause limited consumption and lower demand.

(3) **Price reactions** (Bozduman et al., 2019; Kaya, 2019; Lee et al., 2019; Nuroğlu & Çekin, 2020; Teixeira, 2019; Yılmaz et al., 2019): Naturally, increase in tariffs increases the final cost of importers. Whether it is a raw material or final good, if the profit margin is kept same, the price will be higher because of the input is more expensive than before (Nuroğlu & Çekin, 2020: 79). Increased in prices will lower the purchasing power of the customers (Kaya, 2019) and demand for those goods and also lower the competitive advantage of the firms in international trade with higher price (Nuroğlu & Çekin, 2020: 79). In other word, the manufacturers will have to use more expensive US raw materials instead of cheaper Chinese product that increase their costs as a result consumers will have to buy American products instead of cheaper Chinese products; a burden that is carried by both manufacturers and consumers (Bozduman et al., 2019: 427; Yılmaz et al., 2019: 314).

(4) **Decrease in demand and GDP growth** (Bozduman et al., 2019; Mkwizu, 2019; Welfens, 2019; Yılmaz et al., 2019): Decrease in purchasing power of the customers results a decrease in demand also. The decrease in demand isn't for only the products affected by tariffs but also other product and services available in the local

and global markets (Mkwizu, 2019: 33). If the customer in somehow accept to pay more to purchase the tariff imposed materials, they will have to renounce something else to balance the financial condition. So these tariffs don't affect only purchasing behaviour to relevant products but also to other products in the markets. Following GDP growth decrease is a natural consequence of this process and further tariff retaliations whose fuses are lighted by the on-going trade war will cause continuity in downward trend in GDP growth (Bozduman et al., 2019: 427; Mkwizu, 2019: 34; Welfens, 2019). According to the World Bank data, GDP growth rate is decreased approximately 28% in two years period from 2017 to 2019.

Slow economic growth will affect negatively both develop and especially developing countries in social and economic welfare and will limit them while pricing and cause to use low quality products (Bozduman et al., 2019: 427). Some researchers (Yılmaz et al., 2019: 314) told that the decrease in import rate will transfer the resources for domestic production and increase the volume of local markets.

3.1.3. Impact of the Trade Wars on Turkey's Economic and Commercial Activities

The most vulnerable ones to trade wars are the one who called as “merchant nations” whose foreign trade volume is greater than their gross domestic products like India, Hungary and China (Kaya, 2019: 25). On the other hand, when we looked at the Turkey's statistics it is seen that its exposure is less with the 41% ratio of foreign trade volume to its GDP.

It is a fact that US saw China as a dangerous rival due to growing speed and its economic structure that welcome further developments. But in the case of Turkey, US moves is more likely political than economical when considering their current account surplus in foreign trade between US and Turkey (Aytekin & Uçan, 2018: 861; Kaya, 2019: 26). With foreign trade surplus, there is no point to take protectionist actions against Turkey; Turkey should be the one who consider taking protectionist measures (Aytekin & Uçan, 2018: 861). Nevertheless, Turkey was one of the targets of US (Petersmann, 2018: 181), in 2018 steel and aluminium tariffs were increased 50% and

20% respectively. And as retaliation, Turkey imposed new tariffs to 22 products imported from US mainly automobiles, food product, tobacco, and alcohol...

To see the situation in Turkey, first we should check the trade relation of Turkey with USA and China as main actors in the trade war. According to the TURKSTAT statistics in 2018, China is in the third line of the list Turkey top 10 importers, and USA is in the fourth line. However, China and USA occupied the 9.3% (21.5 billion US dollar) and 5.62% (12.9 billion US dollar) of the total import of Turkey, respectively. On the other China is in the 16th line of the list Turkey top 20 exporters, and USA is in the fifth line while China and USA occupied the 1.74% (3.1 billion US dollar) and 5.12% (9.1 billion US dollar) of the total export of Turkey respectively in 2018.

It might seem that Turkey has a current account deficit to USA, and it is not so bad to decrease the import from USA while giving deficit. But the reality is not simple as it seems. When the goods affected by tariffs are examined, it is found that Turkey have current account surplus and export volume has been increased 1.5 times from 2013 to 2017 while import from USA is decreased almost to half of it was in 2013 (Bozduman et al., 2019: 428). Occupying almost 13.2% of Turkey total export of iron, steel and other mine sources other than those two. That is why recent trade war and tariff is expected to have a possible negative impact on Turkey export volume (Bozduman et al., 2019: 429).

When sectoral impact is researched, automotive sector distinguish itself as a pioneer casualty. As it is known that the most important subsidiary industry of Turkey is automotive sector, and it is expected to be badly influenced by the tariffs imposed on European vehicle by USA. The vehicles volume exported to US will be shrinking and it will reflect negatively to Turkey automobile subsidiary industry. The same contraction will be observed in steel and aluminium sectors due to their raw material supplier position to those subsidiary industry sectors.

3.2. MARITIME SECTOR DURING TRADE WARS

3.2.1. Why Maritime Sector is Sensitive to the Trade Wars?

Approximately ninety percent of the total international trade has been handled by water transportation (International Chamber of Shipping, n.d.). Not only due to the cost effective freight prices but also they can carry huge amount of goods at once with high accessibility to anywhere in the world. It was well known that demand for maritime transport service is derived from the demand for merchandise goods all over the world (Slack, 2010: 5; Açık & Baran, 2018: 1091; Asyalı et al., 2009: 13; Pocuca & Zanne 2009a: 477). Being main enabler of global trade (Jacobs, 2012: 223), puts maritime industry in a position deeply interconnected with all events in international level. That is why, it is impossible for maritime sector not to be affected by the changes in global economy, its position and importance is directly reflected by the global economic activities or global trade (Belova & Mickiene, 2015; Pocuca & Zanne, 2009a: 477). The global production is the main fuel of maritime transportation and this simply and clearly can be explained as; if there isn't any demand there is no point of production, and if there isn't any product, there is no point of the need for transportation of any product from a point A to a point B. And maritime sector has always been affected by sudden and unnatural events in global markets; in other words, many variables are belonged to macro level economy and trade affect maritime sector directly in a very short time.

Global value and supply chain was forced to change by the trade restrictions, the countries adapted this change as early as possible will settle down faster and buy their tickets from the front line of the international trade. But this change took some time to happened, however in maritime sector the effects of the trade war is felt immediately (Wee, 2018), as known demand for transport is derived from the demand for goods will be transported from point A to B. As a main purpose of the trade war, demand for tariff-imposed goods decrease as the first consequence, especially demand for oil, agricultural products, recycling materials, and other dry bulk products (Wee, 2018). Not just because of the fell in the volume of transported goods, trade wars brought also uncertainty to the shipping industry (Daniel & Yildiran, 2019: 7). Also rising tariffs enlarge the marginal costs of the shipping companies, so the shipping companies' marginal cost is decrease with the decrease in the tariff barriers (Francois & Wooton, 2001: 255) increased volume in world merchandise goods cause ships to operate more efficiently. In the time of the recessions or any reason causes a decrease

in international demand for goods or world merchandise good volume will make the ships sail at lower capacities with increase the operational and marginal cost to increase.

Significant amount of world merchandise cargo is carried between USA and China, according to the World Trade Organisation in 2018 world merchandise trade volume was approximately 19.67 trillion U.S. dollars (WTO, 2019: 8) and the goods traded between China and US in 2018 was 120.29 billion U.S. dollars in 2018. Also when we consider the main actors in this tariff war, US and China constitute 8.5% and 23% of the world foreign trade, respectively. So the important of maritime transport related with them is indisputable. So, in other words US-China trade war is one of the macro factors in global economic and trade system that affects maritime trade (Açık & Özlen Başer, 2019: 1128).

3.2.2. Consequences of the Trade Wars on Maritime Sector

After the 2008 crisis countries behaved timid when connecting and merging with the other countries. Because globalization itself brought interconnectedness to worlds economy and trade system that cause domino effect during the 2008 crisis. Under these circumstances, a well-known but older hostile of globalisation that called as “protectionism” begun to rise up slyly as a recent trend in the global economy and international trade. And US-China trade war was the biggest and pioneer move of protectionism.

Because of the fact that shipping service is derived from the demand for merchandise goods all over the world (Slack, 2010: 5; Açık & Baran, 2018: 1091; Asyalı et al., 2009: 13; Pocuca & Zanne 2009a: 477) any downturn in global trade affects maritime sector deeply. In global economic and trade system, there are many factors affect the demand for merchandise goods that affects the maritime sector consequently. In a time of economic recession due to scarce in the liquidity, demand falls because consumers are out of money supply and they are preferred to keep their money in their pockets because of the uncertainty. But in the time of trade wars, demand for merchandise goods is forced to decrease intentionally for protectionist purposes. World exporters and importers are restricted to trade freely (Teixeira, 2019). In recent US-China trade war involved many countries around the world directly and

contamination was spread to the third countries indirectly. Reciprocal tariffs imposed by international players increased the impact of the trade war and caused decreased in global demand as one of the first outcomes. Under these circumstances, it is inevitable for maritime sector not to be affected due to the spontaneously decrease in logistic demand (Cho et al., 2020: 2). And unsurprisingly trade war impacted varied parts of the maritime sector in different ways (Cho et al., 2020: 4; Wee, 2018). The impacts are deteriorated by the global involvement.

According to the UNCTAD (2019: 1) annual report, global maritime trade growth was slower approximately 35% in 2018 comparing with the 2017 numbers. 2017, 2018, and 2019 volumes were 4.1%, 2.7% and 2.8%, respectively.

Tariff changes not just affected the cargo volume but also the way and manner of the goods to be transported, it caused to change in the trade routes (Daniel & Yildiran, 2019: 7). Countries that face with high tariff barriers while exporting or importing started to seek for other potential suppliers and clients from different countries who offer moderate conditions for the new partners. So international trade network started to diverse.

The sudden and unexpected change in maritime sector affected both efficiency and costs the ships that force freight rate to decline that already under the negative influences of the excessive ship supply in maritime sector (Daniel & Yildiran, 2019: 7).

According to the (Daniel & Yildiran, 2019: 7), at the beginning of the second quarter of 2018, the tariffs' impacts is felt on dry bulk carriers, along with the container carriers whose vulnerability was highlighted (Parker, 2018; Wee, 2018) as it suffered earlier and deeper than the other ship types because of the oversupply in container capacity (Wee, 2018). However, the impact on the Crude Carriers market might be felt later when China seeks for other oil suppliers (Daniel & Yildiran, 2019: 7).

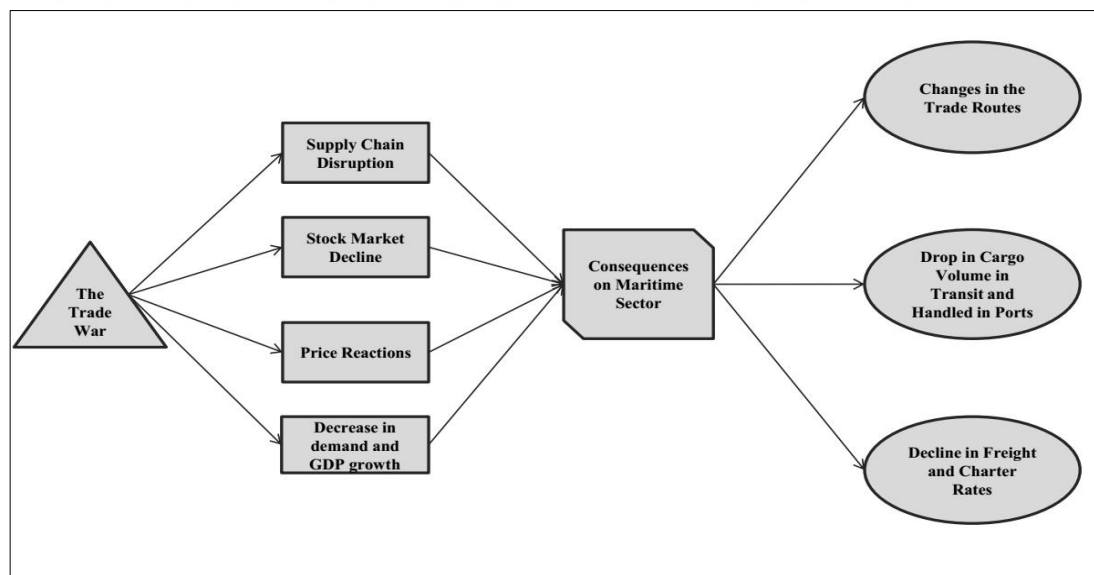
In 2015, by the removing of US crude oil export restrictions, China positioned in the front lines as a US crude oil claimant. Because of the conflict between them will cause a reduction in Chinese oil imports by putting US producers in a difficult position. Most of the oil shipments between them were carrying out by the Very Large Crude Carrier (VLCC) ships, this decrease result a decline in the important of VLCC ships

to China while increasing the popularity of aframax ships to Europe (Wee, 2018) that replacing the Chinese importers.

Overcapacity is sneakiest enemy of maritime sector and always be one of the biggest problem in the time of global imbalances. It is a paradoxical element of maritime sector; in the goods times shipping capacity is increased to meet the demand “as a result” but when it comes to bad times it became the problem as “a reason itself”. Like in the 2008 crisis, overcapacity makes things even worse and become one of the main reasons of the decline in freight rates. Overcapacity doesn’t only affect the freight rates but charter rates too... According to the (Wee, 2018) research, the charter rates decreased, although increasing bunker prices make the operational cost get higher.

However, as a part of this shipping cycle, when maritime sector suffered enough from the overcapacity, ship owners decided to apply for demolition. Because the decline in freight rates leaves nothing to ship owners to cover their expenses. When the number of demolished ships is increased, ship supply decrease and make freight rate moderate conditions again...

Figure 6: Reasons of the Crisis and its Consequences on Maritime Sector



Source: Created by the author

3.2.2.1. Changes in the Trade Routes (Trade Diversion)

The one of the most important impacts of trade war on maritime sector is the changes in the trade routes because of trade diversion (Burnson, 2019; Pencea, 2018: 295). This trade routes diversion brings these questions to our minds; Is the current maritime order ready for change? Will the new destination of the goods be adequately manned and equipped for handling and conducting efficient logistic operation?...etc (Burnson, 2019). The port structures, capabilities, capacity and the type of the ships and other coastal service entities are established while considering the need and demand of a specific area. For example, if the distance from a point A to B is long, bigger ships are needed to lower the marginal and operating costs. Or if a port structure needs to expand its capabilities and capacity that means it cannot meet the demand and needs to grow. In a highly globalized world all sea vehicles and coastal maritime structures, shipyards, enterprises that are dealing with service side like insurance, logistic firms, forwarders, inspectors...etc. are strategically deployed and continuously developing to ensure best efficient and effective conditions. So any unexpected and sudden change in the normal order will make the each member of this sector to be caught unprepared. Faster adaptation to unexpected events is a must for an enterprises or a sector, however the macro events' impacts are heavy and it is low chance not to get a single damage if you highly involved.

The change in the trade routes made new one profitable and vice versa. For example, COSCO (China Ocean Shipping Company) withdrawn from the US-China route because it won't be dense and profitable like before (Pencea, 2018: 295).

Another aspect of changing in trade routes is the vulnerability of the countries that don't have alternative trade routes (Macfie, 2016: 39). To be a maritime nation gives a country opportunity to access the world, to make profit of the usage the seaways and maritime structures, to have wide variety of job and employment options...etc. But as an effect of trade wars, trade routes and ways might change and for a nation who is dependent in the maritime sector for economic recovery, it is a disaster not to have alternative trade routes and plans.

3.2.2.2. Decline in Freight and Charter Rates

Due to dependence of shipping on international trade demand and volume, since 2018 a heavy fluctuation are observed in freight rates (Cho et al., 2020: 1) of various ship types. In the Figure 7, 8 and 9, the fluctuations are tried to be visualized;

Figure 7: World Container Index



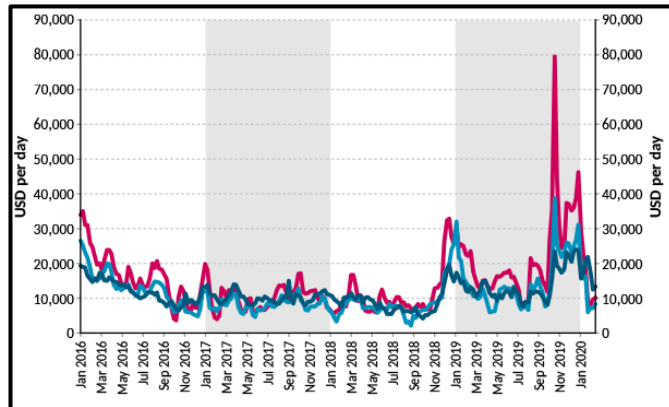
Source: Global Maritime Hub. (n.d.). Drewry World Container Index - 28 May. <https://globalmaritimehub.com/drewry-world-container-index-28-may.html>, (30.07.2021)

Figure 8: Baltic Dry Index



Source: Trading Economics. (n.d.). *Baltic Exchange Dry Index*. <https://tradingeconomics.com/commodity/Baltic>, (08.02.2020).

Figure 9: Oil Product Tanker Earnings



Source: Sand, P. (20.02.2020). *Tanker Shipping: Freight Rates Drop as Strong Seasonality Fades and High Fleet Growth and Coronavirus Uncertainty Hits.* https://www.bimco.org/news/market_analysis/2020/20200225smoo01_tanker_shipping, (25.05.2020)

There are many reasons of freight reduces but the trade war basis reasons are laconic in the literature. The researchers emphasize a few reasons mainly which are decline in stock markets, production, and consumption.

As one of the macroeconomic indicators, stock markets represent the pulse of the production and investments. Any decline points out an upcoming economic downturn (Gong et al., 2020: 1). In US-China trade war the decline in the stock exchange markets are observes all over the world. These declines indicated shrinkage in the global production, and reduce in production means lower needs for raw materials such as coal, crude oil, mine sources (iron ore, steel...) ... This is the point where shipping attends the play. Decrease in demand for raw materials also decreases the demand for bulk and tanker transportation -mainly- which results in freight rate crash. Another aspect of the stock market decline is decreasing in consumption. The decline in stock markets means lower incomes, thus consumers are discouraged to spend money and decides to save for worse days. This in return reflects as a drop in the freight rates mainly in container shipping due to reduce in manufactured goods demand. In Turkey, the decline in stock exchanges is found to have a negative impact on ISTFIX index (Açık & Özlen Başer, 2019: 1129).

3.2.2.3. Drop in Cargo Volume in Transit and Handled in Ports

As a natural cause of the decline in global demand, drop in cargo volume is unsurprising. With the decreasing in the transportation demand, the ships starting to sail partially loaded, it seems like a concert without audience. Approximately 15% drop in the volume of the west of US routes is observed in the late of 2019 and the beginning of 2020 (Burnson, 2019). As a result, Alphaliner have changed their container growth estimation from 3.6% to 2.5% for 2019, this estimation was a result of the decreasing cargo volume especially in pacific routes (Burnson, 2019). The cargo volume in the Port of Los Angeles was decreased 19.1% in 2019 (Cho et al., 2020: 4).

Specifically, port activities are affected by trade wars due to the heavy weight of the maritime transport in international trade (Teixeira, 2019: 176). The growth in the Chinese ports was decreased almost 15% in 2019 compared with 2018 (The Journal of Commerce, 2019: 52). Tariff based slowing in global economy and production volume is also a reason of the decreasing in the port throughput growth. Alphaliner found that ports throughput growth volume decline from 6.6% to 2.8% in 2018 according to the data gathered from 250 ports (Burnson, 2019). The growth rates were changing from region to region, some developing regions like Africa (4.4%), Middle East (10.1%) declared decline in volume while China and US ports recording growth in the volumes. Although this is a disappointing result, might be a good lesson for emerging regions to find alternative routes to ensure continuing in business and decrease the dependence to one.

CHAPTER FOUR

EMPIRICAL ANALYSIS ON THE IMPACT OF GLOBAL IMBALANCES ON MARITIME SECTOR

In this chapter port throughput efficiency of the Turkish ports will be determined and results are evaluated to measure the impact of global imbalances on Turkish ports' throughput efficiency. The reason to focus on this area, although Turkey has unique natural advantages to enhance its maritime activity, it fell behind of the global seaborne trade. This woeful problem put the Turkish maritime sector even more vulnerable in the time of global imbalances.

So, this study will determine the efficiency of Turkish ports throughput to see the impact of global imbalances during 15 years period of time that includes two important global imbalances; 2008 global economic crisis and so called US-China trade wars. By revealing the results, this study aims to highlight the relatively efficient and inefficient times of the Turkish ports and the underlying reasons in order to become a guideline for increasing the port throughput efficiency, for providing safer environment and for giving policy implications to the members of the Turkish maritime sector and trade to adjust their policies and operate more efficiently even in the time of global imbalances.

In this last chapter of this thesis, method of the analysis, chosen variables, data will be discussed as the first two titles. Then relative Turkish ports port throughput efficiency will be determined by comparing the results of the samples. The most efficient times will be benchmarks of the other relatively inefficient times. The efficiency analysis will be carried out by the method called as Data Envelopment Analysis (DEA). It covers the data of the years from the first quarter of 2005 to the last quarter of 2019.

In the literature there are many studies on port throughput efficiency using physical features belongs the ports they analyse and the many of them are conducted their studies to compare port samples and define a benchmark for other inefficient ports either in national or international studies. However, distinguishing features of this study, efficiency of port throughput will be evaluated by considering both physical

and related macroeconomic parameters by looking from the wider frame to this point to.

4.1. RESEARCH QUESTIONS AND RESEARCH GOALS

The first question of the study is that; which macroeconomic parameters have the most impact on the merchandise goods handled by maritime ports? The second question is that; which physical parameters have the most impact on the merchandise goods handled by maritime ports? These parameters will lead us to measure the port throughput efficiency of the ports by considering the handled goods as output and these parameters as input.

The third question is that; which periods are selected as most efficient years (benchmarks) and which ones are inefficient relatively to these benchmarks? What are the target output values for inefficient years to ensure efficiency?

The fourth question is that; what is the economic reasons behind the efficient and inefficient ports to become efficient and inefficient? What should have been adopted to increase efficiency in these past years?

The purpose of this study to determine the efficiency levels of Turkish ports throughput to see the impact of global imbalances during 15 years period of time that includes two important global imbalances; 2008 global economic crisis and so called US-China trade wars. By revealing the results, this study aims to highlight the relatively efficient and inefficient times of the Turkish ports and their reasons in order to become a guideline and to provide policy implications for the members of the Turkish maritime sector and trade to adjust their policies nationally and internationally (Bergantino et al., 2013) and operate more efficiently in the time of global imbalances.

4.2. METHODOLOGY: DATA ENVELOPMENT ANALYSIS (DEA)

DEA is defined as non-parametric method of measuring the relative efficiency of the Decision-Making Unit(s) (DMU) by using multiple or single inputs and outputs. DEA doesn't measure absolute efficiency (Rios & Maçada, 2006: 333).

Farrel first bring forward the theoretical concept of DEA method mentioning a piecewise-linear convex hull approach to frontier estimation. Although Boles (1966) and Afriat (1972) proposed a mathematical programming method for frontier estimation, the main attentions are come after the Charnes, Cooper and Rhodes papers in 1978 and when DEA name is adopted and since then a numerous number of paper applied DEA method for their researches (Cullinane & Wang, 2010), by 1999 CCR paper had been cited over 700 times (Forsund & Sarafoglou, 2002: 1).

This is an approach used to evaluate of the performance of the similar units that are transform multiple or single input to multiple or single outputs (Acer & Timor, 2017: 343). Simply, DEA method defines a virtual frontier represent the efficient level among the DMU(s) by imputing linear combination of the inputs and outputs of most efficient DMU(s) (Schøyen & Odeck, 2013: 203). The aim is defining the efficiency level by comparing all producers to each other and set an efficiency benchmark. If DMU(s) perform less than this benchmark, they called as inefficient. Being inefficient can be caused by producing less output with a certain level of input or by using more input to produce certain level of output. On the other hand, being “more” efficient can be caused by producing more output with a certain level of input or by using less input to produce certain level of output. DEA is not only define the efficiency levels of DMUs but also shows data on how to increase the efficiency levels by lowering or increasing inputs or outputs.

The most widely known and used DEA models are CCR suggested by Charnes, Cooper and Rhodes and refers constant return to scale (CRS) and BCC suggested by Banker, Charnes and Cooper (1984) refers to variable return to scale (VRS). CCR model was used to general technical efficiency of the institutions under the constant return to scale approach. However, BCC model brings another perspective this method, that enables measuring both technical and scale efficiency separately.

DMUs should serve the same purpose and operate under the same market conditions and also the variables affecting the relative effectiveness of the DMUs are required to be same.

DEA method can be used both input and output oriented. In input-oriented DEA models focus on the least input level in order to produce a certain level of

output(s). On the contrary output-oriented DEA models focus on the biggest output level produced by a certain level of input(s).

DEA calculate Technical efficiency of all DMUs. Technical efficiency is consist of pure technical efficiency and scale efficiency and obtained by multiplying these two indices.

Pure technical efficiency refers the managerial efficiency, scale efficiency refers to the firm's success in producing at an appropriate scale.

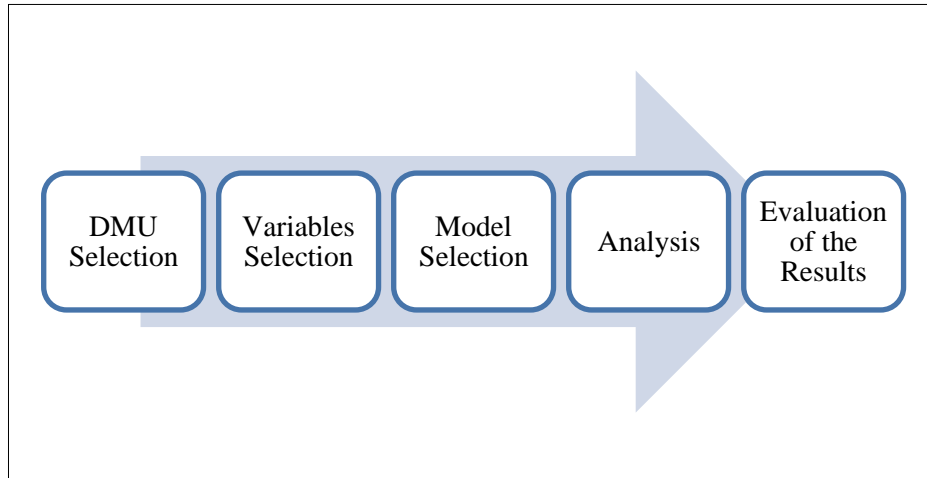
All DMUs cannot be inefficient at the same time. Because DEA creates a production limit by the inputs and outputs of the DMUs and obtain most efficient DMU(s) which have efficiency score “1”. The other DMUs are compared according to this limit and each DMU gets efficiency score from 1 to 0 according to the proximity to this production frontier.

At the end of a DEA analysis researchers can find the following outcomes; efficient DMUs; inefficient DMUs; excessive inputs and insufficient outputs; target input and output levels for each variables (Akyar, 2019: 82).

4.2.1. Implementation of DEA

The first step in DEA implementation is to decide on which DMUs will be examined and compared with each other. After DMUs are determined, researchers should secondly determine the variables; (Cullinane & Wang, 2010: 537) inputs those are assumed to be transformed into (Huang X. et al., 2020) outputs. Then depending on the features of the DMUs and purpose of the analysis researchers should decide on the DEA model; either it is input or output oriented (or both); either it is CCB, BCC, or other models of DEA. The final step is evaluation and interpretations of the findings.

Figure 10: Implementation Steps of DEA



Source: Created by the Author

4.2.1.1. Decision-Making Units Selection

Focusing area of a data envelopment analysis is its DMUs that are defined as producers who produce output by inputs. With DEA, one of the performance indicators of these producers are determined; efficiency... So before measuring the efficiency levels first and most important (Kozanhan, 2012: 74) requirement is to find proper DMUs. This is directly related with the subject of the study (Akyar, 2019: 84; Yüksekıldız, 2014: 32).

Because of the comparison nature of DEA, DMUs should be homogenous in terms of purpose of their productions or tasks by using same inputs and producing same output under similar market conditions.

To ensure reliable results and to achieve a reasonable level of discrimination, DMU number is also expected to be large enough (Bayar, 2005: 43; Brown, 2018: 115). In the literature there are a few theories proposed minimum number of DMUs should be selected. Bowlin (1987) stated that at least two decision units should be chosen for each input and output variable. Vassiloğlu and Giokas (1990) suggested to use at least 3 times of total number of inputs and outputs. Boussofiane et al (1991) specified the least DMU number should be at least “1+input number + output number”. On the other hand Norman and Stoker (1991) defend that there should be at least 20 DMU or twice of the total number of outputs and inputs.

4.2.1.2. Variable Selection

DEA method is a data based analysis, and the main data of the analysis is variables. Reliability of the research is directly related with the relevance of the variables used in production function of producers. Because DEA actually compare the variables of all DMUs with each other and set the efficiency level, so important of the careful selection of variables are deniable. If the selection of irrelevant and incorrect variables might lead researchers to find biased results (Almawshaki & Shah, 2015: 479; Nwanosike, 2014: 153) and contaminate the literature.

There are some points should be considered while variable selection;

(1) Units of variables;

Unlike the other methods, there isn't any limitations on units of variables (Min et al., 2009). The units of all outputs and inputs might different, like kilo, meter, currency, number, time...etc.

(2) Number of variables;

The focus should be both on variable and DMU number. To achieve a reasonable level of discrimination, number of variable should be consistent with DMU number (Brown, 2018: 115). In the literature it is suggested to eliminate the variables don't have significant weight in production. Because if the number of variables is increased, number of efficient DMUs are also increased which is not a desired result (Nwanosike, 2014: 154).

(3) Properties of variables

In DEA positivity and isotonicity of the variables are stipulated. All variables must be positive and non-zero, this is the positivity rules of DEA. Another rule is isotonicity, means all variables must have positive relationship. In another words, increase in a variable shouldn't cause decrease in another variable (Nwanosike, 2014: 161). This rule should be justified in a DEA study to prove the accuracy and reliability of the results. Correlation analysis might be applied to check the isotonicity (Hung et al., 2010: 707; Lin, 2005: 599; Nwanosike, 2014: 161; Rajasekar & Deo, 2012: 14).

4.2.1.3. DEA Model Orientation and Model Selection

After determining the DMUs and variables, proper model should be selected considering the nature of the previous selections. Although there are more DEA models in the literature, only CCR and BCC models are mentioned in this study.

There are two orientation model in DEA: input and output orientation. When deciding on which one should be selected, the nature of variables and the purpose of the study should be considered.

Input orientation: the focus will be on the reducing the input variables to produce the same level of output. Output orientation: the focus will be on the increasing the output variables with same level of inputs. But in some studies variables as inputs or outputs cannot be controlled or interfered. In same studies reducing input is undesirable thing to do. For example, any intention to reduce GDP as input isn't welcome in any case. So input oriented model should be applied if the control over inputs is little or none and vice versa for the output orientation. Researchers might choose both options and applied them separately if there is an availability in the variables.

The most widely known and used DEA models are CCR refers constant return to scale (CRS) and BCC refers to variable return to scale (VRS). CCR model was used to general technical efficiency of the institutions under the constant return to scale approach, it is assumed production is conducted under optimal conditions (Huang X. et al., 2020: 456). However, BCC model assumes operation optimal production level is not realistic due to consider imperfect competition and limitation in sources (Huang X. et al., 2020), so it brings another perspective this method, that enables measuring both technical and scale efficiency separately, for the studies whose DMUs efficiency are influenced by scale differences (Güner, 2015: 39). In another words, in an environment with varying intuition size or production scale, VRS enables to measure efficiency independently from those factors (Cheon, 2008: 11).

DEA calculate Technical efficiency of all DMUs. Technical efficiency is consist of pure technical efficiency and scale efficiency and obtained by multiplying these two indices. Pure technical efficiency refers the managerial efficiency, scale efficiency refers to the firm's success in producing at an appropriate scale in other words it shows closeness of a DMU production size to most efficient scale (Itoh, 2002:

138). So VRS decompose the scale efficiency from technical efficiency to assess the main source of inefficiencies (Güner, 2015: 47). Scale efficiency is also found by dividing CCR efficiency scores by BCC efficiency scores (Itoh, 2002: 140). If SE is less than 1, it means there is a scale inefficiency. When it is observed, researchers should check the weights of the variables (lambdas λ). If sum of lambdas is equals to 1 constant return to scale; less than 1 increasing return to scale; more than 1 decreasing return to scale rules are prevail (Wanke & Barros, 2015: 18).

4.2.1.4. Analysis and Evaluation of the Results

After all previous selections are done, the time for actual analysis is the next step of the research. DEA analysis can be made by special DEA analysis programs or optimizations softwares (Bayar, 2005: 44). The efficiency scores will be between 0 and 1. Results will show the most efficient DMUs as benchmarks and reveal the ones inefficient relatively. Results also shows the target values to be efficient and also output slacks or excess input usage (Nwanosike, 2014: 162) for each DMUs. After revealing all technical results, evaluation will be carried out to find a way to improve the efficiency levels of the relatively inefficient DMUs.

4.2.2. Strengths and Weaknesses of DEA

DEA is non-parametric method, due to this feature, production function defined by the researchers doesn't need former cumulative assumptions about analytical structure (Akyar, 2019: 88). DEA gives freedom to researchers to use their experience and know-how by being flexible. Also, it doesn't require any prior knowledge about former data of the variables (Mustafa et al., 2021: 14). Also it doesn't require matching units for variables which enlarge the researcher's area of study.

It also suggests alternative ways to achieve efficiency, it shows how to achieve better efficiency scores one by one for each variable, so decision makers can make their own choice to increase efficiency considering the environmental conditions, current capabilities, and availabilities.

On the other hand, it compares the DMUs with other and define the best one as benchmark for others, but the result doesn't mean the benchmarks are doing everything perfect, it is relatively best. So, this creates uncertainty for the ones at the edge.

As told many times before, DEA analysis rough data and compared them with each other, so it is data-based method. The reliability of the results is depending on the reliability and conformity of the variables with production function. Existence of an insignificant or an absence of a significant variables might cause deceptive results for the evaluators.

4.2.3. Mathematical Statement of DEA

In this section, mathematical statement of the models applied in this study will be examined.

The fundament of DEA model can be explained historically as division of output to inputs. The models are derived from the formula (1).

$$Efficiency = \frac{Output}{Input} \quad (1)$$

4.2.3.1. Output oriented CCR Model

In output oriented CCR Model, data is analyzed to maximize the output in case of no control over inputs.

In mathematical terms, the basic DEA-CCR model that we are going to refer to would be:

$$\text{Max. } \theta = \left\{ \frac{\sum_{i=1}^p a_{ki} * Y_i}{\sum_{j=1}^m b_{kj} * X_j} \right\} \quad (2)$$

Limitations for each DMU;

$k = 1, 2, 3 \dots, n$ and $Y_i \geq 0$ and $X_j \geq 0$

$$\frac{\sum_{i=1}^p a_{ki} * Y_i}{\sum_{j=1}^m b_{kj} * X_j} \leq 1 \quad (3)$$

Parameters used in this model are as follows;

θ : The efficiency score of the decision unit of (k)

k: number of decision units analysed,

i: number of outputs,

j: number of inputs,

Y: multiplication vector on the a_k ,

X: multiplication vector on b_k respectively,

Y_i : weight for the output i,

X_j : weight for the input j,

a_{ki} : output i of the DMU k,

b_{kj} : input j of the DMU k,

Zk: objective function of the DMU k

So, with the light of the expressions above;

$\sum_{i=1}^p a_{ki} * Y_i$ refers the output function of the DMU k,

$\sum_{j=1}^m b_{kj} * X_j$ refers the input function of the DMU k.

For output oriented CCR model, inputs must be considered same for any conditions and output must be maximum.

If input function is accepted as “1”

$$\sum_{j=1}^m b_{kj} * X_j = 1$$

Objective function will be;

$$\text{Max. } Z_k = \sum_{i=1}^p a_{ki} * Y_i \quad (4)$$

4.2.3.2. Output oriented BCC Model

On the other hand, output-oriented BCC models aim maximum movement in the frontier by proportional increase of outputs. In mathematical terms, the output-oriented DEA-BCC model that we are going to refer to would be:

$$\text{Max.}\theta = \min \frac{\sum_{j=1}^m b_{kj} * X_j - X_k}{\sum_{i=1}^p a_{ki} * Y_i} \quad (5)$$

Limitations for each DMU;

$k = 1, 2, 3 \dots, n$ and $Y_i \geq 0$ and $X_j \geq 0$

$$\text{Max.}\theta = \min \frac{\sum_{j=1}^m b_{kj} * X_j - X_k}{\sum_{i=1}^p a_{ki} * Y_i} \geq 1 \quad (6)$$

X_k refers the scale factor as a free-signed variable for the DMU k ,

4.3. DATA COLLECTION

In this section, core of the empirical analysis applied in this study will be examined. At first, it will start with DMU selection and continue with variables selections (input and output selection) by considering the features must be adopted as the requirements of this method. Each step will be explained comprehensively includes limitations and restrictions encountered while data collection.

4.3.1. Selection of Decision-Making Units

As a distinctive feature of this research, quarterly time periods are selected as DMUs. In the literature whether it is related with ports or not, many study select their DMUs to compare the institutions, organizations...etc. with each other. Since our purpose is to compare the Turkish port throughput efficiencies with itself in different times, and to detect the fluctuations and their reasons in macroeconomic perspective. It is not the only study use time to define DMUs (Açık et al., 2017; Açık & Baran, 2018; Bichou, 2013; Gao et al., 2010; Huang X. et al., 2020; Sağlam et al., 2018).

60 quarterly (3 months period) time periods are selected as DMU starting from the first quarter of 2005 until the last quarter of 2019. The season to start from 2005 is because maritime sector has lived its golden times and nobody feels the impacts of the upcoming crisis, so it allows us to include past better times to make the comparison

more diverse and sounder. The reason to finish at 2019 is obviously the appearance of Covid-19. This study doesn't include the covid-19 impacts on port throughput, so termination of DMUs in the last quarter of 2019 was mandatory. In the construction phase of this study, it was planned to take monthly data as DMUs but availability of the variables let the study to proceed with quarterly data.

4.3.2. Selection of Variables

The empirical study will be two folded, import and export data are divided, and analysis is applied to both separately. Because variables that define import and export goods handled (the differences import and export function) show difference in the literature, so tests were run for both to see the difference and reveal more detailed and pure results.

Table 4: Summary Statistics for Import Variables

| | Output | Inputs | | | |
|-------------------|--|--------------------|-----------------------------------|---------------------------------|-------------------------|
| | Import Throughput (Mln. Tonnage) | REER (2003=100) | GDP Turkey (Bln. Dollar) | Ship Calls (Mln. Tonnage) | Port Number (Pcs) |
| N | 60 | 60 | 60 | 60 | 60 |
| Minimum | 12,37 | 62,51 | 108,02 | 71,41 | 160 |
| Maximum | 33,61 | 127,72 | 255,25 | 210,35 | 180 |
| Mean | 218,577 | 1,037,925 | 1,952,732 | 1,542,410 | 171,20 |
| Std. Deviation | 511,145 | 1,456,135 | 3,685,074 | 4,067,053 | 8,407 |

Source: Created by the Author

Table 5: Summary Statistics for Export Variables

| | Output | Inputs | | | |
|-------------------|-------------------------------------|---------|--------------------------------------|---------------------------------|-------------------------|
| | Export Throughput (Mln. Tonnage) | Euro/TL | GDP Trade Partners (Bln. Euro) | Ship Calls (Mln. Tonnage) | Port Number (Pcs) |
| N | 60 | 60 | 60 | 60 | 60 |
| Minimum | 27,56 | 1,59 | 5153,15 | 71,41 | 160 |
| Maximum | 61,86 | 6,59 | 12608,25 | 210,35 | 180 |
| Mean | 453,475 | 29,202 | 82,494,225 | 1,542,410 | 171,20 |
| Std. Deviation | 879,345 | 140,654 | 202,942,365 | 4,067,053 | 8,407 |

Source: Created by the Author

In the literature there are many studies on port throughput efficiency using physical features belongs the ports they analyse and the many of them are conducted their studies to compare ports and define a benchmark for other inefficient ports either in national studies or international studies. A great number of these studies used the common inputs and outputs that are very popular in port efficiency DEA analysis. Also, many of them measure the operational efficiency of the ports. The Table 6 summarize the studies from last five years while indicating their distinguishing features if any.

Table 6: Summary of the Recent DEA Studies

| Authors | Year | DMU | Input | Output | Remarks |
|---------------|------|---|--|--|-------------------------------|
| Wang and Yang | 2020 | 14 Coastal Ports with Greater International Influence | Annual Cargo Throughput, Intangible Assets, Total Assets, Port Employees' Salaries | Operating Income, Operating Profit, Total Profit, and Net Profit | Measured financial efficiency |

| | | | | | |
|-------------------|------|--|--|--|--|
| Nguyen et al. | 2020 | Top Ten Container Port in Southeast Asia | Berth Length, Number of Cranes, Total Area | Container Throughput | |
| Seth and Feng | 2020 | The 15 Ports Represent The Major Coastal Regions | Port Security Measures Cost, Container Facilities Infrastructure Cost, Dredging Cost | Net Income, Container Throughput | Measured financial efficiency |
| Huang T. et al. | 2020 | Nine Container Ports Along The 21th Century Maritime Silk Road | Container Berth, Wharf Length, Number of Gantry Cranes | Container Throughput | |
| Huang X. et al. | 2020 | Years from 2005 to 2016 | Number of Production Berths, The Length of Production Quay and Number of Container Cranes | Bulk Cargo Throughput , Container Throughput | Used years as DMUs |
| Mustafa et al. | 2019 | Ports In East Asian Region Middle East And South Asian Region | Number Of Berths, Number of Cranes, Berth Length, Berth Depth | Container Throughput | |
| Castellano et al. | 2020 | 24 Italian Ports | The Size of the Terminal Area, The Number of Employees, The Amount of Capital Invested, Green Port Efforts | Liquid Bulk, Solid Bulk, Number of Containers, Environmental Quality Index | Used intangible inputs like indices or efforts |

| | | | | | |
|----------------|------|--|--|---|--|
| Zarbi et al. | 2019 | Top Five Container Ports in Iran | Berth Length, Berth Number, Gantry Crane Number, Handling Area | Container Throughput | |
| Wang J. et al. | 2019 | Shanghai Port, Singapore Port, and Busan Port | Tariff Rate, Market Access, Port Basic Services, Port Facility, Port Communication Level | Total Transportation, Total Seaborne Transportation, Cargo Throughput | |
| Xun | 2019 | Top Ten Ports in Bohai | Number of Berths | Cargo Throughput, Container Throughput | |
| Hynes et al. | 2019 | Five Largest Irish State-Owned Ports and the 10 Spanish North Atlantic Ports | Land, Labour, Capital | Revenue | Measured financial efficiency |
| Akyar | 2019 | 26 Turkish Container Ports | The Terminal Area, Berths Number, Berth Length, The Number of Quay Cranes, Yard Handling Equipment Number, Port Draft, Employee Number | Container Throughput | |
| Huang et al. | 2018 | 18 Major Ports in the Coastal Area in China | Length of the Terminal, The Number of Berths, The Average Depth of Wharf, The Number of Quayside | Throughput of Cargo and Container | Used hinterland GDP, hinterland traffic network density, and the proportion of middle and senior professional in the port as external factors. |

| | | | | | |
|----------------|------|--|---|---|--------------------|
| Guner | 2018 | 13 Turkish Ports | Labor, Total Expenses, Length of Quay, Terminal Area, Number of Cranes, Number of Tugs, and Number of Forklifts | Freight Handled, Ship Calls, Total Income | |
| Brown | 2018 | 69 Ports (across countries) for the Period 2001-2011 | Berth Length, Terminal Area, Terminal Equipment | Container Throughput | |
| Saglam et al. | 2018 | Years from 2011 to 2016 | Number Of Berths, Berth Length, Draft, Number Of Tugs, Number Of Quay Cranes | Berthing Time Difference | Used years as DMUs |
| Açık and Baran | 2018 | Years from 1980 to 2016 | World Fleet Cargo Capacity, World GDP | Major Dry Bulk Transported | |
| Acer | 2017 | Turkish Container Ports | Berth Length, Number of Workers, Port Area, Container Freight Station Equipment | Container Throughput , Ship Calls | |
| Jang et al. | 2016 | 21 Ports among World's Top 100 Container Ports | Length Of Berth, Gantry Crane, Terminal Areas | Container Cargo Volumes | |

Source: Created by the Author

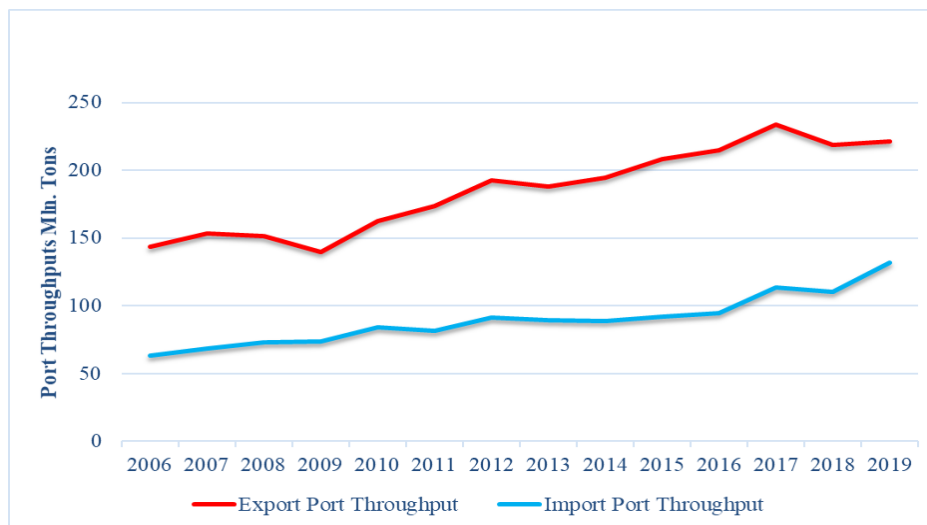
In the next sections output and input variables used in this study will be explained. As a distinguishing features of this study from the other DEA port efficiency analysis like above, efficiency of the ports will be evaluated by considering both physical and economic parameters.

4.3.2.1. Output Variable

Only one output factor is selected that is Port Throughputs in tons in Turkey. DEA is usually used to measure the technical efficiency of the institutions and the former studies are mainly focused on the physical outcomes. Financial data like cost and revenue are not so popular because of the restriction in availability of these data (Bichou, 2013: 31). Port throughput is the one of common outputs in the literature. However, there are more different outputs in the literature like port or channel traffic, number of ship calls, number of hours of work, crane productivity, turnaround time...etc. as more common outputs; Environmental Quality Index (Castellano et al., 2020: 6), profits (Wang & Yang, 2020: 688), total income (Güner, 2018: 573) as more rare ones...etc.

Export goods handled in ports are selected for export analysis and import goods handled in ports are selected for import analysis. The monthly data “goods handled in Turkish Ports” were collected from General Directorate of Maritime Affairs, Department of Maritime Trade Development work under the Ministry of Transport and Infrastructure of Turkey (<https://denizcilikistatistikleri.uab.gov.tr>). These monthly data were transformed into quarterly data later. In Figure 11 annual data has been showed.

Figure 11: Export and Import Port Throughput



Source: Compiled by Author by using the data of The Ministry of Transport and Infrastructure of Turkey, (n.d.). Annual Cargo Handling Statistics. Retrieved 2020, May 05 from <https://denizcilikistatistikleri.uab.gov.tr>

4.3.2.2. Input Variables

In the literature the variety of input variable are deeper than output variables in port studies. The most common ones are; berth length, number of berths, number of cranes, terminal area, port depth....etc. and more uncommon ones are working hours, number of workers, loading/unloading hours per ton, invested capital (Castellano et al., 2020: 9), intangible assets and salaries (Wang & Yang, 2020: 688), port communication level and market access (Wang et al., 2019: 27)...etc. In some studies, environmental factors are adopted like GDP (Bergantino et al., 2013; Brown, 2018), hinterland traffic networks...etc. As (Brown, 2018), (Cui et al., 2015), (Li & Xu, 2011) say, input variables as port performance indicators might be internal (physical production function elements), external (economic parameters) and environmental (socio-economic factors). So the studies in the literature shows high variety of inputs depending on the perspective and the purpose of the study.

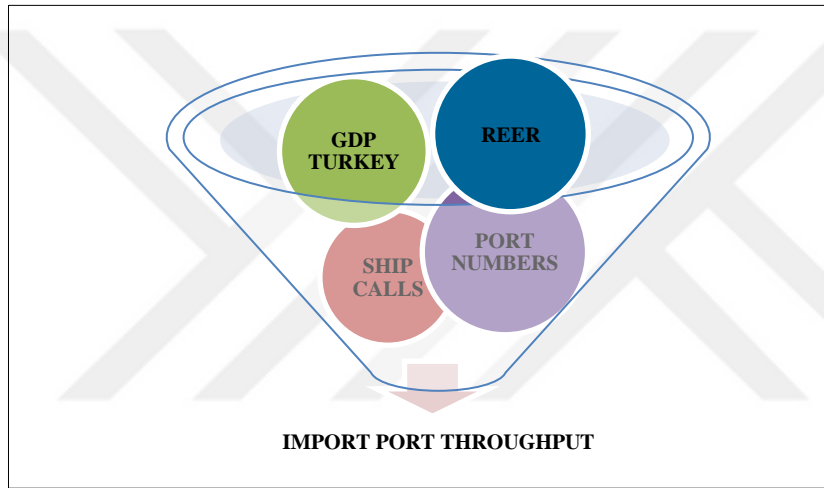
As sorted above, many studies are using physical inputs to describe the production function of ports. However, performance of ports cannot be evaluated by only port facility related variables, and developing a system includes both micro and macro parameters is best way to evaluate port efficiency (Bergantino et al., 2013: 46; Cui et al., 2015: 1401). That is why this study chose another path to describe it which is economical. Because the purpose of ports founded to meet certain needs of trade, to transport goods by transmarine ways, so it is a derivative demand of commercial and economic activities nationally and internationally (Belova & Mickiene, 2015; Cristina-Steliana, 2009; Wang, 2014; Wildenboer, 2015: 11). According to UNCTAD 2015 maritime transport report, seaborne trade volume grown at about 2.3% followed by the growth in world GDP at about %2.5. Because of the importance of economic activity inland and outland, the macroeconomic indicators are play a very significant role on analyzing port performance (Belova & Mickiene, 2015: 26; Chou et al., 2008; Cristina-Steliana, 2009: 87; Sun & Chen, 2008; Tongzon, 1995; Vanoutrive, 2010; Wildenboer,

2015: 11) as the sources of all commercial activities and directly port activities. So this study is looking from the wider frame to this point and use economic variables.

Four input variables for both import and export analysis have been chosen.

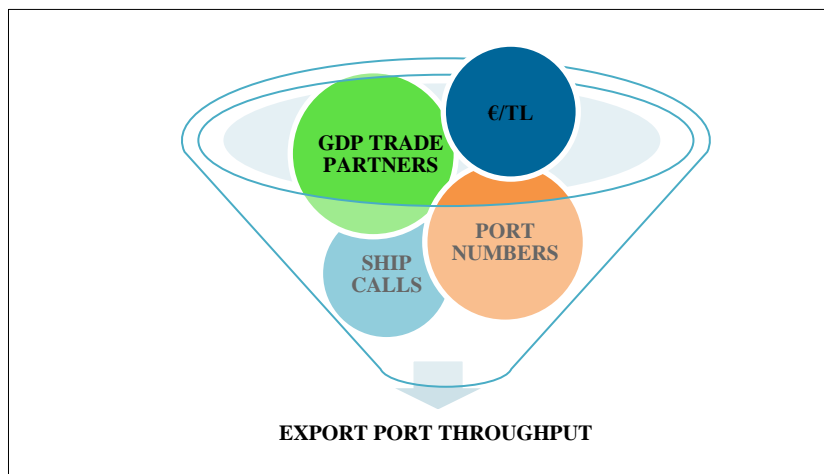
For import analysis (see Figure 12); (1) Real effective exchange rate (REER), (2) GDP Turkey, (3) Total tonnage of the ships handled in Turkish ports, (4) Number of ports. **For export analysis** (see Figure 13); (1) Euro/Turkish Lira, (2) GDP of Turkish export-trade partners, (3) Total tonnage of the ships handled in Turkish ports, (4) Number of ports.

Figure 12: Input and Output Function of Import Analysis



Source: Created by the Author

Figure 13: Input and Output Function of Export Analysis



Source: Created by the Author

In the first place, Industrial Production Index (IPI) is also one of the input variables as Aık et. al. (2019) found a unidirectional correlation between port throughput and industrial production index. However, it has been eliminated from both analyses because IPI and GDP are highly correlated economic terms which both represent the production of a country. So, using them both will lower the level of discrimination and make the results unreliable (Akyar, 2019: 84).

Also, according to the correlation results, variables meet the positivity and isotonicity rules of DEA except one variable, REER. Due to devaluation trend of TL since the first samples until last one results a so-called negative relationship between import throughputs; while import throughput is increasing it was decreasing due to other external factors affects the TL to devalue. In statistical correlation test might show negativity but it is theoretically incorrect argument, REER has been decreasing due to other economic reasons, but numerical coincidence shows a fake negative correlation, so that variable wasn't eliminated.

Researchers used both economical and physical variables in analysis. In literature, DEA port efficiency studies are mainly uses only physical variables. But as the purpose of the study, researchers want to observe efficiency from the economical window.

➤ **For import analysis;**

(1) *Real effective exchange rate (REER)*

TL evaluation is one of the strongest signs of wealth and well-being increase. When TL evaluates the price of imported goods are reduces relatively and increase the purchasing power of imported goods (Öztürk, 2012: 40). Import rates of countries are increasing with the rise in REER (Öztürk, 2012: 40). REER contains information about the relative price or cost development between countries and is therefore considered as one of the key macroeconomic indicators used to evaluate the competitiveness and prosperity of economies. The increase of REER means evaluation of TL which lead import requirement and import throughput to increase. That is why REER is chose as first input variables of import analysis.

€/TL or \$/TL couldn't be used in import analysis, because increasing inputs must increase the output level too not decreasing it. In case of using of one of those,

when the input is increasing, TL devaluated and import rate will be decrease rationally, so these inputs couldn't be used.

(2) GDP Turkey

GDP tells us how much a country produces in a certain time period (usually quarterly or yearly) in terms of prices. In order to collect different goods, common measure is set as price. GDP is the main macroeconomic indicator of a country's production and growth and port performance and economic growth seems to have a positive relationship (Belova & Mickiene, 2015: 25; Cristina-Steliana, 2009: 87; Sun & Chen, 2008: 3409; Tongzon, 1995; Wang, 2014: 33; Van Dorsser et al., 2012). Turkey production is highly dependent on imported goods. (Saygili et al., 2010: 76) found that in 2007 imported goods ratio in industrial production was 61.8%. These shows a direct relationship between GDP and import ratio (Gosasang et al., 2011: 474) which lead us to choose GDP as second input variables.

Quarterly REER and GDP (\$) data was collected from Central Bank of the Republic of Turkey electronic data system (<https://evds2.tcmb.gov.tr>)

Researchers firstly consider to applied GDP growth instead of GDP. However in some quarters negative growth value was observed. Due to positivity rule, GDP has been applied instead of GDP growth.

➤ For export analysis;

(1) Euro/Turkish Lira

This variable is chosen because the one of the most important export catalyzator is devaluation in national currency to increase the competitiveness in international markets. So the increasing in nominal exchange rate cause a positive impact on exported port throughput (Gosasang et al., 2011: 474; Kim, 2016: 243; Öztürk, 2012: 41). According to the TURKSTAT, 47% of Turkey export is made in Euro that is why Euro/TL currency has been chosen. The data was collected from Central Bank of the Republic of Turkey electronic data system (<https://evds2.tcmb.gov.tr>)

(2) GDP of Turkish export-trade partners

Export of goods and services are sourced by the demand of the opposite site of the sales agreement. In the literature it is also supported by the former researches, port

performance has a positive relationship between economic growth of countries they are interacted with (Belova & Mickiene, 2015; Gosasang et al., 2011: 474; Öztürk, 2012: 40; Tongzon, 1995; Vanoutrive, 2010: 4; Wang, 2014: 16), the GDP of the trade partners are very significant for the export of one country because demand from other trade partner are key reason to export. That is why we choose the second economical variable of export analysis, as GDP Trade Partners.

In this research, the total GDP value of EU, Russia, USA and China was selected. According to the TURKSTAT's data, cumulative amount since 2005 to 2019, these four are occupied %50 of our total export value. There are more numerical significant trade partners in US dollar, however the important thing to consider is exports transported by sea. According to the TURKSTAT's data, since 2005, 52% of our maritime export loadings are conducted for EU, Russia, USA and China.

The quarterly data was collected from European Statistical System (EUROSTAT) (<https://ec.europa.eu/eurostat>).

Researchers firstly consider to applied GDP growth instead of GDP. However in some quarters negative growth value was observed. Due to positivity rule, GDP has been applied instead of GDP growth.

➤ **The common physical variables for import and export analysis;**

(3) Total tonnage of the ships handled in Turkish ports, (4) Number of ports

Two physical variables has been chosen; ship calls in tonnage and Turkish port numbers. Naturally, these two variables has a direct impact on port throughput. If the number of ships (in tonnage) and port numbers are increasing there will be more goods to be handled and more facilities to prosper the handling activity. Among the direct results, number of ports and ship frequency is an attractive feature for importers and exporters which effect the volume even more (Tongzon, 1995: 251; Wang, 2014: 16).

The data of number of ports was collected from annual maritime sector reports published by Turkish Chamber of Shipping (<https://www.denizticaretodasi.org.tr/>). Ports are our doors opening to international trade, more ports mean more facility, more ships to visit more goods to be handled.

Number of ship is visited in Turkish ports data also available in the database, however it isn't chosen because in time with the technological developments, ships

got bigger, so real capacity is measures with tonnage not number. The monthly data “ship number handled in Turkish Ports” were collected from General Directorate of Maritime Affairs, Department of Maritime Trade Development work under the Ministry of Transport and Infrastructure of Turkey (<https://denizcilikistatistikleri.uab.gov.tr>). These monthly data were transformed into quarterly data later.

4.3.3. DEA Model and Analysis

Because of competition, ports are increasing their investments and enlarge their facility to provide more detailed and better service. However this drag investors to spend more than they can earn with waste of sources in their hands (Huang X. et al., 2020: 456). Also in reality focus should be on maximize the output rather than minimize the inputs (Cheon, 2008: 11). In this study output orientation is adopted to check the efficiencies of ports to increase output without changing inputs. Another reason is macroeconomic variables are out of control and we want to see the how Turkish Ports handle their efficiency issues under various economic conditions. Both output-oriented CCR and BCC models are applied in case if there is a scale effect on efficiency according to the scale assumption of Banker, Charnes and Cooper. In CCR analysis, outputs will change in same proportion as inputs changes, on the other hand in BCC it will be assumed that production function is sensitive to scale differences, increasing, constant or decreasing returns to scale might be observed and we can see economies of scale is valid for port sector (Cheon, 2008: 11).

The analysis will be made by the computer program called Data Envelopment Analysis Program – DEAP version 2.1. The results will be shown and discussed in the following chapter.

4.4. RESULTS AND DISCUSSIONS

In this section the empirical results of the analysis will be shown and interpreted considering the impacts of economic imbalances faced during the last fifteen years.

4.4.1. Imported Goods Port Throughput Efficiency Results; Output Oriented CCR and BCC Models

The import port throughput efficiency results of the selected years are shown in Table 7 and illustrated in Figure 14. The time period is divided into 4 which are, Pre 2008 Crisis, 2008 Crisis, Interim and Trade Wars Periods. The interpretation and discussion will be made considering these periods to make a macro analysis in sampling area.

Table 7: Imported Goods Port Throughput Efficiency Results

| Periods | DMUs | DEA Model Efficiency Scores for Imports | | | |
|---------------------------------------|---------|---|-------|-------|-----|
| | | CSR-O | VRS-O | SCALE | RTS |
| Pre 2008 Crisis Period | 2005-Q1 | 0.869 | 1 | 0.869 | irs |
| | 2005-Q2 | 0.831 | 0.947 | 0.878 | irs |
| | 2005-Q3 | 0.783 | 0.792 | 0.988 | irs |
| | 2005-Q4 | 0.804 | 0.833 | 0.965 | irs |
| | 2006-Q1 | 0.863 | 0.948 | 0.91 | irs |
| | 2006-Q2 | 0.847 | 1 | 0.847 | irs |
| | 2006-Q3 | 0.838 | 0.944 | 0.888 | irs |
| | 2006-Q4 | 0.901 | 0.969 | 0.93 | irs |
| | 2007-Q1 | 1 | 1 | 1 | - |
| | 2007-Q2 | 0.838 | 0.905 | 0.927 | irs |
| | 2007-Q3 | 0.728 | 0.785 | 0.927 | irs |
| | 2007-Q4 | 0.752 | 0.807 | 0.932 | irs |
| | 2008-Q1 | 0.787 | 0.823 | 0.957 | irs |
| | 2008-Q2 | 0.896 | 1 | 0.896 | irs |
| 2008 Crisis Period | 2008-Q3 | 0.833 | 0.938 | 0.888 | irs |
| | 2008-Q4 | 0.733 | 0.829 | 0.884 | irs |
| | 2009-Q1 | 0.794 | 0.966 | 0.822 | irs |
| | 2009-Q2 | 0.799 | 0.988 | 0.809 | irs |
| | 2009-Q3 | 0.801 | 0.998 | 0.803 | irs |
| | 2009-Q4 | 0.867 | 1 | 0.867 | irs |
| Interim Period | 2010-Q1 | 0.871 | 0.889 | 0.979 | drs |
| | 2010-Q2 | 0.867 | 0.874 | 0.992 | drs |
| | 2010-Q3 | 0.794 | 0.799 | 0.994 | drs |
| | 2010-Q4 | 0.816 | 0.822 | 0.992 | drs |
| | 2011-Q1 | 0.817 | 0.828 | 0.987 | drs |
| | 2011-Q2 | 0.745 | 0.749 | 0.996 | drs |
| | 2011-Q3 | 0.699 | 0.7 | 0.998 | drs |

| | | | | | |
|--------------------------|---------|-------|-------|-------|-----|
| | 2011-Q4 | 0.779 | 0.783 | 0.995 | drs |
| | 2012-Q1 | 0.845 | 0.854 | 0.99 | drs |
| | 2012-Q2 | 0.806 | 0.806 | 1 | - |
| | 2012-Q3 | 0.737 | 0.749 | 0.983 | irs |
| | 2012-Q4 | 0.797 | 0.798 | 0.999 | drs |
| | 2013-Q1 | 0.837 | 0.839 | 0.998 | drs |
| | 2013-Q2 | 0.79 | 0.834 | 0.948 | irs |
| | 2013-Q3 | 0.696 | 0.757 | 0.919 | irs |
| | 2013-Q4 | 0.731 | 0.761 | 0.961 | irs |
| | 2014-Q1 | 0.808 | 0.81 | 0.997 | drs |
| | 2014-Q2 | 0.768 | 0.817 | 0.94 | irs |
| | 2014-Q3 | 0.66 | 0.738 | 0.895 | irs |
| | 2014-Q4 | 0.736 | 0.791 | 0.931 | irs |
| | 2015-Q1 | 0.774 | 0.781 | 0.991 | drs |
| | 2015-Q2 | 0.766 | 0.766 | 0.999 | drs |
| | 2015-Q3 | 0.647 | 0.656 | 0.987 | irs |
| | 2015-Q4 | 0.722 | 0.724 | 0.996 | irs |
| | 2016-Q1 | 0.767 | 0.771 | 0.995 | drs |
| | 2016-Q2 | 0.755 | 0.756 | 0.999 | drs |
| | 2016-Q3 | 0.714 | 0.716 | 0.997 | drs |
| | 2016-Q4 | 0.735 | 0.737 | 0.997 | drs |
| | 2017-Q1 | 0.924 | 0.927 | 0.996 | drs |
| | 2017-Q2 | 0.841 | 0.841 | 1 | - |
| | 2017-Q3 | 0.791 | 0.791 | 1 | - |
| | 2017-Q4 | 0.887 | 0.887 | 1 | - |
| | 2018-Q1 | 0.77 | 0.77 | 1 | - |
| | 2018-Q2 | 0.77 | 0.77 | 1 | - |
| Trade Wars Period | 2018-Q3 | 0.939 | 1 | 0.939 | irs |
| | 2018-Q4 | 0.935 | 0.935 | 1 | - |
| | 2019-Q1 | 0.997 | 1 | 0.997 | irs |
| | 2019-Q2 | 1 | 1 | 1 | - |
| | 2019-Q3 | 0.969 | 0.969 | 1 | - |
| | 2019-Q4 | 0.992 | 0.992 | 1 | - |

Source: Created by Author

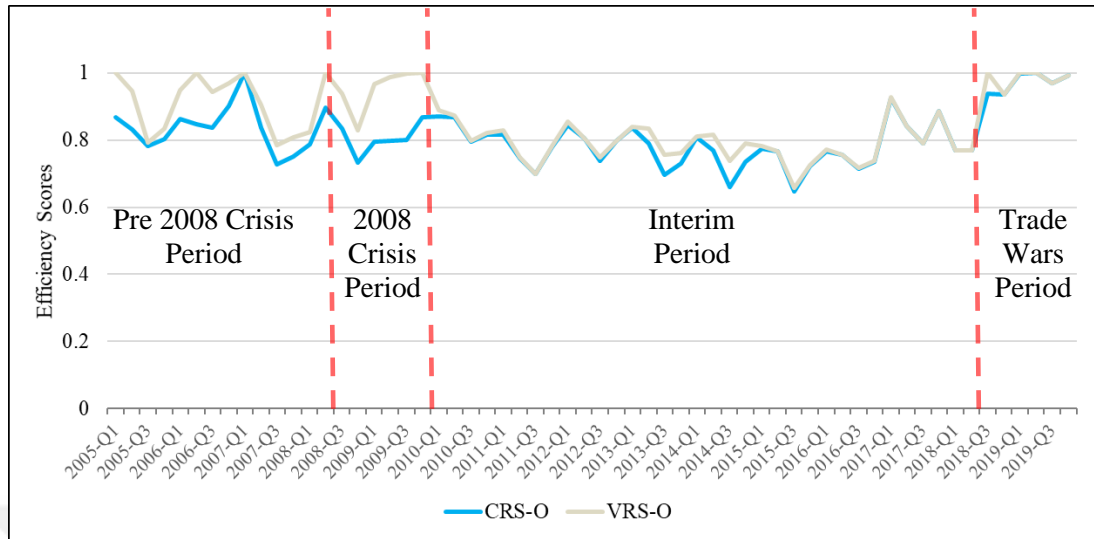
CRS-O = technical efficiency from CRS DEA

VRS-O = technical efficiency from VRS DEA

SCALE = scale efficiency = CRS-O/VRS-O

RTS = return to scale characteristic of DMUs

Figure 14: Imported Goods Port Throughput Efficiency Results



Source: Created by Author

Average scores of efficiencies of CRS and VRS models 0.814 and 0.854 respectively are derived, where a value of 1 reveals maximum efficiency. The results of both models shows high correlation except some periods. VRS scores are usually greater or equal to CRS scores, which is expected. Correlated results also indicate that scale efficiency is high (mean: 0.956) and there is not a significant scale problem which affect efficiency too much, and it shows technical problems like excessive input or lack of outputs.

In the Pre 2008 Crisis Period, the average scores of CRS and VRS are 0.838 and 0.911 respectively. The efficiency is relatively high than the following two periods. It is compatible with the positive macroeconomic conjuncture before the crisis.

In the 2008 Crisis Period, we observed a sharp decrease in the beginning of the crisis. The CRS score decreased to lowest 0.733 with a period average 0.804. During this period, although inputs and output were decreasing proportionally, the efficiency score decreased and remained low. We can see the crisis negative effects on efficiency, which is expected by the researchers. Low scale efficiency (SE) also shows us the inefficiency is caused by scaling problems, gradual increase in scale since 2005 stopped and started to decrease in the 2008 crisis period. This also explains the difference between CRS and VRS scores. While CRS results represent technical

efficiency (TE), VRS results represents pure technical efficiency (PTE), and that is why is higher than CRS results because it purifies itself from scale effects. During the crisis, negative economic conditions and sharply decreased global demand affected scale economies negatively. Diseconomies of scale decreased the production efficiency and increase the costs of Turkey's import partners and caused import to be decreased.

During Interim Period, the average scores of CRS and VRS are 0.778 and 0.791 respectively. When we looked at the input and output data growths of import analysis, the growth in tonnage of ships handled are higher than the growth in imported goods handled in ports. Data shows us the reaction of output to increase is low to an increase in input ratio. So it can be deducted a relative contraction in imported goods handled in Turkish ports which make the efficiency lower. This is also supported by the negative growth in REER during this period. If REER is low means that TL is losing its power against other currencies. With low TL, consumption of imported goods are expected to be lower (or lower growth rate) as it is in the results.

Meanwhile after the second quarter of 2013, FED started to give signals of interest rate increase. In those times, capital inflows to US started. Capital outflow leads less investment and production in local economy which affect the import ratios negatively because production is dependent on the imported goods. This outflow increased the need for foreign exchanges and makes TL lower against them. Not only this outflow of capital, but also foreign debt in foreign currency increased the need for foreign currency reserves too and make caused continues devaluation of TL during this period. Therefore, efficiency of ports' throughput of imported goods are expected to be low which is matching with the results.

Also decreasing return to scale is much heavier than increasing return to scale trend. Means, port's scales are large enough and lowering their efficiency might increase the efficiency which supported the inferences above and compatible with the recovering economic environment (low demand, and production) after crisis.

In the time of Trade Wars period, the results are technically unexpected. But when we deepened the reasons underlying the results, the results is found expected. The average scores of CRS and VRS are 0.972 and 0.983 respectively, when we consider the averages of the other periods, the results are the highest. Because the ratio

of imported goods handled in ports aren't decreasing even with lower GDP growth, lower tonnage handled of ships handled and much lower REER. When inputs are decreasing, the output is increasing at the same time which results a great efficiency.

In normal conditions, if national currency is depreciated, import is expected to decrease. This is expected result to ensure foreign trade balance. However, in the case of Turkey whose growth, export and consumption is highly dependent to imported goods, the results weren't matching with general theories.

Turkey is a country which is highly dependent to imported goods to grow. In the previous periods the energy weight in imports were higher but now the other imported goods significance become high too. Intermediate products, agricultural and industrial goods, commodities, machinery parts and many other imported goods become a dependence of Turkey's production and export. Turkey's export is also dependent on the imported goods too and increasing export value naturally cause import to increase at the same time too. Devaluation in national currency is expected to decrease the import ratio and increase the export, however in this case to increase export, import also needs to be increased too.

Accumulated macroeconomic and financial instabilities, and structural problems let Turkey into fragile positions. High tech product dependency of import, inefficient allocation of resources (reliability on unsustainable investments like construction sector), and lack of structural forms (like lack of a comprehensive industrial policy) are one of the examples of these problems. These instabilities make the empirical results incompatible with general economic and international trade theories.

4.4.2. Potential Improvements Results for Imported Goods Port Throughput Efficiency

DEA is also used to find the target values of outputs and inputs of inefficient DMUs to be efficient relatively to their benchmark DMUs. The target output values are shown in Table 8;

Table 8: Potential Improvements for Import Port Throughput Efficiency

| Periods | DMUs | Real Import Port Throughput (mln tones) | CRS Targets of Import Port Throughput (mln tones) | Target Growth (%) | VRS Targets of Import Port Throughput (mln tones) | Target Growth (%) |
|-------------------------------|----------------|---|---|-------------------|---|-------------------|
| Pre 2008 Crisis Period | 2005-Q1 | 12.37 | 14.23 | 15% | 12.37 | 0% |
| | 2005-Q2 | 14.24 | 17.13 | 20% | 15.04 | 6% |
| | 2005-Q3 | 14.18 | 18.12 | 28% | 17.91 | 26% |
| | 2005-Q4 | 13.83 | 17.20 | 24% | 16.61 | 20% |
| | 2006-Q1 | 13.24 | 15.35 | 16% | 13.96 | 5% |
| | 2006-Q2 | 15.61 | 18.43 | 18% | 15.61 | 0% |
| | 2006-Q3 | 16.77 | 20.01 | 19% | 17.77 | 6% |
| | 2006-Q4 | 17.65 | 19.59 | 11% | 18.21 | 3% |
| | 2007-Q1 | 18.61 | 18.61 | 0% | 18.61 | 0% |
| | 2007-Q2 | 17.78 | 21.21 | 19% | 19.66 | 11% |
| | 2007-Q3 | 15.98 | 21.96 | 37% | 20.35 | 27% |
| | 2007-Q4 | 16.30 | 21.69 | 33% | 20.21 | 24% |
| | 2008-Q1 | 16.09 | 20.44 | 27% | 19.56 | 22% |
| | 2008-Q2 | 21.29 | 23.77 | 12% | 21.29 | 0% |
| 2008 Crisis Period | 2008-Q3 | 19.97 | 23.97 | 20% | 21.29 | 7% |
| | 2008-Q4 | 15.90 | 21.69 | 36% | 19.19 | 21% |
| | 2009-Q1 | 15.25 | 19.20 | 26% | 15.79 | 4% |
| | 2009-Q2 | 18.47 | 23.12 | 25% | 18.70 | 1% |
| | 2009-Q3 | 19.73 | 24.63 | 25% | 19.77 | 0% |
| | 2009-Q4 | 20.32 | 23.45 | 15% | 20.32 | 0% |
| Interim Period | 2010-Q1 | 18.81 | 21.60 | 15% | 21.16 | 12% |
| | 2010-Q2 | 22.43 | 25.88 | 15% | 25.66 | 14% |
| | 2010-Q3 | 21.37 | 26.91 | 26% | 26.75 | 25% |
| | 2010-Q4 | 21.32 | 26.14 | 23% | 25.94 | 22% |
| | 2011-Q1 | 19.69 | 24.10 | 22% | 23.79 | 21% |
| | 2011-Q2 | 20.57 | 27.60 | 34% | 27.48 | 34% |
| | 2011-Q3 | 20.11 | 28.78 | 43% | 28.72 | 43% |
| | 2011-Q4 | 21.40 | 27.48 | 28% | 27.35 | 28% |
| | 2012-Q1 | 21.28 | 25.17 | 18% | 24.92 | 17% |
| | 2012-Q2 | 23.88 | 29.63 | 24% | 29.61 | 24% |
| | 2012-Q3 | 22.79 | 30.94 | 36% | 30.42 | 33% |
| | 2012-Q4 | 23.36 | 29.32 | 26% | 29.29 | 25% |
| | 2013-Q1 | 22.09 | 26.40 | 19% | 26.33 | 19% |

| | | | | | | |
|--------------------------|----------------|-------|-------|-----|-------|-----|
| | 2013-Q2 | 23.91 | 30.27 | 27% | 28.68 | 20% |
| | 2013-Q3 | 21.72 | 31.20 | 44% | 28.68 | 32% |
| | 2013-Q4 | 21.84 | 29.86 | 37% | 28.68 | 31% |
| | 2014-Q1 | 21.28 | 26.34 | 24% | 26.28 | 23% |
| | 2014-Q2 | 23.43 | 30.50 | 30% | 28.68 | 22% |
| | 2014-Q3 | 21.16 | 32.04 | 51% | 28.68 | 36% |
| | 2014-Q4 | 22.68 | 30.80 | 36% | 28.68 | 26% |
| | 2015-Q1 | 21.80 | 28.17 | 29% | 27.92 | 28% |
| | 2015-Q2 | 24.82 | 32.42 | 31% | 32.39 | 30% |
| | 2015-Q3 | 21.63 | 33.42 | 54% | 32.99 | 53% |
| | 2015-Q4 | 23.89 | 33.11 | 39% | 32.99 | 38% |
| | 2016-Q1 | 23.41 | 30.52 | 30% | 30.35 | 30% |
| | 2016-Q2 | 24.86 | 32.91 | 32% | 32.88 | 32% |
| | 2016-Q3 | 22.94 | 32.11 | 40% | 32.03 | 40% |
| | 2016-Q4 | 23.60 | 32.11 | 36% | 32.03 | 36% |
| | 2017-Q1 | 29.05 | 31.45 | 8% | 31.34 | 8% |
| | 2017-Q2 | 28.23 | 33.59 | 19% | 33.58 | 19% |
| | 2017-Q3 | 26.60 | 33.61 | 26% | 33.61 | 26% |
| | 2017-Q4 | 29.82 | 33.61 | 13% | 33.61 | 13% |
| | 2018-Q1 | 25.82 | 33.53 | 30% | 33.53 | 30% |
| | 2018-Q2 | 25.88 | 33.61 | 30% | 33.61 | 30% |
| Trade Wars Period | 2018-Q3 | 27.31 | 29.08 | 6% | 27.31 | 0% |
| | 2018-Q4 | 31.41 | 33.61 | 7% | 33.61 | 7% |
| | 2019-Q1 | 32.14 | 32.23 | 0% | 32.14 | 0% |
| | 2019-Q2 | 33.61 | 33.61 | 0% | 33.61 | 0% |
| | 2019-Q3 | 32.57 | 33.61 | 3% | 33.61 | 3% |
| | 2019-Q4 | 33.35 | 33.61 | 1% | 33.61 | 1% |

Source: Created by Author

In the Pre 2008 Crisis Period, the average growth need of imported port throughput to be efficient is 20% in CRS and 11% in VRS results. The difference is caused by scale effect and PTE need less improvements to be efficient.

In the 2008 Crisis Period, the average growth needs are 25% and 5% in CRS and VRS respectively. During the fiercest time of the crisis, the need for growth was increased to 36% in CRS and 21% in VRS which shows in the very deep point of the crisis efficiency drop cannot explained by only scale, but technical problems caused

by the crisis itself. The difference between the needs in TE and PTE results shows the effect of the crisis. Because already increased scale in years increase the expectation in throughput grow but in the time of crisis it won't work like it is expected. When we consider TE targets, this result means that if the output ratio was 25% (average) more than the original value, the years can be efficient. 25% is a very high expectation and shows the impact of the crisis with an increase 5% after previous period.

In the Interim Period, the average growth needs are 29% and 27% in CRS and VRS respectively. Means in a very long time until the trade war the average need in throughput growth was very high. In long run inference, the high needs show instability in shortage of port throughput.

In the Trade Wars Period, the average growth needs are 7% and 6% in CRS and VRS respectively. The results are the lowest among the other periods, like in the trade wars period the handled goods are enough to be efficient and theoretical expectation shows difference than reality. But the reasons discussed in the previous section explains the opposing results.

In the results of the analysis, the target values for inputs are also calculated. According to DEA to increase efficiency outputs should be increase or input should be decrease. However, decrease in GDP Turkey, REER and ship calls are not welcome economically, this research didn't examine the target shrinks for these inputs. On the other hand, relatively excessive port numbers might give an idea for potential investors while deciding the correct time to invest. In our results, the only significant shrink targets (-12%) were for the years between 2005 and the second quarter of 2006.

To sum up, the growth needs of outputs of each inefficient quarters to become efficient is increased consecutively in Pre 2008 Crisis, 2008 Crisis and Interim periods, 20%, 25% and 29% respectively. These results are compatible with researcher's expectations.

Due to the reasons explained in the section 4.4.1., there is an increase in efficiency during the Trade War period, therefore the average growth need of output values to become efficient is lower than the other periods.

4.4.3. Exported Goods Port Throughput Efficiency Results; Output Oriented CCR and BCC Models

The export port throughput efficiency results of the selected years are shown in Table 9 and illustrated in Figure 15. The time period is divided into four which are, Pre 2008 Crisis, 2008 Crisis, Interim and Trade Wars Periods. The interpretation and discussion will be made considering these periods to make a macro analysis in sampling area.

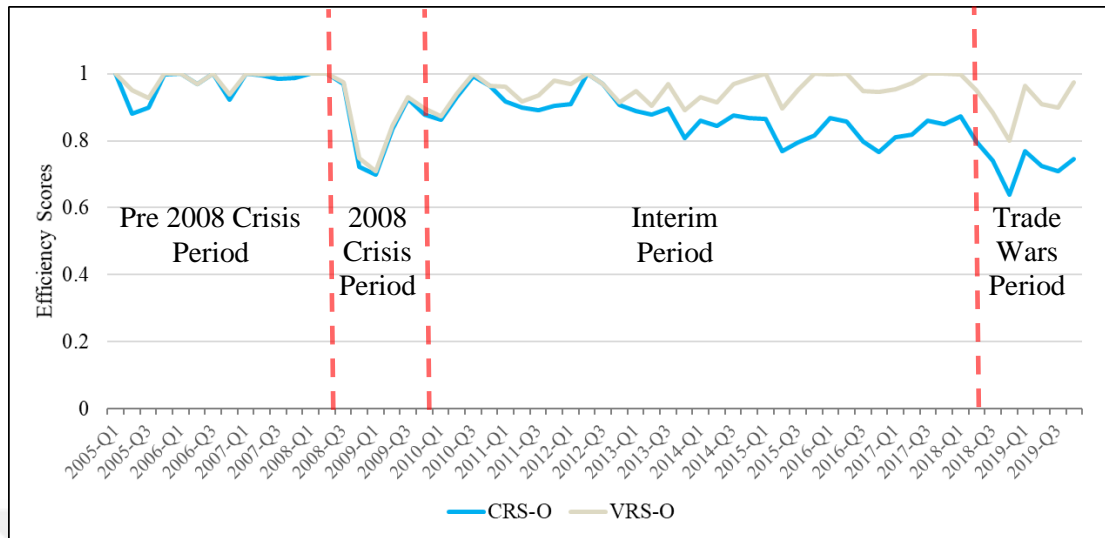
Table 9: Exported Goods Port Throughput Efficiency Results

| Periods | DMUs | DEA Model Efficiency Scores for Exports | | | |
|---------------------------------------|---------|---|-------|-------|-----|
| | | CSR-O | VRS-O | SCALE | RTS |
| Pre 2008 Crisis Period | 2005-Q1 | 1 | 1 | 1 | - |
| | 2005-Q2 | 0.881 | 0.95 | 0.927 | irs |
| | 2005-Q3 | 0.898 | 0.928 | 0.967 | irs |
| | 2005-Q4 | 0.997 | 1 | 0.997 | irs |
| | 2006-Q1 | 1 | 1 | 1 | - |
| | 2006-Q2 | 0.97 | 0.97 | 1 | - |
| | 2006-Q3 | 1 | 1 | 1 | - |
| | 2006-Q4 | 0.922 | 0.938 | 0.983 | drs |
| | 2007-Q1 | 1 | 1 | 1 | - |
| | 2007-Q2 | 0.994 | 0.998 | 0.996 | irs |
| | 2007-Q3 | 0.984 | 1 | 0.984 | irs |
| | 2007-Q4 | 0.988 | 1 | 0.988 | irs |
| | 2008-Q1 | 1 | 1 | 1 | - |
| | 2008-Q2 | 1 | 1 | 1 | - |
| 2008 Crisis Period | 2008-Q3 | 0.968 | 0.973 | 0.995 | irs |
| | 2008-Q4 | 0.722 | 0.747 | 0.967 | drs |
| | 2009-Q1 | 0.699 | 0.71 | 0.984 | drs |
| | 2009-Q2 | 0.835 | 0.843 | 0.99 | drs |
| | 2009-Q3 | 0.924 | 0.931 | 0.992 | drs |
| | 2009-Q4 | 0.877 | 0.895 | 0.979 | drs |
| Interim Period | 2010-Q1 | 0.863 | 0.874 | 0.987 | drs |
| | 2010-Q2 | 0.931 | 0.941 | 0.989 | irs |
| | 2010-Q3 | 0.993 | 1 | 0.993 | irs |
| | 2010-Q4 | 0.964 | 0.964 | 0.999 | irs |
| | 2011-Q1 | 0.918 | 0.961 | 0.955 | drs |
| | 2011-Q2 | 0.9 | 0.918 | 0.98 | drs |

| | | | | | |
|--------------------------|---------|-------|-------|-------|-----|
| | 2011-Q3 | 0.89 | 0.935 | 0.952 | drs |
| | 2011-Q4 | 0.905 | 0.98 | 0.924 | drs |
| | 2012-Q1 | 0.908 | 0.969 | 0.937 | drs |
| | 2012-Q2 | 1 | 1 | 1 | - |
| | 2012-Q3 | 0.968 | 0.968 | 1 | - |
| | 2012-Q4 | 0.906 | 0.915 | 0.99 | drs |
| | 2013-Q1 | 0.889 | 0.948 | 0.938 | drs |
| | 2013-Q2 | 0.879 | 0.905 | 0.971 | drs |
| | 2013-Q3 | 0.895 | 0.968 | 0.925 | drs |
| | 2013-Q4 | 0.809 | 0.891 | 0.908 | drs |
| | 2014-Q1 | 0.859 | 0.931 | 0.922 | drs |
| | 2014-Q2 | 0.844 | 0.915 | 0.923 | drs |
| | 2014-Q3 | 0.876 | 0.969 | 0.904 | - |
| | 2014-Q4 | 0.867 | 0.984 | 0.881 | drs |
| | 2015-Q1 | 0.864 | 1 | 0.864 | drs |
| | 2015-Q2 | 0.77 | 0.896 | 0.859 | drs |
| | 2015-Q3 | 0.794 | 0.951 | 0.835 | drs |
| | 2015-Q4 | 0.815 | 1 | 0.815 | drs |
| | 2016-Q1 | 0.868 | 0.998 | 0.87 | drs |
| | 2016-Q2 | 0.857 | 1 | 0.857 | drs |
| | 2016-Q3 | 0.798 | 0.947 | 0.843 | drs |
| | 2016-Q4 | 0.765 | 0.946 | 0.809 | drs |
| | 2017-Q1 | 0.81 | 0.953 | 0.851 | drs |
| | 2017-Q2 | 0.818 | 0.971 | 0.842 | drs |
| | 2017-Q3 | 0.859 | 1 | 0.859 | drs |
| | 2017-Q4 | 0.849 | 1 | 0.849 | drs |
| | 2018-Q1 | 0.872 | 0.998 | 0.874 | drs |
| | 2018-Q2 | 0.798 | 0.951 | 0.84 | drs |
| Trade Wars Period | 2018-Q3 | 0.739 | 0.883 | 0.837 | drs |
| | 2018-Q4 | 0.639 | 0.801 | 0.798 | drs |
| | 2019-Q1 | 0.768 | 0.965 | 0.796 | drs |
| | 2019-Q2 | 0.724 | 0.908 | 0.798 | drs |
| | 2019-Q3 | 0.708 | 0.899 | 0.788 | drs |
| | 2019-Q4 | 0.746 | 0.974 | 0.765 | drs |

Source: Created by the Author

Figure 15: Exported Goods Port Throughput Efficiency Results



Source: Created by the Author

Average scores of efficiencies of CRS and VRS models 0.876 and 0.948 respectively are derived, where a value of 1 reveals maximum efficiency. Export results of CRS and VRS analysis show a high similarity until the first quarter of 2013. After 2013, the efficiency results began to show differences. As expected, VRS scores are higher than the CRS scores. Correlated results are also indicated that scale efficiency is high (mean: 0.925) and there is not a significant scale problem which affect efficiency too much until 2013, after that scale efficiency began to decrease and gap between CRS and VRS results become wider because of scaling problems. But decreasing and increasing of efficiency scores results in each model reacts with a great parallelism in almost all quarters that shows technical problems were always in place and naturally affected both TE (CRS) and PTE (VRS) results at the same time predominantly. Otherwise, if the decreases only observed in CRS results means there is mostly a scaling problem than technical problem.

In the Pre 2008 Crisis Period, the efficiency scores of CRS and VRS were 0.974 and 0.984 respectively. This period is the most efficient one. It shows parallelism to the macroeconomic conjuncture back then when national growth, production and wealth began to increase after the recovering measures after 2001 crisis and increased global demand. This era is called as golden times of Turkish macroeconomic environment exactly the same motto embraced by maritime sector too. Also, other than

national economic condition, the economic growth of our trade partners was increasing too which cause their demand for import from us to rise.

In 2008 Crisis Period, the first thing salient is sharp decrease in efficiency after the 2008 crisis boomed. The average score of this period is 0.838 in CRS and 0.849 in VRS models with lowest score of 0.699 in the first quarter of 2009. The Crisis began in the US who is in the key position of global economy and trade. In a short time, it spilled all over the world and gain a new identity as Global Financial Crisis. Due to the severe effects of the crisis on global demand, international trade has crashed simultaneous. In our results, the reason of this sharp efficiency decrease is the heavy decrease in exported goods port throughput due to decreased demand in international trade. In the quarterly data shows us Euro/TL was slightly increased and the average GDP of trade partners until the end of the period showed a small increase (except first quarter of 2009). However, ship calls' tonnage during this period was contracted. This shows in the time of crisis countries were followed more protectionist policy and tented to local market other than foreign market. When we consider the reasons of the 2008 crisis in the Chapter 2, protectionist behaviour adopted put the international trade and simultaneously maritime sector in a very hard position than national economies.

When we looked at the return to scales, in the time of maritime sector affected by the crisis scaling to be efficient changed to decreasing return to scale means scale is large enough and scale decreasing could improve the efficiency. It is expected after the crisis when demand decreased, and current facilities become excessive.

In the Interim Period, the efficiency scores of CRS and VRS are 0.870 and 0.957 respectively. Especially after 2013 the TE scores continuously decreased. The growth rate of exported goods port throughput wasn't enough to increase efficiency comparing the growth rate of input variables. This means ports operated at low efficiency, although the increase in port numbers, ship calls tonnage, €/TL rate and GDP of trade partners. This can be explained by the inadequacy of Turkish export policies and behaviour. Turkey policy in competition in international trade is depended on the TL devaluation other than sustainable production and investments. In China, this devaluative policies to increase their comparative advantage in exports were followed for many years. However, for example China doesn't trust on the devaluation advantage for export only, focuses on the innovation, high-tech products and value-

added products in their production chain and used currency advantage as a catalyzer. However, in Turkey this case is completely opposite to China case. So, devaluative policy on shaky ground without a sound export and industrial policy, inefficiency in national production and innovations made the export port throughput decreased in favourable environment (inputs are increasing) and caused port efficiency to decrease.

The results show continues decrease after 2012 when EU struggled with sovereign debt crisis. EU is playing one of key part in Turkish export, and any crisis or economic fluctuation happened in EU affect Turkey simultaneously. Some of the countries haven't fully recovered yet like Italy, Greece, Portugal, Ireland and Spain...etc. the EU countries who have seaborne trade with Turkey. So, the one of the main reasons in decreasing of efficiency is this Eurozone debt crisis.

After the 2008 crisis has boomed, FED lowered the interest rate, pumped the liquidity into financial sector. The credits taking with low interest rates in Turkey, were used in unsustainable production and investments like construction sector. After the second quarter of 2013, FED started to give signals of interest rate increase and actually started to increase the interest rates in 2015. Increasing interest rates of FED made TL to devaluate against foreign exchanges and increase our vulnerability, exposure to foreign exchanges with already increased foreign debt. This unsustainable economic policy made TL to devaluate continuously and decreased solvency.

Increasing FED interest rates didn't affect our foreign exchange exposure only, in these times, the capital inflows to home country. Capital outflow leads less investment and production in national economy. This is also a case of an unsustainable policy depending on the hot money increase without an actual return of the investment in production, innovation sector.

Decreasing return to scale trend continued until the end of the sample years which means scale is too large to be efficient, because port throughput doesn't meet the favourable conditions to be increased, and by decreasing in scale, by being smaller can make the port efficiency to increase with this port throughput lower than the expectations.

In the Trade Wars Period, same as in the 2008 crisis a sharp decrease is came into prominence. The average score of this period is 0.720 in CRS and 0.905 in VRS models with lowest score of 0.639 in the second quarter of 2018. The effect of the any

economic crisis on the maritime sector is observed half year later after the beginning of the crises. This situation shows itself in 2008 crisis too.

The decreasing efficiency in the time of a global imbalances (trade war) meets the expectation of the researchers. The common purpose of the trade wars might increase national economy and wealth but in a highly globalized world each country supply and production chains have been already adapted to international trade exchanges and become a part of an interconnected form. So as a result of the trade wars, international trade naturally become the main target while protectionist policies are adopted and followed as a main action and so called measures to avoid the spill over effect of global unbalances. US protectionist behaviour and actions to drag China down, affected the global trade networks and penetrate a fear of protectionism to global markets and decreased the demand globally. Being the main two main players in global economy (with a great network) increase the spill over effect of this trade war. That is why, in spite of the jump in Euro/TL cross rate, increase in GDP of trade partners, export port throughput didn't meet the expectations of rise and caused efficiency to be decreased. In import analysis efficiency was increased contrary to export efficiencies. The reason between, export ratio is directly connected with the demand in trade partners. In an environment with price and stock market increase by tariff lower the purchasing power, also deterioration in world supply chain, and protectionist behaviour made countries act timidly as an actor of international trade. All these reasons make the global demand to fall and also Turkey export port throughput efficiency simultaneously.

The results show us, even with a sharp devaluation of TL due to two separate currency shocks that Turkey faced to in 2018; first occurred in May and the second occurred after Priest Brunson political problem, Turkey export port throughput in the following season didn't increase as expected by the economic theories. The reason is the same as mentioned in import section, due to the macroeconomic and financial instabilities, and structural problems make, export increase only depended on the TL devaluation is not expected, so the results are compatible with theoretical base of the Turkey case and this research.

4.4.4. Potential Improvements Results for Imported Goods Port Throughput Efficiency

DEA is also used to find the target values of outputs and inputs of inefficient DMUs to be efficient relatively to their benchmark DMUs. The target output values are shown in Table 10;

Table 10: Potential Improvements for Export Port Throughput Efficiency

| Periods | DMUs | Real Import Port Throughput (mln tones) | CRS Targets of Export Port Throughput (mln tones) | Target Growth (%) | VRS Targets of Export Port Throughput (mln tones) | Target Growth (%) |
|------------------------|---------|---|---|-------------------|---|-------------------|
| Pre 2008 Crisis Period | 2005-Q1 | 28.49 | 31.66 | 11% | 28.49 | 0% |
| | 2005-Q2 | 30.85 | 35.04 | 14% | 32.83 | 6% |
| | 2005-Q3 | 32.05 | 36.10 | 13% | 34.64 | 8% |
| | 2005-Q4 | 32.68 | 35.84 | 10% | 35.79 | 10% |
| | 2006-Q1 | 35.60 | 35.60 | 0% | 35.60 | 0% |
| | 2006-Q2 | 36.04 | 37.82 | 5% | 37.75 | 5% |
| | 2006-Q3 | 35.66 | 38.68 | 8% | 38.65 | 8% |
| | 2006-Q4 | 36.33 | 39.12 | 8% | 38.35 | 6% |
| | 2007-Q1 | 37.29 | 37.61 | 1% | 37.50 | 1% |
| | 2007-Q2 | 39.56 | 39.82 | 1% | 39.56 | 0% |
| | 2007-Q3 | 38.80 | 39.47 | 2% | 38.81 | 0% |
| | 2007-Q4 | 37.88 | 38.35 | 1% | 37.88 | 0% |
| | 2008-Q1 | 39.07 | 39.07 | 0% | 39.07 | 0% |
| | 2008-Q2 | 41.99 | 41.99 | 0% | 41.99 | 0% |
| 2008 Crisis Period | 2008-Q3 | 39.24 | 40.84 | 4% | 39.86 | 2% |
| | 2008-Q4 | 31.25 | 41.78 | 34% | 40.18 | 29% |
| | 2009-Q1 | 27.56 | 39.14 | 42% | 38.45 | 40% |
| | 2009-Q2 | 35.45 | 42.02 | 19% | 41.42 | 17% |
| | 2009-Q3 | 39.15 | 42.62 | 9% | 41.99 | 7% |
| | 2009-Q4 | 37.70 | 42.70 | 13% | 41.70 | 11% |
| Interim Period | 2010-Q1 | 35.59 | 41.29 | 16% | 40.72 | 14% |
| | 2010-Q2 | 40.74 | 43.76 | 7% | 43.72 | 7% |
| | 2010-Q3 | 43.45 | 43.76 | 1% | 43.72 | 1% |
| | 2010-Q4 | 42.82 | 44.43 | 4% | 44.40 | 4% |
| | 2011-Q1 | 40.49 | 45.00 | 11% | 44.38 | 10% |

| | | | | | | |
|--------------------------|----------------|-------|-------|-----|-------|-----|
| | 2011-Q2 | 43.08 | 47.77 | 11% | 47.22 | 10% |
| | 2011-Q3 | 43.93 | 48.73 | 11% | 48.31 | 10% |
| | 2011-Q4 | 46.04 | 49.76 | 8% | 49.48 | 7% |
| | 2012-Q1 | 44.81 | 47.21 | 5% | 46.64 | 4% |
| | 2012-Q2 | 51.84 | 51.84 | 0% | 51.84 | 0% |
| | 2012-Q3 | 48.65 | 50.27 | 3% | 50.26 | 3% |
| | 2012-Q4 | 47.17 | 51.55 | 9% | 51.53 | 9% |
| | 2013-Q1 | 44.53 | 48.37 | 9% | 48.30 | 8% |
| | 2013-Q2 | 46.89 | 51.52 | 10% | 50.83 | 8% |
| | 2013-Q3 | 50.17 | 52.31 | 4% | 51.50 | 3% |
| | 2013-Q4 | 46.19 | 52.67 | 14% | 52.12 | 13% |
| | 2014-Q1 | 43.77 | 48.62 | 11% | 48.53 | 11% |
| | 2014-Q2 | 47.43 | 52.34 | 10% | 51.72 | 9% |
| | 2014-Q3 | 50.21 | 53.41 | 6% | 52.44 | 4% |
| | 2014-Q4 | 53.36 | 53.36 | 0% | 53.36 | 0% |
| | 2015-Q1 | 51.40 | 51.70 | 1% | 51.40 | 0% |
| | 2015-Q2 | 49.15 | 55.55 | 13% | 54.98 | 12% |
| | 2015-Q3 | 51.59 | 56.42 | 9% | 55.99 | 9% |
| | 2015-Q4 | 56.18 | 56.50 | 1% | 56.18 | 0% |
| | 2016-Q1 | 54.33 | 55.11 | 1% | 54.72 | 1% |
| | 2016-Q2 | 53.45 | 57.08 | 7% | 56.46 | 6% |
| | 2016-Q3 | 53.42 | 56.83 | 6% | 56.44 | 6% |
| | 2016-Q4 | 53.94 | 57.29 | 6% | 57.02 | 6% |
| | 2017-Q1 | 54.22 | 57.43 | 6% | 56.91 | 5% |
| | 2017-Q2 | 57.28 | 59.59 | 4% | 59.37 | 4% |
| | 2017-Q3 | 60.29 | 60.29 | 0% | 60.29 | 0% |
| | 2017-Q4 | 61.86 | 61.86 | 0% | 61.86 | 0% |
| | 2018-Q1 | 58.74 | 59.08 | 1% | 58.88 | 0% |
| | 2018-Q2 | 57.31 | 61.49 | 7% | 61.49 | 7% |
| Trade Wars Period | 2018-Q3 | 53.88 | 61.11 | 13% | 61.02 | 13% |
| | 2018-Q4 | 48.61 | 60.82 | 25% | 60.69 | 25% |
| | 2019-Q1 | 52.98 | 58.59 | 11% | 58.21 | 10% |
| | 2019-Q2 | 54.60 | 60.32 | 10% | 60.14 | 10% |
| | 2019-Q3 | 54.17 | 60.44 | 12% | 60.28 | 11% |
| | 2019-Q4 | 59.65 | 61.29 | 3% | 61.22 | 3% |

Source: Created by the Author

The results of VRS analysis shows high similarities with the results of CRS analysis. Only small differences about 2% in the pre-crisis period and crisis period was

observed. However this difference found in significant. So the finding will be interpret together.

In Pre 2008 Crisis Period, the average growth need was 5%. When the crisis has took over the control of global trade, in other words in 2008 Crisis Period, the need for growth was increased to 20% with maximum 42% in the first quarter of 2009. This pointed out the export port throughput was less approximately 30% than target score. This target growth is also the highest one among all quarters underline the inadequacy of export port throughput in 2008 crisis.

In the Interim Period, the growth need for export throughput shows no significant change until the trade wars (average 6%). In some quarters, increased in need to grow was observed, in 2013 and 2015, 14% and 13% respectively.

However, in the Trade Wars Period, the growth need in export port throughput was increased to 25% in the last quarter of 2018, which is the highest need since 2008 crisis. The consecutive five quarters starting with third quarter of 2018 shows high need to be efficient in the time of trade wars with average 14%.

Same as in the import analysis, the target values for inputs are also calculated. According to DEA method to increase the efficiency among DMUs, it is aimed to decrease inputs or increase output or both. However, decrease our inputs are not welcome economically, so this research didn't examine the target shrinks for these inputs. Only in port number results, there is no significant excess generally. The most excessive input value is observed in the first quarter of 2010, with 7%. The following eight quarters until the first quarter of 2012, also shows some excess with average 4%.

To sum up, the growth needs of outputs of each inefficient quarters to become efficient is increased consecutively in Pre 2008 Crisis, 2008 Crisis, Interim, and Trade War periods, 5%, 20%, 6% and 12% respectively. In the time of crisis, the growth need is increased because efficiency is much lower relatively, in the other periods the growth need is in a favorable levels. These results are compatible with researcher's expectations.

CONCLUSION

Approximately 90% of these world merchandise goods are transported by maritime transportation which put maritime sector in a highly crucial position as a main enabler of international trade. Because shipping service is derived demand, its position and importance are directly reflected by the global economic activities or global trade, in other words, many variables are belonged macroeconomics and trade affect maritime sector directly in a very short time. In the past, maritime sector has always been affected by sudden and unexpected events. This study analysed effects of the economic imbalances on maritime sector occurred in last decades in Turkish economy.

Since the beginning of the international trade and maritime sector, developments, inventions, and requirements shaped maritime sector branches like the vein of a piece of leaf. However, in this great network, the role of ports is one of the most crucial one indisputably as the doors opening to international trade. If the maritime transport is consisted of vascular system of global trade, ports are the points of blood pressure.

Turkey is a sea country and although Turkey has unique natural maritime advantages, it fell behind of the global seaborne trade, especially when comparing with the other Mediterranean and Black Sea countries. However, insufficient attention and weak policies created and cumulated today's maritime sector problems. And these problems put the Turkish maritime sector even more vulnerable in the time of global imbalances. All these problems are challenges for the future and musts to be eliminated one by one to increase Turkey's share in international maritime system and to turn the capital flow back to the homeland. To reach this goal, the first station is Turkish ports and increasing their effectiveness and efficiency.

In this study port throughput efficiency of the Turkish ports was determined and results were evaluated to measure the impact of global imbalances on Turkish ports' throughput efficiency in the last 15 years when two important global imbalances -2008 Global Economic Crisis and US-China Trade Wars- occurred.

By revealing the results, this study aims to highlight the relatively efficient and inefficient times of the Turkish ports and their reasons to become a guideline and to

give signals for the members of the Turkish maritime sector and trade to adjust their policies nationally and internationally and operate more efficiently in the time of global imbalances.

In the literature there are many studies on port throughput efficiency that are using physical inputs to describe the production function of ports in order to compare sample ports and define a benchmark for other inefficient ports either in national studies or international studies. However, performance of ports cannot be evaluated by only port facility related variables, importance of economic activity inland and outland, the macroeconomic indicators are play a very significant role on analysing port performance. That is why, the distinguishing feature of this study is that it is looking from the wider frame to this point and use both physical and related some macroeconomic parameters to evaluate port throughput efficiency.

In the import port throughput efficiency analysis, the efficiency results were found mostly parallel to the global economic condition of each period examined, however in the case of Turkey, the sensitivity of the import port throughput is found more related with the national economic structure and conditions. Import power mostly reflect the national economic conditions, so it is expected to be affected from the national conditions.

- Pre 2008 crisis period were found relatively efficient, and this is compatible with the positive macroeconomic conjuncture before the 2008 Crisis.
- 2008 crisis were negatively affected the efficiency that shows our import port throughput were react to global imbalances simultaneously. With the crisis, economies of scale affected negatively made the costs of Turkey import partners increase that further reduce the Turkey import port throughput.
- In interim period, the efficiency was found lowest relatively to other periods. The negative growth in REER decreased the import port throughput and lower the efficiency. Also increasing FED interest rate increase our foreign debt solvency accumulated since 2008 crisis and lower the TL even more against increasing foreign exchange needs. Also, capital flow to US leads less investment and production in local economy that depended on the imported goods.

- Trade war period were found most efficient period among the other three. In Turkey case, despite the deterioration in economy, excessive devaluation of TL couldn't decrease the import rate as theoretically expected. With the underlying reasons beneath the Turkish economic and financial conditions and structural form, these results are not surprising. Because Turkey's growth, export and consumption are highly dependent to imported goods. Along with the energy ratio, the other imported goods' significance like intermediate products, agricultural and industrial goods, commodities, machinery parts become high too. This result reflects the instabilities in Turkish economic and financial conditions and structural problems which make the empirical results incompatible with general economic and international trade theories but attract the attention to major reasons and highlight the instabilities as a guideline.

In the export port throughput efficiency analysis, the efficiency results were found parallel to the economic condition of each period examined. The method, parameters used were found highly sensitive to the global economic and commercial imbalances, the reaction time of any imbalances on efficiency scores won't exceed two quarters consecutively.

- Pre 2008 crisis period were found most efficient period and reflect the golden times of the macroeconomic conjuncture in terms of maritime sector, Turkish foreign exchange stability and positive growth of our trade partners.

- 2008 crisis were negatively affected the efficiency suddenly shows our export port throughput were sensitive to global imbalances and react simultaneously. The reason of this sudden decrease was found the decreased demand for international trade, countries were followed protectionist behaviour and focused on national trade caused Turkish export port throughput efficiency to decrease.

- In interim period, the efficiency was low although relatively favourable conditions than in crisis times. There are three underlying reasons found during analyses. One of them is European Sovereign Debt crisis, which shows us how Turkish export port throughput is sensitive to European demand decrease. Second one is FED's decision to increase interest rate that caused Turkey more vulnerable and increase its

foreign exchange exposure. But the main and last reason is Turkish unreliable devaluation-oriented export policy without a sound industrial policy.

- Trade war period were found most inefficient period among the other 3 and again prove the sensitivity of export port throughput to global imbalances. In this period even with an excessive increase of €/TL, export port efficiency was decreased because of the decrease in demand to international trade. In this highly connected global economic and commercial form, wars won't play between only two countries, they spread through global supply and production chain.

The results indicate us a clear path for policy implication and suggestions. Port throughput is directly related with the national (predominantly affects import) and international (predominantly affects export) economic and commercial condition. To increase the port throughput efficiency, to provide safer environment for maritime sector, its members from every branch, current and possible maritime investors, policy implications are suggested for primary economic and financial instabilities and structural problems. Because ports are the doors to international trade and the key is the combination of economy, finance and trade. To conclude, below measures can be suggested to rise the port efficiency during economic imbalances in Turkish economy:

- Comprehensive, sound and sustainable export, import, industrial and foreign exchange policy should be established and put into practice.

- Devaluation-oriented export policy and comparative advantage in export should be supported with industrial, technological, and structural development and efficiency.

- Export partners risk assessments (ex, green deal between Turkey and EU) should be made, and risks allocation should be conducted to minimize the consequences of foreign imbalances. Like politically and commercially paving the way for potential new markets, developing new trade partners channels.

- Import dependence should be reduced by supporting industrial and financial incentives.

Limitations and suggestions for further researches; When Covid-19 emerged, another global imbalance, this study has been recently started and there wasn't enough data to examine. That is why the biggest epidemic disaster since decades couldn't be included in the analysis. The significance and impacts on global trade of the covid economic shock ...and economy of Covid-19 are experienced and well known by countries, cooperates, and individuals, so for further studies including covid-19 is believed to contribute the literature in a significant way.



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APPENDICES

APPENDIX 1: Import Analysis Input and Output Dataset

| Quarters | Import Port Throughput (Mln Tons) | Real Effective Exchange Rate (2003=100) | GDP Turkey (Bln Dollar) | Ship Calls Tonnage Handled (Mln Tons) | Port Numbers (Pcs) |
|-----------------|--|--|--|--|-----------------------------------|
| 2005-Q1 | 12.37 | 109.74 | 108.02 | 71.41 | 160 |
| 2005-Q2 | 14.24 | 112.69 | 120.23 | 88.37 | 160 |
| 2005-Q3 | 14.18 | 113.95 | 140.34 | 90.92 | 160 |
| 2005-Q4 | 13.83 | 119.46 | 138.90 | 86.32 | 160 |
| 2006-Q1 | 13.24 | 119.94 | 122.22 | 77.01 | 160 |
| 2006-Q2 | 15.61 | 99.16 | 134.27 | 95.53 | 160 |
| 2006-Q3 | 16.77 | 107.58 | 146.78 | 103.87 | 160 |
| 2006-Q4 | 17.65 | 109.85 | 151.60 | 100.72 | 160 |
| 2007-Q1 | 18.61 | 113.08 | 136.56 | 93.38 | 160 |
| 2007-Q2 | 17.78 | 119.55 | 161.15 | 112.82 | 160 |
| 2007-Q3 | 15.98 | 120.42 | 186.89 | 118.43 | 160 |
| 2007-Q4 | 16.30 | 127.72 | 204.18 | 116.42 | 160 |
| 2008-Q1 | 16.09 | 117.72 | 183.20 | 107.05 | 160 |
| 2008-Q2 | 21.29 | 118.83 | 199.63 | 132.04 | 160 |
| 2008-Q3 | 19.97 | 124.92 | 225.62 | 133.53 | 160 |
| 2008-Q4 | 15.90 | 111.15 | 170.36 | 116.47 | 160 |
| 2009-Q1 | 15.25 | 105.79 | 129.02 | 101.56 | 160 |
| 2009-Q2 | 18.47 | 110.78 | 154.75 | 127.15 | 160 |
| 2009-Q3 | 19.73 | 111.97 | 183.69 | 138.45 | 160 |
| 2009-Q4 | 20.32 | 113.67 | 187.05 | 129.58 | 160 |
| 2010-Q1 | 18.81 | 118.84 | 161.27 | 111.48 | 175 |
| 2010-Q2 | 22.43 | 121.60 | 183.37 | 143.49 | 175 |
| 2010-Q3 | 21.37 | 123.21 | 212.41 | 151.20 | 175 |
| 2010-Q4 | 21.32 | 120.22 | 222.23 | 145.42 | 175 |
| 2011-Q1 | 19.69 | 111.66 | 186.53 | 130.15 | 175 |
| 2011-Q2 | 20.57 | 109.01 | 217.17 | 156.36 | 175 |
| 2011-Q3 | 20.11 | 99.69 | 222.33 | 165.23 | 175 |
| 2011-Q4 | 21.40 | 103.34 | 212.38 | 155.44 | 175 |
| 2012-Q1 | 21.28 | 108.08 | 187.56 | 138.20 | 175 |
| 2012-Q2 | 23.88 | 109.92 | 213.91 | 171.55 | 175 |
| 2012-Q3 | 22.79 | 109.54 | 237.64 | 181.40 | 175 |
| 2012-Q4 | 23.36 | 110.99 | 241.88 | 169.24 | 175 |
| 2013-Q1 | 22.09 | 112.70 | 218.35 | 148.22 | 172 |
| 2013-Q2 | 23.91 | 107.95 | 241.76 | 177.22 | 172 |

| | | | | | |
|----------------|-------|--------|--------|--------|-----|
| 2013-Q3 | 21.72 | 102.73 | 251.16 | 184.20 | 172 |
| 2013-Q4 | 21.84 | 100.93 | 243.92 | 174.17 | 172 |
| 2014-Q1 | 21.28 | 97.28 | 204.53 | 147.83 | 172 |
| 2014-Q2 | 23.43 | 104.47 | 232.30 | 178.97 | 172 |
| 2014-Q3 | 21.16 | 103.47 | 255.25 | 190.51 | 172 |
| 2014-Q4 | 22.68 | 105.74 | 247.50 | 181.20 | 172 |
| 2015-Q1 | 21.80 | 104.63 | 203.44 | 159.50 | 179 |
| 2015-Q2 | 24.82 | 99.09 | 212.04 | 191.28 | 179 |
| 2015-Q3 | 21.63 | 91.84 | 223.42 | 200.30 | 179 |
| 2015-Q4 | 23.89 | 99.05 | 223.31 | 196.46 | 179 |
| 2016-Q1 | 23.41 | 102.51 | 193.18 | 176.79 | 180 |
| 2016-Q2 | 24.86 | 101.77 | 219.92 | 194.72 | 180 |
| 2016-Q3 | 22.94 | 101.45 | 226.51 | 188.69 | 180 |
| 2016-Q4 | 23.60 | 93.54 | 229.44 | 188.71 | 180 |
| 2017-Q1 | 29.05 | 90.83 | 177.36 | 183.79 | 180 |
| 2017-Q2 | 28.23 | 92.82 | 206.78 | 199.75 | 180 |
| 2017-Q3 | 26.60 | 91.62 | 239.29 | 210.31 | 180 |
| 2017-Q4 | 29.82 | 86.32 | 236.60 | 208.58 | 180 |
| 2018-Q1 | 25.82 | 85.04 | 209.07 | 199.36 | 180 |
| 2018-Q2 | 25.88 | 78.12 | 205.54 | 210.35 | 180 |
| 2018-Q3 | 27.31 | 62.51 | 185.76 | 204.36 | 180 |
| 2018-Q4 | 31.41 | 76.41 | 186.05 | 202.74 | 180 |
| 2019-Q1 | 32.14 | 75.28 | 172.64 | 190.28 | 180 |
| 2019-Q2 | 33.61 | 72.24 | 175.21 | 199.94 | 180 |
| 2019-Q3 | 32.57 | 76.89 | 204.24 | 200.66 | 180 |
| 2019-Q4 | 33.35 | 76.25 | 208.69 | 205.39 | 180 |

APPENDIX 2: Export Analysis Input and Output Dataset

| Quarters | Export Port Throughput (Mln Tons) | Euro/TL | GDP Trade Partners* (Bln Euro) | Ship Calls Tonnage Handled (Mln Tons) | Port Numbers (Pcs) |
|-----------------|--|----------------|---|--|-----------------------------------|
| 2005-Q1 | 28.49 | 1.73 | 5,153.15 | 71.41 | 160 |
| 2005-Q2 | 30.85 | 1.71 | 5,539.77 | 88.37 | 160 |
| 2005-Q3 | 32.05 | 1.63 | 5,745.73 | 90.92 | 160 |
| 2005-Q4 | 32.68 | 1.60 | 6,131.70 | 86.32 | 160 |
| 2006-Q1 | 35.60 | 1.59 | 5,853.59 | 77.01 | 160 |
| 2006-Q2 | 36.04 | 1.82 | 5,992.12 | 95.53 | 160 |
| 2006-Q3 | 35.66 | 1.90 | 6,003.24 | 103.87 | 160 |
| 2006-Q4 | 36.33 | 1.87 | 6,299.95 | 100.72 | 160 |
| 2007-Q1 | 37.29 | 1.84 | 5,995.54 | 93.38 | 160 |
| 2007-Q2 | 39.56 | 1.80 | 6,216.43 | 112.82 | 160 |
| 2007-Q3 | 38.80 | 1.76 | 6,245.37 | 118.43 | 160 |
| 2007-Q4 | 37.88 | 1.71 | 6,438.20 | 116.42 | 160 |
| 2008-Q1 | 39.07 | 1.79 | 6,026.69 | 107.05 | 160 |
| 2008-Q2 | 41.99 | 1.96 | 6,198.45 | 132.04 | 160 |
| 2008-Q3 | 39.24 | 1.82 | 6,353.80 | 133.53 | 160 |
| 2008-Q4 | 31.25 | 2.02 | 6,922.18 | 116.47 | 160 |
| 2009-Q1 | 27.56 | 2.15 | 6,274.22 | 101.56 | 160 |
| 2009-Q2 | 35.45 | 2.13 | 6,394.33 | 127.15 | 160 |
| 2009-Q3 | 39.15 | 2.13 | 6,329.61 | 138.45 | 160 |
| 2009-Q4 | 37.70 | 2.19 | 6,563.77 | 129.58 | 160 |
| 2010-Q1 | 35.59 | 2.08 | 6,397.62 | 111.48 | 175 |
| 2010-Q2 | 40.74 | 1.95 | 7,135.55 | 143.49 | 175 |
| 2010-Q3 | 43.45 | 1.95 | 7,205.64 | 151.20 | 175 |
| 2010-Q4 | 42.82 | 1.98 | 7,404.21 | 145.42 | 175 |
| 2011-Q1 | 40.49 | 2.15 | 6,966.24 | 130.15 | 175 |
| 2011-Q2 | 43.08 | 2.24 | 7,165.44 | 156.36 | 175 |
| 2011-Q3 | 43.93 | 2.44 | 7,367.76 | 165.23 | 175 |
| 2011-Q4 | 46.04 | 2.46 | 7,903.28 | 155.44 | 175 |
| 2012-Q1 | 44.81 | 2.34 | 7,580.20 | 138.20 | 175 |
| 2012-Q2 | 51.84 | 2.31 | 8,020.33 | 171.55 | 175 |
| 2012-Q3 | 48.65 | 2.24 | 8,275.58 | 181.40 | 175 |
| 2012-Q4 | 47.17 | 2.32 | 8,480.80 | 169.24 | 175 |
| 2013-Q1 | 44.53 | 2.35 | 7,815.91 | 148.22 | 172 |
| 2013-Q2 | 46.89 | 2.40 | 8,275.39 | 177.22 | 172 |
| 2013-Q3 | 50.17 | 2.60 | 8,389.92 | 184.20 | 172 |
| 2013-Q4 | 46.19 | 2.75 | 8,657.67 | 174.17 | 172 |

| | | | | | |
|----------------|-------|------|-----------|--------|-----|
| 2014-Q1 | 43.77 | 3.03 | 7,943.79 | 147.83 | 172 |
| 2014-Q2 | 47.43 | 2.89 | 8,337.84 | 178.97 | 172 |
| 2014-Q3 | 50.21 | 2.87 | 8,752.68 | 190.51 | 172 |
| 2014-Q4 | 53.36 | 2.82 | 9,415.95 | 181.20 | 172 |
| 2015-Q1 | 51.40 | 2.77 | 9,238.77 | 159.50 | 179 |
| 2015-Q2 | 49.15 | 2.94 | 9,967.16 | 191.28 | 179 |
| 2015-Q3 | 51.59 | 3.16 | 10,033.76 | 200.30 | 179 |
| 2015-Q4 | 56.18 | 3.18 | 10,522.67 | 196.46 | 179 |
| 2016-Q1 | 54.33 | 3.24 | 9,576.01 | 176.79 | 180 |
| 2016-Q2 | 53.45 | 3.27 | 10,017.03 | 194.72 | 180 |
| 2016-Q3 | 53.42 | 3.30 | 10,246.81 | 188.69 | 180 |
| 2016-Q4 | 53.94 | 3.53 | 10,970.88 | 188.71 | 180 |
| 2017-Q1 | 54.22 | 3.93 | 10,318.80 | 183.79 | 180 |
| 2017-Q2 | 57.28 | 3.93 | 10,689.62 | 199.75 | 180 |
| 2017-Q3 | 60.29 | 4.12 | 10,532.79 | 210.31 | 180 |
| 2017-Q4 | 61.86 | 4.47 | 11,119.67 | 208.58 | 180 |
| 2018-Q1 | 58.74 | 4.68 | 10,175.30 | 199.36 | 180 |
| 2018-Q2 | 57.31 | 5.20 | 10,981.90 | 210.35 | 180 |
| 2018-Q3 | 53.88 | 6.49 | 11,173.83 | 204.36 | 180 |
| 2018-Q4 | 48.61 | 6.30 | 11,845.69 | 202.74 | 180 |
| 2019-Q1 | 52.98 | 6.09 | 11,042.35 | 190.28 | 180 |
| 2019-Q2 | 54.60 | 6.59 | 11,754.93 | 199.94 | 180 |
| 2019-Q3 | 54.17 | 6.31 | 11,979.48 | 200.66 | 180 |
| 2019-Q4 | 59.65 | 6.40 | 12,608.25 | 205.39 | 180 |

*Cumulative GDP of EU Countries, Russia, USA and China.