

ANALYSIS OF THE GROWTH DYNAMICS IN TURKISH COMMERCIAL
SHIPBUILDING SECTOR AND ITS PROSPECTS

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ABSTRACT

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This thesis aims to analyze the growth dynamics of the Turkish commercial shipbuilding industry between 1992 and 2008. It tests the hypotheses whether each of the 14 variables identified in the literature are valid in explaining the growth of Turkish commercial shipbuilding industry between 1992 and 2008 and if there is a difference in the importance of these variables through utilizing secondary data as well as the results of the semi structured interviews made with 16 experts and managers representing all stakeholders in public institutions, NGOs, academicians and shipyards. It argues that clustering in Tuzla, growth of world GDP and trade and specialization in chemical tankers and container ships, and three-pillar outsourcing were the major reasons for the growth of Turkish commercial shipbuilding industry for the period between 1992 and 2008 and change in dollar exchange rate is a minor reason.

Keywords: Turkey, Shipbuilding, Growth, Analysis, Commercial

ÖZ

TÜRK GEMİ İNŞA SEKTÖRÜ BÜYÜME DİNAMİKLERİ VE GELECEĞE BAKIŞ

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Bu tez Türk ticari gemi inşa endüstrisinin 1992 ve 2008 yılları arasındaki büyüme dinamiklerini analiz etmeyi amaçlamaktadır. Tez kapsamında literatürde saptanan 14 değişkenin herbirinin Türk gemi inşa endüstrisinin 1992 ve 2008 yılları arasındaki büyümesini açıklamada geçerli olup olmadığını ve bu değişkenlerin öneminde bir fark olup olmadığını, ikincil veriler ile birlikte kamu kurumları, STK, akademisyenler ve tersanelerdeki tüm paydasları temsil eden 16 uzman ve müdürle yapılan yarı yapılandırılmış söyleşileri kullanarak test edilmiş ve Tuzla'daki kümelenme, dünya GSMH ve ticaretindeki büyüme, kimyasal tankerler ve konteynır gemilerindeki uzmanlaşma ve üç ayaklı taşıyon kullanımının 1992 ve 2008 yılları arasında Türk gemi inşa endüstrisinde görülen büyümenin temel nedenleri olduğu ve dolar döviz kurundaki değişim de ikincil bir neden olduğu sonucuna varılmıştır.

Anahtar Kelimeler: Türkiye, Gemi İnşa, Büyüme, Analiz, Ticari

-To Dedicated Turkish Shipbuilding Experts -

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CHAPTER 1

INTRODUCTION

Between 1994 and 2008 Turkish shipbuilding industry achieved an average annual growth rate of 22% in the number of ships produced and 35% in the volume of ships produced measured in dead weight tonnes (dwt) and was one of the largest growing manufacturing industries of Turkey during the period. The employment is increased from 4042 to 33480 representing an extraordinary increase of 823% in 16 years and contributed to the livelihoods of nearly 100.000 people in the beginning of 2008. However, a recent comprehensive study analyzing the dynamics of the growth of Turkish shipbuilding industry does not exist despite this fascinating growth performance. This thesis targets to fill to this gap by explaining the growth dynamics of Turkish shipbuilding industry. In other words, aim of this thesis is to explain the causes of the extraordinary growth rates of Turkish shipbuilding industry between 1992 and 2008 and identify which factors contributed to the achievement of such growth rates.

Shipbuilding industry encompasses quite a big range of different activities, and parts of it respond to the developments in the economy in different manners. In other words, shipbuilding industry encompasses different sub-sectors with distinct characteristics and dynamics. Therefore, any study on growth dynamics of a shipbuilding industry should investigate each distinct sub-sector separately. Although classification of several types of ships, like big cruise liners, big advanced fishing boats and advanced coastal guards, might be problematic, modern shipbuilding industry can be classified into three distinct groups with different characteristics: boat building and repair, naval shipbuilding and repair, and commercial shipbuilding and repair sectors and this classification can be taken as the basis of investigation for the scope of this thesis.

Boat building and repair was classified as a different industry referring to the construction of

boats and sailboats and currently characterized by small size production for leisure purposes and fishing. Boat building activity is dominated by artisan activities and manufacturing is restricted to hull production. Naval production and navy repair sector, referring to the construction and repairing of ships utilized for defense purposes excluding policing of coasts, were considered a distinct part from commercial shipbuilding and ship repair sector. In comparison to commercial sector, naval sector encompasses relatively sophisticated designs, activities, techniques and materials, such as important insulation requirements, erecting state of art weapons and highly monitored and regulated shipyard traits and construction activities. The third group, commercial shipbuilding and repair sector, refers to construction of ships for transportation purposes dominated by freight. These differences in the characteristics of these three sectors create different trends as well as different responses to the developments in world economy and eventually lead to different dynamics of growth.

Moreover, although sudden increases in freight demand might create growth for both new ship construction and ship repair sectors, new shipbuilding and repairing ships carry different characteristics and often shows different trends and respond to the developments in the world economy in a different manner. While shipbuilding is a long term process, which necessitates several activities realized in a sequential manner, ship repairing usually takes relatively less time and consists of discrete activities. New regulations on ship standards have opposite impacts to these two activities, while they increase demand for new ships, they decrease the demand for repairing. Labor is the most important factor of production for ship repair while its contribution to new ship construction is usually less than machinery in value terms. In brief, new shipbuilding sector has different characteristics in comparison to ship repairing sector and each of the three sub-sectors, commercial shipbuilding and repairing sector, naval shipbuilding and repairing sector as well as boat building and repairing sector has its own distinct characteristics leading to differences in size and the contribution of it to the economy and development of societies.

Among these six different sub shipbuilding sectors which needs to be investigated separately - three sectors, each of which divided into two - this thesis will focus only on commercial new shipbuilding sector since it is the far dominating sub-sector in Turkish shipbuilding industry in terms of its overall size, employment potential. According to TUIK, commercial shipbuilding sector constitutes 72,9% of all shipbuilding sector firms, utilizes 88,5% of labor hours and consumes 97,2% of the electricity consumed by whole sector on average, for the

years between 1992 and 2008. In other words, as one of the first comprehensive studies, the objective of this thesis is to analyze the growth dynamics of Turkish commercial shipbuilding industry for the years between 1992 and 2008. In the remaining part of this thesis, the expression "shipbuilding industry" will mean commercial shipbuilding industry and the expression "Turkish shipbuilding industry" will refer to Turkish commercial shipbuilding sector.

To comprehend the characteristics and growth dynamics of shipbuilding industry and to develop measures to improve the performance of individual shipbuilding industries, an extensive and quite diversified literature came into existence. A first group of sources studied shipbuilding industry as a whole. Focusing on different locations and time periods, growth of shipbuilding industry has been investigated as a case study for the hypothesis of cluster theory, its development has been analyzed through focusing on long term historical development patterns and life cycles of the industry in different countries, positive effects resulting from interactions with other sectors, both horizontally and vertically, were studied, the outcomes of different public policy frameworks on shipbuilding industry were discussed, restructuring of the industry following the loss of competitiveness of a specific shipbuilding industry were analyzed under the scope of industry level studies.

Second group of sources studied the shipbuilding industry by focusing on demand factors for ships. The impact of growth of GDP and trade of different regions or the world as a whole, through increasing demand for water transportation made by ships, the change in the pattern of world trade, through creating demand for different type and sized ships, changes in regulatory framework, through making some ships obsolete and decreasing available ships, changes in the preferences of shipping companies, through changing demand for different types of vessels and different shipyards and replacement demand, which is defined as the demand for new ships to replace old vessels, on the growth of shipbuilding industries are identified and studied in detail.

Third group of sources focused on the supply factors effecting the growth of shipbuilding industry. Availability of skilled workers, changes in regulatory framework, through creating costs to comply with new restrictions on shipyard properties and health and safety regulations, exchange rate, degree of vertical integration, through increasing the safety of supplies and ensuring market for the produced ships, marketing and management capabilities, existence of a distinct industry strategy, through enhancing competitive advantage of particular regions of

shipyards, and interaction with other sectors, through creating positive externalities, are studied as the supply factors effecting growth of shipbuilding industries. . In these studies, level of agglomeration, degree of specialization in particular niches, level of interaction with other industries, existence of an effective government support framework, growth of GDP and trade volume of the world, the change in the pattern of world trade, the age of national and/or international merchandise fleet, exchange rate, degree of vertical integration, wage rate, firm size, managerial capacity, availability of cheap finance and existence and effectiveness of export oriented shipbuilding sector policy are identified as 14 variables that explain the growth of shipbuilding industry for different locations in different time periods. Which of these factors are relevant in explaining the growth of Turkish commercial shipbuilding industry and how important these relevant factors are, are going to be two core questions under the scope of this thesis. The tested hypothesis of the thesis is whether each of these 14 variables are valid in explaining the growth of Turkish commercial shipbuilding industry between 1992 and 2008 and if there is a difference in the importance of these variables.

To be able to analyze the growth dynamics of Turkish commercial shipbuilding industry for the period between 1992 and 2008 and to identify the relevant variables as well as their importance, initially, literature will be analyzed in chapter 2. General characteristics of the literature of growth dynamics of shipbuilding industry will be identified and used as a background for the analysis of individual literature groups. Then, each literature group, which are specified previously under three groups: industry level studies, studies focused on demand side and studies focused on supply side, will be discussed individually. Following individual discussions, the scope and understanding of 14 variables mentioned in the previous paragraph will be determined and the outcomes of each source regarding the relation between these variables and the growth dynamics of shipbuilding industry will be evaluated to identify the variables on which there is a near consensus on the relation with the growth dynamics of shipbuilding industry.

Such variables with near consensus will be considered as the focus variables of this thesis and other variables without a near consensus considering the relation with the growth dynamics of shipbuilding industry will not be analyzed as focus variables due to two main reasons. First, absence of appropriate qualified data makes an objective statistical and/or econometric analysis suggesting objective relations impossible. In the absence of such data, the only way to incorporate different type of relations between the variables and the growth of shipbuilding

industry is introducing conditionality and claiming, for instance, that the variable is positively related with the growth of shipbuilding industry under a set of conditions and unrelated or negatively related under other set of conditions. However, secondly, identification of the conditions which create a particular direction of relation between the variable and the growth of shipbuilding industry is impractical at best and impossible at most considering the complexities and the huge number of factors that needs to be considered concerning shipbuilding industry.

Non focus variables will be one of the three types, the variables, which different studies suggested different direction of relation with growth of shipbuilding industry, the ones which were discussed in the literature only marginally and the ones assumed to be relevant only if some peculiar conditions on the existing structure of shipbuilding industry hold, will not be considered as focus variables. However, these non focus variables will be considered in the evaluation of primary data, and the variables where primary data suggest a strong relevance to the growth dynamics of the Turkish shipbuilding industry will be embedded to analysis and discussions made in the conclusion part.

Literature analysis made in chapter 2 will conclude that level of agglomeration, degree of specialization in particular niches, interactions with other sectors, growth of GDP and trade volume of the world, change in the pattern of trade, average age of national/international commercial fleet, exchange rate and degree of vertical integration are 8 focus variables that can be used to explain growth dynamics of Turkish commercial shipbuilding industry for the period between 1992 and 2008 and that all of them the value of Turkish Lira are positively related with the growth of shipbuilding industry. It will also suggest that government support frameworks and legislative changes, due to existence of quite a range of public policy interventions and difficulty in identifying a variable with near consensus on the relation with growth dynamics, wage rate, due to opposing arguments about if low wages is a positive factor for the growth, firm size, managerial capacity, availability of cheap finance and existence and effectiveness of export oriented shipbuilding sector policy, due to lack of support for their relevance, cannot be evaluated as focus variables.

Literature analysis in chapter 2 will be followed by data analysis in chapter 3 by utilizing both secondary data, obtained from Organization for Economic Cooperation and Development (OECD), the Union of Turkish Shipbuilders (GISBIR), Turkish Chamber of Shipping

(COS), World Trade Organization (WTO), International Monetary Fund(IMF), Turkish Statistics Institute (TUIK) and State Planning Organization of Turkish Republic (SPO) and primary data, obtained from semi-structured interviews made with 16 interviewees in 12 organizations (1 Academician, 3 Magazines Representatives, 2 Union Senior Managers, 2 Shipyard representatives, 5 Bureaucrats, 3 NGO experts) conducted by the author of the thesis.

In chapter 3 each focus variable will be studied individually. For each of them, initially, the units of measurement that can be used to test suggested relation with the growth of shipbuilding industry, specified in chapter 2, will be identified using relevant literature. If there is no common unit of measurement exist then a unit will be developed depending on the nature of available secondary data. Then secondary data will be utilized as the first source of information to test if the suggested relation between specified focus variables is also valid for Turkish shipbuilding industry. Later, the observations made during the semi structured interviews will be analyzed to evaluate if the evidence from secondary data is supported by primary data as well. Finally, the questions asked under the scope of the thesis, namely if the considered focus variable is relevant in explaining the growth of Turkish commercial shipbuilding industry and how important it is will be answered to close the discussion for the considered focus variable. it will be argued that clustering in Tuzla, growth of world GDP and trade and specialization in chemical tankers and container ships were the major reasons for the growth of Turkish shipbuilding industry during the last 2 decades and dollar exchange rate is a minor reason.

Discussion of each focus variable will be followed by evaluation of primary data, which is not covered by the discussions of focus variables It will be argued that the flexibility and cost decrease achieved by three pillar outsourcing, of labor provision to subcontractors, of purchasing to distributors and to customers, of administrative responsibilities to customers, is one of the other factors contributing to the growth of Turkish commercial shipbuilding industry. In addition, despite high growth rates and high profits there was no improvement in management efficiency and institutionalization and improvements in management and institutionalization were not a factor of the growth of Turkish shipbuilding industry.

As the concluding part of data analysis, the findings derived from the investigation of the focus variables as well as semi-structured interviews will be summarized and classified into three main groups. Stylized facts will refer to the findings, against which no counter evidence is available, high probable relations will refer to findings, against which only small or negli-

gible counter evidence is available and indecisive relations where there is no single consistent finding is provided. Since other findings derived from secondary data are not supported by primary data they will be classified as high probable relations. The last section of chapter 3 will conclude that clustering in Tuzla, growth of world GDP and trade and specialization in chemical tankers and container ships, and three-pillar outsourcing were the major reasons for the growth of Turkish commercial shipbuilding industry for the period between 1992 and 2008 and dollar exchange rate is a minor reason.

In the concluding part, chapter 4, the findings are going to be investigated in a detailed manner and the interpretations of the author will be provided initially. Then using the findings and interpretations the prospects for the future will be identified and finally further study options and suggestions are going to be indicated.

CHAPTER 2

LITERATURE IN RETROSPECT

Research on shipbuilding industry and particularly on growth dynamics present different characteristics in comparison to the other industrial investigations on manufacturing industries due to long time period required to build a ship and small number of ships produced in a single instant by individual shipyards or by any of the countries save the few top ones. Unlike, for instance, automotive industry, which is the closest sector to shipbuilding in nature, production of a single unit takes 1 to 2 years on average, and the number of manufactured ships being produced in at any point in time in a country is about 15. Therefore research on shipbuilding and growth dynamics in shipbuilding usually take a long term approach.

Another general observation on the literature is that number of researches directly dealing with the growth and growth dynamics are quite limited in general and research on Turkish shipbuilding industry hardly exists. Therefore an investigation on the growth dynamics of Turkish shipbuilding industry and its prospects needs to deal with several literatures horizontally and needs to derive lessons from quite a diversified range of studies. In addition inferences need to be a tool in forming the literature investigation.

Having identified the common points in the literature, distinct characteristics of the relevant literature can be studied. An investigation on the literature on the growth dynamics of the shipbuilding industry reveals that relevant literature can be classified in three major subsets. The first type is the industry-level researches which usually approach the shipbuilding industry or sub industries as a whole. These industry level researches which carry implications for the growth dynamics are usually concentrated on cluster theory and also cover historical investigations, interactions with other sectors, studies on different policy setups and structural analysis. The second major subset consists of the studies dealing with the effects on demand

variables, which affect the demand for ships and the third subset contains the researches focused on supply variables. In the sections below, these three major subsets will be dealt with in a detailed manner.

2.1 INDUSTRY-LEVEL STUDIES

Industry level researches having implications on the shipbuilding sector can be classified into five main groups. The first one examines the shipbuilding industry in the framework of cluster theory and focuses on interdependencies and agglomeration forces. The second group evaluates the shipbuilding industry in an historical perspective and deals with the rise and fall of leading shipbuilding nations and the major reasons of the change in the top positions in world shipbuilding industry. A third main group focuses on the interactions and dependencies between shipbuilding industry and other industries such as steel, petrochemical and automotive industries. A fourth large group deals with the policy framework for shipbuilding industry both at the national and international level and evaluate the implications on the policy and legal changes in the regional and global shipbuilding industry. Finally the fifth main group approaches the shipbuilding industry in a structural manner and focuses on the pillars of the industry structure and the effects of restructuring on shipbuilding industry.

2.1.1 Cluster Theory

Cluster theory is the first group of industry level investigated literature having implications on the growth of shipbuilding industry.

Van Klink and De Langen analyzed shipbuilding industry in the Northern Netherlands through identifying a stylized cluster life cycle by examining six properties (Character of the value chain, strategic relations, cluster dynamics, Co-operative domain, determinant for success and government's role in enhancing clustering) in four phases (development, expansion, maturation and transition). The paper concluded that the successful shipbuilding industry of Northern Netherlands is organized as a cluster and is in its maturation stage in the beginning of 2000s.[1]

Knarvik and Steen searched the existence of agglomeration forces in Norwegian maritime in-

dustry and examined three sub industries of shipbuilding: building of ships, building of boats and building of oil platforms in a detail. They have analyzed the sub-sectoral dependencies using structural econometric models and it is argued that there are no strong linkages between two downstream industries (the building of ships and building of boats) and the upstream ones (manufacture of engines and motors and manufacture of components and fixtures) and that there are significant economies of scale in the maritime milieu and especially in sub-industry level.[2]

Windem et al. investigated the maritime cluster in Finland located in Turku and the paper argued that "the cluster confirms that localized innovation networks can produce technological innovations and suppliers actively reduce the risks of lock-in by searching new market opportunities, in this case in the emerging Chinese shipbuilding industry and the oil industry in Russia and Central-Asian countries and thus, suppliers develop knowledge locally in regional innovation networks (mainly in co-operation with the central actor: the shipyard), and exploit this knowledge globally" and concluded that although generalizations for other shipbuilding regions are problematic, the Turku cluster can be an example for indicating the success of clustering in shipbuilding industry [3]

De Langen sought to answer two questions in cluster theory namely what the advantages of locating in a cluster are and what factors influence the development of maritime clusters and identified four agglomeration economies in Dutch maritime cluster (a joint labor pool, a broad supplier and customer base, knowledge spillovers, and low transaction costs.) It is concluded that the extendedness of firms in the maritime cluster adds to the performance of these firms.[4]

Bateman et al. investigated the transition of Croatian shipbuilding industry during the reform programmes in the 1990s using data obtained from Primorska-Goranska region of Croatia within the framework of Small Enterprise Cluster Formation Theory. They have researched the changes in three of the main shipyards in the region and concluded that it is quite difficult to create an efficient shipbuilding cluster which can compete in regional and international scale without large customers located nearby regions and managerial capacity and the active government supports are quite substantial for successful shipbuilding enterprises.[5]

Thornton and Thompson analyzed the data for World War II shipbuilding in American Shipyards by using parametric estimation for analyzing job learning and found that learning

spillovers across products and across shipyards were a significant source of the growth in productivity in war time shipbuilding programme and that the size of the learning externalities across shipyards were quite small.[6]

2.1.2 Historical Investigation

A second group for industry level researches is the historical investigation group dealing with the trends in the volume of the shipbuilding industries of particular countries or the world as a whole. The studies in this group try to find the causes of the rise and decline of the shipbuilding levels and to explain the evolution and the cyclical movement of shipbuilding industries.

One such study is made by OECD. After analyzing annual world shipbuilding production data for the years 1956 to 2002, it has concluded that new countries enter the market initially by using their low cost labor and use the shipbuilding industry as an efficient path to development. It gave the examples of Japan in the 1960s, Korea in 1970s and China as the more recent entrant. In addition, it has shown that the cycles in the shipbuilding industry correspond with the movements of world economy with a lag of approximately a year.[7]

Wickham and Hall explained that despite other regions' lost their shipbuilding capacities due to intense competition, Tasmanian shipyards become stars of shipbuilding industry by identifying light shipbuilding as a niche and specializing in this segment. [8]

In his study Todd historically monitored the corporate strategies applied by 15 British and Irish shipyards in dealing with issues of growth, diversification and rationalization for the years 1883 to 1966 and used the structural contingency model to investigate the responses of shipyards. It is concluded that in the shift periods, particularly in downstream phases of the shipbuilding industry cycle, mergers and acquisitions are substantial to the survival of the shipyards and the success of the merger and acquisition activities was the leading determining force in the British case. In addition he has identified specializing in a niche market as the second leading determinant by referring to the success of British naval shipyards.[9] In another study, he has stated that "Like all other shipbuilding organizations, those in the UK have been forced to come to terms with standardization in ship production." It also explained that the object of much post-war technological change discussion was investigation of the

relation between the initial adoption of an innovation in shipbuilding of UK and Japan ” and the paper concluded that construction of large ships using prefabricated techniques was much more important than the wage rate difference in favor of Japan.[10]

Motora studied the Japanese shipbuilding industry between 1868 and 1989 by separating the period into five main phases and elaborating on the defining characteristics of each group. It is argued that the existence of abundant funds provided by the US programmes as well as the Japan Development Bank was quite decisive in the great rise of the Japanese shipbuilding industry in the 1950s. He also stated that “the industry owes much of its success to the industry-wide cooperative efforts for catching up on the technology of advanced European countries and the United States (especially welding technology)”. He identified “Steel Vessels Manufacturing Methods Committee, in which the representatives of shipyards discuss their production methods openly as one of the unique characteristics of Japanese shipbuilding industry. [11]

In another paper by Pitelis it is argued that the experience of Japan and the newly industrialized countries economic success correlated with ”focus on consensus-based export-led manufacturing growth and a (dynamic) competitive advantage achieved through strategic industrial strategies“. [12]

2.1.3 Interactions with Other Sectors

A third group of literature related to the growth dynamics of shipbuilding industry focuses on the interactions between shipbuilding industry and several other industries. Koenig researched on the different trends and growth performances of several heavy industries in developed economies and tried to develop a framework which can explain the different trends in automotive, steel and shipbuilding industries. He developed a synthesized approach to describe heavy industries and elaborated on work breakdown structures. It is concluded that the technologies, processes and economic forces involved in ship design and production are in many ways a reduced scale, more ”tractable mirror” of those found in more economically vital heavy industries such as automobile and airplane manufacturing.[13]

Sohal and Ferme utilized their direct observations obtained from the visits made to five leading South Korean manufacturing organizations made in 1993 and 1994 to investigate the

industrial structure. They have stated that shipbuilding industry is highly related not only to industries like steel which provide an import part of shipbuilding input but also with automotive and electrical equipment because of the advantage derived from pooling research and development effort, which is especially observed in Hyundai Group.[14] Greenwood argued that shipbuilding and repair utilize a large range of trade skills (such as steel and aluminum fabrication and welding, pipe forming and fitting, mechanical fitting, electrical and electronics), all of which are also supportive of other industries.[15] Furthermore, OECD report on shipbuilding argued that the shipbuilding industry employs a large work force and its developments are connected to the activities in the iron and steel, electrical and mechanical industries.[7]

Jiaguo has investigated the relationship between shipbuilding and steel industries by mainly focusing on the relationship between the two industries in China. Through analyzing the share of steel in producing different types of ships he has proposed that "Steel industry and modern shipbuilding industry are born allies." and that "because of this, it is just natural that these two industries make researches of each other and become a critical factor of each other's development." [16] Similarly it has been indicated that increasing price of steel increases the cost of producing ships, to the extent that many yards, even with full order books, are finding it difficult to generate profits from orders based on contracts made before the steel prices rose. As well as the rising cost of steel, some shipyards have found it difficult to secure steady supplies. Therefore the relationship between the shipbuilding and steel industries might increase substantially following a closer integration in some economies between these heavy industry sectors.[17]

Greenwood cited Janvier and supported the idea that there is considerable synergy and supportive cross-utilization between the shipbuilding trades and technology sector and others such as construction, power generation/distribution, and information and communication technology (ICT).[15]

Sanderson focused on British naval shipbuilding industry to explain the relationship between shipbuilding and other industries by using "action research" methodology of Greenwood and Levin. It is argued that longer-term relationships and greater collaboration between shipyards and their suppliers are seen as critical aspects for improved performance however to be able to establish such a relation, studies of individual supply networks within the industry which is

rarely done in the studies on shipbuilding industries is necessary. In addition the paper stated that supplier relations is a resource sharing scheme in nature and there is no study proving the significant benefit resulting from collaboration.[18]

2.1.4 Policy Framework

Literature in policy framework is most probably the largest and the most scattered among the literature related with the growth dynamics of shipbuilding industry.

Wickam examined the policies of Tasmanian state government of Australia by analyzing data on the industry and used semi structured interview with all the key informants to identify the potential contributions of the Tasmanian state government to the light shipbuilding industry. He concluded that the success of the Tasmanian government in building the Tasmanian light Shipbuilding industry suggests that governments should attempt to encourage activities that fit a region's social and economic strengths even when, as in the Tasmanian case, these strengths are subtle. In addition he argued that it is necessary to alter type and the strength of government assistance as the industry develops and new industry members should be covered as well.[19] Beeson, also investigated light fast ferry industry by focusing on the circumstances that underpinned the shipbuilding industry's recovery, the role played by industrial policy, the future of the industry and the lessons derived from the experience for the shipbuilding industry in general. He concluded that the federal structure and the existence of an effective local government were quite important for the development of industry based on the fact that in central policy level favoring a region was much more difficult and the pressure from other regions would nullify the development in a region. In addition he stated that "Importantly, the redesigned eligibility criteria, with their emphasis on export rather than domestic markets, were central components in revitalizing and reorienting the entire industry." [20]

Pires investigated the maritime policy model adopted in Brazil since the late 1960s through the estimation of economic benefit transfer flow. The paper concluded that the Brazilian policy framework of direct operation of state-owned companies in maritime transportation services, cargo reservation for national flag carrying ships and strict control of private owners created no substantial positive effect on shipbuilders and this framework implies a massive net economic benefit transfer from the consumers of shipping services, mainly importers, to the maritime private investors, shipbuilding input suppliers and government.[21]

Glen reviewed the World Trade Organization rulings on the subsidies directed to the shipbuilding industry, evaluated the effect of such subsidy measures to the different stakeholders in the world and focused on the argument between the EU and South Korea's disputes in the 1990s. He proposed that the owners of yards are the only organized group among all stakeholders and in the international level the frameworks suggested are highly biased towards the yards mostly creating burden on consumers of ships all over the world.[22]

In a World Bank working paper, Hamilton investigated the effect of support in 1970s provided to Swedish shipbuilding industry and compared the support measures with the ones applied in Japanese shipbuilding industry. Working paper stated that Japanese policy makers were more successful in promoting it with limiting the production through the usage of quantity limitations for shipyards and the amount of total working hours and supporting takeover of inefficient shipyards by the successful ones while Swedish policy makers encouraged new entrants and takeover the failing firms themselves.[23] It also argued that elimination of excess domestic competition was an important part of Japan's strategy.[12]

King analyzed the implications of the policy framework started to be applied by the European Union starting from 1999 through an analysis of the OECD shipbuilding agreements and their provisions, policies applied by the EU during 1990s, actions and policies committed by other major shipbuilding countries and concluded that contract-related aid has done little to improve the competitiveness of European shipyards. He stated that European shipyards can be more successful in design premium niches including cruise ships, ro-ro vessels, high-speed ferries, chemical and gas tankers, dredgers, underwater operations and offshore industry vessels, production, storage and offloading vessels, and large yachts. He argued against the common vision that shipbuilding is a low technology industry and insisted that in some niches like cruise liners research and technology are substantial.[24]

Flynn argued that Chinese interventions in maritime industry were contrary to the general assumption that she has adopted a much more "hands-off" approach and this will encourage the shipbuilding industry to maintain a more rational economic structure and stated that this approach is much more suitable "as avenues for tapping international markets".[25]

2.1.5 Structural Analysis

Another group for industry-level researches on shipbuilding industry is the structural analysis group, which focuses on the structural aspects in performance of the shipbuilding industries and which analyzes the effect of restructuring of some shipbuilding industries around the world. One such study has been made by Johnson, Kotchen and Loveman on the restructuring of the Polish shipbuilding industry through the investigation of the effects of the organizational change in two similar Polish state enterprises for five years. The paper criticized the lack of managerial capabilities as an input for the research on shipbuilding industries. It has been stated that the assumption of the strategists on shipbuilding union that a shipyard needs to produce different type of vessels, the absence of the direct interaction between the fleet owners and the shipyards were the leading problems of Polish shipbuilding industry. They have concluded that the combination of radical restructuring of the debt overhang, shifting financing to buyer, specializing in small number of vessels, shifting production methods toward a less labor intensive one were the key components of the successful shipyards after the restructuring period.[26]

In a policy review paper edited by Mawson, Tuppen studied the restructuring of French shipbuilding industry and the creation of enterprise zones, the setup and the policies applied by the French government and the developments experienced by the industry. The review has stated that in theory merging unproductive firms is a desired policy for restructuring in shipbuilding industry, however the nature of the companies and their locations should be addressed properly and also that forcing three shipyards located in different areas and with different business cultures to merge was far from fruitful.[27]

Sanderson cites the work of Gordon and suggests that Gordon argues that prime contractors in the shipbuilding industry should develop a more collaborative approach to relationship management based on the notion of "supply chain leadership". This concept, which has much in common with the idea of a "supply network convener", is focused on the role that a prime contractor might play in facilitating a pooling of knowledge resources to drive innovation.[18]

Considering structural changes in Shipbuilding industry, OECD report on shipbuilding industry in 2005 stated that in Australia, structural adjustment was facilitated by making use of technological change and finding a niche market for the shipbuilding industry.[7]

2.2 STUDIES FOCUSING ON THE DEMAND SIDE

Studies focused on the demand side identify and analyze single or multiple variables in creating demand for the output of shipbuilding industry. The review of the demand side related literature reveals that the world GDP growth rate and more directly the growth of world trade volume, the changes in the pattern of the world trade, changes in the international and national regulatory framework in environmental and security aspects of ships, changes in the preferences of the shipping sector and replacement demand are considered as the major demand variables for world shipbuilding industry.

2.2.1 Growth of World GDP and World Trade

The first of the demand variables effecting world shipbuilding is the growth of the world GDP and the world trade volume. A report prepared by the Japanese Ministry of Land, Infrastructure and Transport in 2006 explained that an important part of the current demand is premised on the expectation of non-decreased trade and a consequent high demand for shipping. [17] J-MoLIT report also explained the relation between the shipbuilding demand and the growth of world GDP and trade as follows: "A significant proportion of current shipbuilding demand is premised on the expectation of sustained or growing trade, and a consequent high demand for shipping. Therefore, any weakening of either the demand for raw commodities, or the demand for finished products, will initially have a direct impact on demand for shipping services, and subsequently on the demand for new vessels." [17] In addition the sectoral monitoring report of the Korean Equity Research stated that "amid the slowing economy, the global shipbuilding sector, Korean companies no exception, also entered the down cycle. However, starting in 2003 emerging nations, like China, registering a double digit economic growth are providing a momentum to boosting shipbuilding orders." [28]

2.2.2 The pattern of world trade

The second demand variable is the shift in the pattern of world trade, e.g. the appearance of new demand and supply centers and the fall of existing ones, the change in the intensity of goods traded and etc. Japanese Ministry of Land, Infrastructure and Transport report indicates that "LPG/LNG vessels have enjoyed a very strong growth due to the growing preference shift

for gas energy over oil.“ and also that ”in addition, any diversification of commodity sourcing (such as the recent Chinese decision to source more of its oil from Latin America rather than the Middle East) may also impact on the demand for shipping services.“[17] Song and Lee argued that the increase in the demand for LNG throughout the world caused a new star market to appear in shipbuilding industry and that they expect offshore plant orders to surge in the longer term and they will be a ”springboard“ for the industry.[29] A report by Community of European Shipyards Associations states that new trade routes opened recently such as East Africa to China and South America to China affect the demand for new vessels especially for container vessels positively.[30] International Association of Independent Tanker Owners reports that product tanker demand has been strong over the last few years and may also continue to be strong, in particular after 2008/2010 as new, large refineries in the Middle East and India may mean that ore products will be moved over longer distances at the expense of crude oil.[31]

2.2.3 Changes in Regulatory Framework

One substantial variable highly referred in shipbuilding demand literature is the changes in regulatory framework. A report by Lloyd’s Register of International Association of Classification Societies stated that ”New legally binding IMO instrument; Convention on recycling will provide regulations for: preparation of ships, design, construction, operation and preparation of ships and will create demand on modernization of existing fleet or construction of new vessels”[32] and Gandre stated that IMO prescribed a phase out timetable setting 2010 as the principal cut-off date for all single hull tankers. This created a strong replacement demand for ships in 2006. The directorate general of shipping fixed the age limit at 25 years for all cargo vessels other than gas carriers, oil or product tankers and dredgers. For gas carriers, the limit is 30 years. This acts as demand driver for yards around the globe. [33]

2.2.4 Change in the preferences of the Shipping Companies

Another demand driving force is the changes in the preferences of the shipping companies came into existence as a response to the changing preferences of the customers such as the rising expectations on the speed and reliability of the shipping services. The Report prepared by International Association of Independent Tanker Owners stated that ”the strong tanker

market over the prolonged period was not only caused by a robust world economy and high oil demand. Since 1999, it has met with many incidents and dramas affecting tanker supply and demand. Virtually every year there have been special events affecting the market balance, starting with the Erika accident at the end of 1999, which created a differentiated market where new ships obtained a premium over old ones.”[31]

2.2.5 Replacement Demand

The last major factor for demand for the shipbuilding in the literature is replacement demand meaning the demand originating from the replacement of old age old technology using ships by the new ones. A report by Korean Shipbuilders Association stated that for particular niches replacement demand will be one of the main factors that soften the effect of current world economic slowdown. It states that ”the phase out of old tonnage could be one of the forces to soften the crash of freight market”[34] and OECD report on Japanese Shipbuilding industry states that ”in recent years issues such as protection of the global environment and improvement of transportation efficiency have been of significant interest in the world shipping community. It is necessary for the shipbuilding industry to respond to those concerns. Such efforts will lead to creation of new demand.”[35]

2.3 STUDIES FOCUSING ON THE SUPPLY SIDE

Studies on the supply side of the shipbuilding industry focus mostly on the firm-level and by using a comparative approach try to identify the supply side factors and the importance of these factors on shipbuilding industry. The most important factors discussed in the relevant literature are availability of skilled workers, changes in regulatory frameworks, exchange rate, degree of vertical integration, marketing management capability and existence of a distinct industry strategy.

2.3.1 Availability of Skilled Workers

One of the leading supply side factors referred in the literature is the availability of skilled workers. A report by J-Molit argued that one of the competitive edges of Japanese shipbuild-

ing industry is in its excellent human resources. In actual manufacturing process, where it is difficult to fully automate production lines, highly experienced skilled workers capable of sophisticated judgment and discretions are invaluable assets.[35]

2.3.2 Changes in Regulatory Framework

J-MoLIT report argued that changes in coating standards, will have a significant effect on shipbuilders' business and necessitate additional space for coating work, and qualified workers and will result in higher building time and therefore higher costs [36]. The Chinese report on the changes in international safety and environmental standards proposed that the adjustments to "Goal-Based Standard (GBS)" of IMO, which aims at further strengthening the safety management at sea, releasing of the common rules of IACS aiming at building "more solid" tankers and bulk carriers ships, IMO Supplementary Article VI of MARPOL Protocol to prevent the air pollution arising from ships' exhausts have brought forth a great impact on the shipbuilding industry.[37]. Similarly it is stated that banning use of hazardous substances, such as asbestos, in the construction of ships, management and certification of the use of potentially hazardous substances through the life cycle of ships, from designing, construction, operation to dismantling, proper pre-recycling preparation and certification, mandating compliance with minimum standards and certification for recycling facilities will have significant impact on ship design and material procurement[36].

2.3.3 Changes in Exchange Rate

The third supply side variable affecting shipbuilding industry is the exchange rate. Lu and Tang stated that being an international business, the majority of shipbuilding contracts are based on US dollars. They gave the volatile exchange rate between the dollar and Japanese Yen and gave the example of China, which exported ships in dollars and imported Japanese inputs by Yen and stated that the volatility of international monetary market could also bring about great losses to the industry, for instance in 1986 Chinese shipbuilding industries lost about US\$ 12.5 million owing to the depreciation of US dollar.[38] As the yen rises against the dollar, Asian economies gain competitiveness against Japanese products in domestic and overseas markets. This stimulates their exports, output, and investment. This effect is stronger in the more industrialized NIEs whose exports of automobiles, steel, chemicals, shipbuilding,

etc. compete directly with those of Japan. Kwan noted that exports of Korea's heavy chemical industries are boosted significantly when the Yen appreciates, and vice versa.[39]

2.3.4 The Degree of Vertical Integration

Another variable is the degree of vertical integration. Chou and Chang stated that direct material costs is one of the key factors in increasing competitiveness for contract quotes in the world shipbuilding market, and the direct material cost competitive advantage is related with vertical integration degree of upstream material suppliers for the shipbuilders. The Japanese and Korean conglomerates are divided into shipbuilding, heavy machinery, and electronics division, and can manufacture marine equipment by themselves. Therefore their material costs are lower than that of Taiwan by about 10-15%. [40] Similarly, Steed concluded that on the supply side two factors were significant to explain the fall of British shipbuilding: the doubling of the price steel plates from 1950 to 1960 and the difficulty in obtaining steel of the right quality and quantity at the time desired.[41]

2.3.5 Marketing Management Capability

The fifth supply side variable is the marketing management capability. Chang and Chou stated that as for promotion, Japan and South Korea have established field offices or send their marketers overseas extensively to gather information at the source. At present, Taiwan acquires orders mainly through brokers, however establishing a system to investigate the relationship between the broker and the customer is lacking and this creates a competitive disadvantage for the Taiwanese shipyards. [40]

2.3.6 Existence of a Distinct Industry Strategy

The sixth important supply side variable observed in the literature is existence of a distinct strategy. Chou and Chang quoted Porter and emphasized the existence of strategic difference among the largest shipbuilding nations. Japanese shipbuilders adopt a "Differentiation Strategy" to recommend various high-priced vessels. South Korean shipbuilders adopt a "low cost strategy" to build various vessels such as oil tankers, at a lower cost and avoid direct confrontation with Japan. The promising shipbuilders in China adopt a "low cost and focus

strategy' to supply only standardized vessels. To avoid severe competition, Taiwan's shipbuilders should have a strategy emphasizing their strong points: high quality, on time delivery and low price.[40]

2.3.7 Interaction with Other Industries

The final important supply variable is level of interaction with other industries. The number of studies on interaction between shipbuilding industry and other sectors is high and the scope of the studies is quite large. Koenig identified linkages between automotive, steel and shipbuilding industries and concluded that the technologies, processes and economic forces involved in ship design and production are in many ways a reduced scale, more tractable mirror of those found in more economically vital heavy industries such as automobile and airplane manufacturing.[13] Another study by Sohal and Ferme stated that shipbuilding industry is highly related not only to industries like steel which provide an import part of shipbuilding input but also with automotive and electrical equipment because of the advantage derived from pooling research and development effort.[14] Greenwood argued that shipbuilding and repair utilize a large range of trade skills (such as steel and aluminum fabrication and welding, pipe forming and fitting, mechanical fitting, electrical and electronics), all of which are also supportive of other industries.[15] Furthermore, the OECD Report on shipbuilding and Jiaguo argued that the shipbuilding industry employs a large work force and its developments are connected to the activities in the iron and steel, electrical and mechanical industries.[7],[16] and .[17] Greenwood listed construction, power generation/distribution, environmental, and information and communication technology (ICT) as the examples of the related sectors with shipbuilding.[15]

2.4 ANALYSIS OF THE LITERATURE AND THE IDENTIFICATION OF THE FOCUS VARIABLES

Having made a detailed description of the relevant literature on the growth dynamics of shipbuilding industry, in this section an analytical investigation of the conclusions reached by these studies will be made to identify the focus variables. Potential variables mentioned in the previous chapter will be discussed separately and literature's suggestions of the relation

with these variables will be investigated. Whenever required, additional literature on the potential variables will be discussed. Those variables on which there is a near consensus on the relation with the growth of shipbuilding industry will be considered as focus variables. Those variables, which different studies suggested different direction of relation with growth of shipbuilding industry, the ones which were discussed in the literature only marginally and the ones assumed to be relevant only if some peculiar conditions on the existing structure of shipbuilding industry hold, will not be considered as focus variables. However, these non focus variables will be considered in the evaluation of primary data, and the variables where primary data suggest a strong relevance to the growth dynamics of the Turkish shipbuilding industry will be embedded to analysis and discussions made in the conclusion part.

2.4.1 Level of Agglomeration

The first potential variable is level of agglomeration. 7 articles support the positive relation between the level of agglomeration and the growth of shipbuilding industry and no article indicates any non-positive relation.

Van Klink and De Langen's and De Langen's investigations of the Northern Netherlands Maritime Cluster [1], [4], Knarvik and Steen's analysis of Norwegian Shipbuilding industry [2], Thornton and Thompson's study of World War II shipbuilding in American shipyards [6] and finally Vittanen and Karvonen's report on Finnish maritime cluster and Windem et al.'s analysis of the Turku shipbuilding in Finland [42], [3] all support the argument.

Therefore it is reasonable to assume that the level of agglomeration can be used as a focus variable for Turkish shipbuilding industry and the appearance and deepening of a cluster can be a positive factor for growth of Turkish Shipbuilding Industry.

2.4.2 Degree of Specialization in Particular Niches

The second potential variable is degree of specialization in particular niches. 4 articles argue for the advantage of the niche market strategy approach especially for non-leading firms and countries. Moreover no non-advantageous relation is suggested.

Wickham and Hall explained that despite other regions' lost their shipbuilding capacities due

to the intense competition, Tasmanian shipyards became stars of shipbuilding industry by identifying light shipbuilding as a niche and specializing in this segment. [8] Todd argued that in the survival of the British shipbuilding industry identifying naval production as a niche was an important aspect. [9]. Similarly King suggested the European Union to specialize in niche markets not to lose more ground in the world shipbuilding industry and an OECD report in 2005 identified finding niches as the one of the prerequisites in the period of restructuring in the shipbuilding industry. [7]. Chou and Chang quoted Porter and emphasized the existence of strategic difference among the largest shipbuilding nations and gave the examples of Japan, South Korea and China to indicate the merits of specialization strategies of the companies.[40]

Based on this consensus on the positive effect of niche strategies, degree of specialization in particular niches is going to be taken as a focus variable in the thesis and it will be expected that applying niche strategies create positive effects for the Turkish shipbuilding industry.

2.4.3 Interaction with Other Industries

Third potential focus variable is level of interaction with other industries. 6 articles suggest a positive relation with the level of interaction with other industries and the growth of shipbuilding industry and no article defends the opposite.

Koenig concluded that technologies, processes and economic forces involved in ship design and production are in many ways a reduced scale, more tractable mirror of those found in more economically vital heavy industries such as automobile and airplane manufacturing.[13] Another study by Sohal and Ferme stated that shipbuilding industry is highly related not only to industries like steel which provides an import part of shipbuilding input but also with automotive and electrical equipment because of the advantage derived from pooling research and development effort.[14] Greenwood argued that shipbuilding and repair utilize a large range of trade skills (such as steel and aluminum fabrication and welding, pipe forming and fitting, mechanical fitting, electrical and electronics), all of which are also supportive of other industries.[15] Furthermore, OECD Report on shipbuilding and Jiaguo argued that the shipbuilding industry employs a large work force and its developments are connected to the activities in the iron and steel, electrical and mechanical industries.[7],[16] and .[17] Greenwood listed construction, power generation/distribution, and information and communication technology (ICT) as the examples of the related sectors with the shipbuilding.[15]

Considering this extended literature and the indicated mutual relations between shipbuilding sector and other particular sectors, interaction with the other industries will be used as a focus variable.

2.4.4 Government Support Framework

The fourth potential focus variable is the availability of government support by a specific support framework. Wickam defended a government support framework varying between the development stages of the industry and encouraging the new entrants [19] whereas Hamilton appreciated the Japanese policy of controlling the output of the industry through merging shipyards.[12] While Bateman et al. attached special importance to the leading role of the central government[5], Beeson emphasized the existence of federal structure and local government as one of the most important aspects of the shipbuilding industry by arguing that a central government will have difficulty in allocating resources to a single region because of the political pressure from other regions. [20]. These 4 articles indicate different arguments on the government support framework depending on different existing governance structure. In other words, the relevance of government support framework to the growth of shipbuilding industry is contextual.

Therefore, considering the literature, assuming a direction of the relation between government intervention in general or several policies in particular with the growth shipbuilding industry is not possible and government support will not be analyzed as a focus variable.

2.4.5 Growth of World GDP and World Trade

The Fourth potential focus variable is the growth of world GDP and world trade. 3 statements in 2 resources indicate a positive relation between world GDP and world trade.

J-MoLIT explained that an important part of the current demand is premised on the expectation of non-decreased world trade and a consequent high demand for shipping. [17] The Korean Equity Research has stated that "Amid the slowing economy, the global shipbuilding sector, Korean companies no exception, also entered the down cycle. However, starting in 2003 emerging nations, like China, registering a double digit economic growth are providing a momentum to boosting shipbuilding orders." [28]. In addition, J-MoLIT report also explained

the relation between the shipbuilding demand and the growth of world GDP and trade as follows: "A significant proportion of current shipbuilding demand is premised on the expectation of sustained or growing trade, and a consequent high demand for shipping. Therefore, any weakening of either the demand on commodities, or the demand for finished products, will initially have a direct impact on demand for shipping services, and subsequently on the demand for new vessels." [17]

Thus world GDP growth and/or the growth of world trade will be considered as one of the focus variables in the later chapters. It is expected that the growth of both world GDP and trade volume are positively related with the growth rate of the Turkish shipbuilding industry.

2.4.6 The Change in the Pattern of World Trade

The fifth potential focus variable is the change in the pattern of world trade, namely changes in the location and weight of demand and supply centers. 4 resources outline the importance of the pattern of trade in effecting the growth of shipbuilding industries.

J-MoLIT indicated that "in addition, any diversification of commodity sourcing (such as the recent Chinese decision to source more of its oil from Latin America rather than the Middle East) may also impact on the demand for shipping services." [17] Song and Lee has argued that the increase in the demand for LNG throughout the world caused a new star market to appear in shipbuilding industry and that they expect offshore plant orders to surge in the longer term and they will be a "springboard" for the industry.[29] A report by Community of European Shipyards Associations states that new trade routes opened recently such as East Africa to China and South America to China effect the demand for new vessels especially for container vessels positively.[30] International Association of Independent Tanker Owners reports that product tanker demand has been strong over the last few years and may also continue to be strong, in particular after 2008/2010 as new, large refineries in the Middle East and India may mean that ore products will be moved over longer distances at the expense of crude oil.[31]

Therefore the pattern of world trade will be investigated as one of the focus variables and it will be assumed that a shift in the pattern increases the demand for new ships and thus the growth of shipbuilding industry.

2.4.7 The average age of the national and International fleet and the numbers of old vessels

The fifth potential focus variable is the average age of fleets both nationally and environmentally. 2 relevant articles indicate a positive relation between the average age of fleets and growth of shipbuilding through creating replacement demand.

The report by Korean Shipbuilders Association stated that for particular niches replacement demand will be one of the main factors that softens the effect of current world economic slowdown and that “the phase out of old tonnage could be one of the forces to soften the crash of freight market”[34] and OECD report on Japanese Shipbuilding industry states that “in recent years issues such as protection of the global environment and improvement of transportation efficiency have been of significant interest in the world shipping community. It is necessary for the shipbuilding industry to respond to those concerns. Such efforts will lead to creation of new demand.”[35]

Thus the average age of the national and international fleet and/or the number of old vessels are going to be one of the focus variables of the thesis and it is assumed that as the age of existing vessels increases the demand for new vessels increase.

2.4.8 Change in Exchange Rate

The sixth potential focus variable is change in exchange rate. 2 sources indicate that movements in the exchange rate affects shipbuilding activity.

Lu and Tang stated that being an international business, the majority of shipbuilding contracts are based on US dollars and that the volatility of international monetary market could also bring about great losses to the industry[38] Kwan argues that as the rise in yen against the dollar, stimulates the exports, output, and investment of several other countries. This effect is stronger in the more industrialized NIEs whose exports of automobiles, steel, chemicals, shipbuilding compete directly with Japan’s. [39]

For this reason movements in the exchange rate is considered as one of the focus variables and it is expected that the appreciation of Turkish Lira will a negative impact on the growth of the sector.

2.4.9 The Degree of Vertical Integration

The seventh potential focus variable is degree of vertical integration. Sources relevant to the degree of vertical integration suggest conflicting results. Whereas Chou and Chang[40] and Steed [41] argues for a positive relation Mawson [27] claims that vertical mergers do not imply a positive impact without addressing location and other characteristics of the shipyards and suppliers.

Therefore there is no near consensus on the direction of the relation between the degree of vertical integration and the growth of the shipbuilding without conditionality attached to the existing structure of shipbuilding industry. Thus degree of vertical integration will not be considered as a focus variable.

2.4.10 Wage Rate

The eight potential variable is wage rate. While OECD Report[7] indicates low wages as one of the most important reasons for growth of east Asian countries Todd argues that construction of large ships using prefabricated techniques was more important than the wage rate difference in favor of Japan.[10]. The study of Motora [11] and another study by Todd [9] also concludes that wage rate was not an important reason for the growth of Japanese and British shipyards.

Therefore there is a dispute in the literature on the relevance of wage advantages and wage rate will not be considered as a focus variable.

2.4.11 Other Potential Focus Variables

In the literature review, firm size, managerial capacity, availability of cheap finance and export oriented policies are discussed as other relevant variables. However since the discussion on them in the framework of shipbuilding growth studies are marginal they are not considered as focus variables.

2.4.12 Summary

In this section initially the literature is described under three sub groups. The first group contains industry level studies, and second and third group contains studies on demand side and on supply side. Then these studies are analyzed and 14 potential focus variables are identified. Later, through comparing and contrasting 7 focus variables and the direction of the relation with the growth of the Turkish shipbuilding industry are identified. The results are summarized in table 2.1 below:

Table 2.1: Focus Variables and Indicative Direction with Growth of Turkish Shipbuilding Industry

Variable	Result	Reason	Indicative Direction
Level of Agglomeration	Focus	N.A.	Positive
Degree of Specialization in Particular Niches	Focus	N.A.	Positive
Interaction With Other Industries	Focus	N.A.	Positive
Government Support Framework	Not Focus	Conditional on Existing Structure	N.A.
Growth of World GDP and Trade	Focus	N.A.	Positive
The Change in the Pattern of Trade	Focus	N.A.	Positive
Average Age of Fleet	Focus	N.A.	Positive
Change in Exchange Rate	Focus	N.A.	Negative
The Degree of Vertical Integration	Not Focus	Conditional on Existing Structure	Positive
Wage Rate	Not Focus	Inconclusive Direction	N.A.
Firm Size	Not Focus	Marginal	N.A.
Improvement in Managerial Capacity	Not Focus	Marginal	N.A.
Availability of Cheap Finance	Not Focus	Marginal	N.A.
Export Oriented Policy	Not Focus	Marginal	N.A.

Table 2.1 indicates that there is a near consensus of the relevance of level of agglomeration, degree of specialization in particular niches, interaction with other industries, growth of world GDP and trade, changes in the pattern of world trade, average age of fleet, changes in exchange rate to the growth of shipbuilding industry and all of them except change in exchange rates are positively related with the growth of shipbuilding industry. In addition, it shows that government support framework and degree of vertical integration (since their relevance is conditional on existing structures), wage rate (since there is a dispute in the direction

of its relation with the growth of shipbuilding industry), firm size, improvement in managerial capacity, availability of cheap finance and existence of export oriented policy (since they are marginal in the studies related with the growth of the shipbuilding industry) are not going to be analyzed as focus variables.

CHAPTER 3

METHODOLOGY AND ANALYSIS OF DATA

3.1 Methodology

Since available data is quite restricted to make a comprehensive analysis of the growth dynamics of Turkish shipbuilding industry primary data collection is going to be one of the two parts of the data analysis. In this section initially, available secondary data on the focus variables, which are identified in the previous section will be analyzed. For each focus variable available units of measurement in the literature will be discussed and depending on the strength of the unit of measurement and the availability of data to obtain it, one or two of them will be calculated. Then, data generated which is obtained from the semi-structured interviews will be utilized. Semi structured interview was the chosen method because it allows interviewees , first, to discuss the relevance of each variable in a context they consider appropriate and second general questions asked might indicate the variables previously not considered by the literature or the author. In the end of this section a matrix showing the focus variable measurement units against the last two decades will be constructed.

3.2 Focus Variables

3.2.1 Level of Agglomeration

The first of the focus variables chosen to investigate the growth of the Turkish shipbuilding industry is the level of agglomeration. As indicated in chapter 2, several studies on shipbuilding industry support the idea that a deepening in the cluster results in an increase in competitiveness.

In order to investigate if the progress of the cluster is one of the reasons for growth in Turkish shipbuilding industry in the last decade, first it is necessary to explain what a cluster is. Porter defined cluster as "geographic concentrations of interconnected companies and institutions in a particular field" and explained that they "encompass an array of linked industries and other entities important to competition. They include, for example, suppliers of specialized inputs such as components, machinery, and services, and providers of specialized infrastructure." [43]. In their article Martin and Sunley summarized the definitions of cluster in the literature and cited the following definitions [44].

Table 3.1: Different Cluster Descriptions in the Literature

Researcher(s)	Definition
Crouch and Farrell	The more general concept of 'cluster' suggests something looser a tendency for firms in similar types of business to locate close together
Rosenfeld	A cluster is very simply used to represent concentrations of firms that are able to produce synergy because of their geographical proximity and interdependence
Swann and Prevezer	Clusters are here defined as groups of firms within one industry based in one geographical area.
Swann and Prevezer	A cluster means a large group of firms in related industries at a particular location.
Simmie and Sennett	We define an innovative cluster as a large number of interconnected industrial and/or service companies having a high degree of collaboration, typically through a supply chain, and operating under the same market conditions.
Roelandt and den Hertag	Clusters can be characterized as networks of producers of strongly interdependent firms (including specialized suppliers) linked each other in a value-adding production chain.
Van den Berg, Braun and van Winden	The popular term cluster is most closely related to this local or regional dimension of networks. Most definitions share the notion of clusters as localized networks of specialized organizations, whose production processes are closely linked through the exchange of goods, services or knowledge.
Enright	A regional cluster is an industrial cluster in which member firms are in close proximity to each other.

However, in addition to Porter's and Martin and Sunley's definitions, there are quite many definitions. Table 3.1 shows eight of these definitions which can be classified into three groups. According to table 3.1 clusters are identified by the existence of firms interlinked with other firms horizontally or vertically (As defined by Roelandt and den Hertag, and Sim-

mie and Sennett,) or by the regional concentration (As defined by Crouch and Farrell, Swann and Prevezer, and Enright) or by the simultaneous existence of both (Porter, Rosenfeld and Van den Berg et all).

Thus, there are two core elements of cluster definition. First, the firms in a cluster must be linked in some way and, secondly, they should be concentrated geographically.

To measure the first core element namely, the connection or interlinkages, the most commonly used method is to investigate input and output tables between the industries whose interdependency is investigated. Jones stated that "Since the linkage concept is based on industrial interdependence, an input-output table is a natural place to look for linkage indicators." [45] and Mc Gilvray argued that "Linkages are descriptive measures of economic interdependence of industries and the most commonly accepted method for measuring sectoral linkages is based on the inverse of an static input-output model." [46]. However since a study on input-output tables between the Turkish shipbuilding industry does not exist, measurement of the inter linkages between the Turkish shipbuilding industry and other sectors is not possible with the available data.

Therefore, a cluster definition for Turkish shipbuilding industry covering inter linkages is not possible using available data and in the absence of data, only possible cluster definition of the industry is the one referring to regional concentration or agglomeration. However, as indicated by Martin and Sunley by referring to Porter "...Hence the process of clustering, and the intense interchange among industries in the cluster, also works best where the industries involved are geographically concentrated"[44]. Thus, it is reasonable to assume that level of concentration can be used to measure the level of agglomeration in Porter's sense and, therefore, a measure of concentration will be assumed as a strong indicator of the existence and the strength of a cluster, whose existence and strength assumed to contribute to the growth of the core sectors in it.

Having argued that level of agglomeration can be used as an indicator for the measurement of a cluster in Porter's sense, now the unit of measurement needs to be discussed.

O'Donoghue and Gleave argued that "Perhaps the most popular measure used to spatially delimit agglomerations is the location quotient (LQ).[47], Martin and Sunlye stated that "Many studies employ location quotients to measure relative spatial concentration, and high values

of location quotients are taken to indicate the presence of clusters.”[44] and similarly Beyene and Moineddin concluded that LQ is a useful measure which allows quantification and comparison of health and other outcomes across defined geographical regions. It is a very simple index to compute and has a straightforward interpretation.[48]

Although there are improvements to simple LQ in the cluster literature such as simple standardization, Delta Method of Beyene and Moineddin, The Fieller Method or Generalized Linear Modeling use of simple LQ, which is defined by the ratio of an industry’s share of the economic activity of the economy being studied to that industry’s share of another economy in which Employment is the measurement of economic activity, is sufficient under the scope of this thesis.

In other words, if

e_i = local employment in industry i

e = total local employment,

E_i = is the total employment in industry i,

E = total employment of the country,

then the location quotient for industry i may be expressed as;

$$LQ = \frac{\frac{e_i}{e}}{\frac{E_i}{E}} \quad (3.1)$$

In Turkey, there are several locations in which shipbuilding activity is observable. These locations are Istanbul(Tuzla), Zonguldak (Ereğli), İzmit, Çanakkale, and several provinces on the Eastern Black Sea coast. Table 3.2 indicates the number of shipyards as well as the total capacities for new construction and repairing and maintenance in DWT’s in 2008.

Table 3.2 indicates that 65.91% of the commercial ships produced in Turkish shipyards are produced in Tuzla measured in the number of ships produced. When production is evaluated in terms of dwts, it is observed that Tuzla produces 76.35%. The closest region is Ereğli and it produced only 11.36 in numbers and 11.68 in dwts. Therefore Tuzla appears to be a candidate for being a cluster. The results for location quotient for Tuzla are represented by Table 3.3.

Table 3.2: Shipbuilding Activities in Different Locations in 2008

Location	Quantity	Percentage	New Building Capacity (Dwt/Year)	Percentage	Repair Capacity (Dwt/Year)	Percentage
Istanbul (Tuzla)	29	65,91	729000	76,35	15825000	90,89
Istanbul (Other)	4	9,09	5600	0,59	1200000	6,89
Zonguldak (Ereğli)	5	11,36	111500	11,68	300000	1,72
Çanakkale	2	4,55	54750	5,73	55000	0,32
Ordu	1	2,27	16000	1,68	32000	0,18
Sinop	1	2,27	2000	0,21	0	0
Trabzon	1	2,27	1000	0,1	0	0
Izmit	1	2,27	35000	3,67	0	0
Total	44	100	954850	100	17412000	100

Table 3.3: Location Quotients for Tuzla Shipbuilding Site, 1998-2008

Year	e_i	e	E_i	E	LQ
1988	N.A.	N.A.	N.A.	17755000	N.A.
1989	N.A.	N.A.	N.A.	18220000	N.A.
1990	N.A.	N.A.	N.A.	18047000	N.A.
1991	N.A.	N.A.	N.A.	19366000	N.A.
1992	2215	613000	5035	19357000	13,89
1993	N.A.	N.A.	4562	18320000	N.A.
1994	N.A.	N.A.	4042	19986000	N.A.
1995	N.A.	N.A.	3898	20260000	N.A.
1996	N.A.	N.A.	4038	20840000	N.A.
1997	N.A.	N.A.	4320	21326000	N.A.
1998	N.A.	N.A.	4069	21223000	N.A.
1999	N.A.	N.A.	4042	22589000	N.A.
2000	N.A.	N.A.	5250	21580000	N.A.
2001	N.A.	N.A.	5750	21524000	N.A.
2002	3438	1781934	13575	21354000	3,03
2003	N.A.	N.A.	14150	21147000	N.A.
2004	N.A.	3521000	14750	21870000	N.A.
2005	N.A.	3708000	24200	20067000	N.A.
2006	N.A.	3808000	28580	20423000	N.A.
2007	N.A.	3847000	33000	20738000	N.A.
2008	28000	3923000	33480	21194000	4,52
2008	20000	3726000	25923	21277000	4,41

In other words, since LQ is a simple ratio, the question of which number constitutes a cluster is arbitrary. In the relevant literature several papers used different LQ values to classify a particular region an economic cluster. For instance, Miller et al. accepted 1.25 as the threshold[47, 49], Leigh defined a value exceeding 3[50]. Although there is a discussion on which LQ value represents a cluster, the values 13,89 , 3,03, 4,52 and 4,51 all of which are more than 3, are much more than the values used by several researchers. Therefore we can conclude that the available secondary data supports the idea that Tuzla shipbuilding site constitutes a cluster.

Primary Data

There are 11 level of agglomeration related observations resulting from 7 interviewees belonging to shipyard representatives, academicians, NGO and government agency experts. Among these 7 are related to Tuzla and all answers provided by interviewees agree that Tuzla is the center and far dominating location in Turkish shipbuilding sector in terms of the number of shipyards and employment capacity. 4 of them indicate that machinery components are dominantly purchased in Tuzla from retailers and distributors. In other words, primary data also supports that Tuzla is a shipbuilding cluster.

3.2.2 Specialization in Particular Niches

The second focus variable for investigation is the specialization in a particular niche. Since specialization is associated with the reduction in the number of different outputs produced and increasing the production of several types of outputs instead of other ones, the ratio of the production of one type of ship to all production is a reasonable variable to measure specialization in shipbuilding.

However, the characteristics of the shipbuilding industry dictate a problem in defining the ratio of particular production in relation to overall production. Since vessels can be classified into different groups based on their size, their main functions, their complexity etc. a common measure for comparing the large number of diversified vessels is necessary. One such common measure is "compensated gross tons (cgt)" measure defined by Council Working Party on Shipbuilding(CWPoS) of OECD. The measure first defined by Council Working Party on Shipbuilding of OECD in 1970s to provide a more accurate measure of shipbuilding activity

in relation to gross tons(gt) and deadweight ton(dwt)measures. In 1994 Community of European Shipyards Associations(CESA), the Shipbuilder’s Association of Japan(SAJ) and the Korean Shipbuilders Association(KOSHIPA) upgraded the definition and finally CWPoS has defined the currently used version in 2007. OECD defined cgt as ”a statistical tool developed in order to enable a more accurate macro-economic evaluation of shipbuilding workload than is possible on a pure deadweight tons (dwt) and gross tons (gt) basis” and argued that ”by multiplying figures in gross tons with cgt coefficients, which reflect the work content of each type and size of ships, it is possible to convert the ever changing production mix into cgt figures, which reflect with some accuracy worldwide shipbuilding activity.”[51]

The most recent formulae for CGT is:

$$CGT = A * gt^B \quad (3.2)$$

where A and B factors are indicated in the table 3.4 below: [51]

Table 3.4: Coefficients for Calculating CGT, Source: OECD

Ship type	A	B
Oil tankers (double hull)	48	0.57
Chemical tankers	84	0.55
Bulk carriers	29	0.61
Combined carriers	33	0.62
General cargo ships	27	0.64
Reefers	27	0.68
Full container	19	0.68
Ro ro vessels	32	0.63
Car carriers	15	0.70
LPG carriers	62	0.57
LNG carriers	32	0.68
Ferries	20	0.71
Passenger ships	49	0.67
Fishing vessels	24	0.71
NCCV	46	0.62

However, although using cgt is a solution to compare produced vessels in terms of their quantities, an annual measure for comparing the production of a particular type of a ship requires consideration on time dimension. Since the construction period of different vessels differs from each other in a large range and usually it takes more than one year to complete a vessel,

using cgt as a comparison variable is valid only a longer time period exceeding the construction period of a vessel which is, in most of the cases, more than a year. Therefore, in order to have an annual production amount of a particular type of vessel as well as all industry, the amount of production of cgt made in the considered year for each vessel type or for the whole industry is necessary. Assuming that an equal share of construction is completed in each day during the period the vessel is being constructed, the following formulae will be used to obtain an annually comparable measure covering all type of vessels:

$$APN_i = \sum \frac{CGT_j}{NOC_j} \quad (3.3)$$

where APN_i = Annual production of that type of vessel in the i th year

CGT_j = CGT of the j th vessel in that vessel type produced in the year including the i th year

NOC_j = Number of years the j th ship constructed in the year including the i th year

Data constructed by GISBIR and SPO provides information on 643 vessels produced by Turkish shipyards between 1992 and 2010. It includes size of vessels built in Dwt terms and cg terms for 213 vessels as well as beginning and end dates of construction. To utilize formulae 3.3 initially NOC_j are calculated by the difference between the end and start of construction dates. Then cgt values are calculated by using cg's provided using formulae 3.2.

As an initial step to measure degree of specialization the ratio of cgt of each particular niche for the years between 1992 and 2010 is used. Table 3.5 indicates the annual percentages of production in each niches. An evaluation of Table 3.5 suggests that chemical tankers and container ships are the most common vessels produced by Turkish shipyards followed by tanker and bulk carriers.

And if we define the coefficient of specialization in a niche as the ratio of share of the highest shared niche market to the average of the shares of remaining niches, as an indicator for specialization on particular niches, the degree of specialization in Turkish shipbuilding niches for the years between 1992 and 2010 are indicated in Table 3.6. It indicates the coefficient of specialization for the 2 leading niches.

The results in Table 3.6 indicates that between 1992 to 2000 Turkish shipyards were not specialized in any particular niche and the leading niche changed from year to year. However,

Table 3.5: Annual Percentages of Production in Each Niche for the Sector, 1992-2010

	BULK	CHEM -ICAL TANKER	CONTA -INER SHIP	DRY BULK	FISH -ING BOAT	TANK -ER	TUG BOAT	YACHT	TOTAL
1992	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
1993	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
1994	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	100.00
1995	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	100.00
1996	0.00	0.00	47.81	22.62	0.00	29.56	0.00	0.00	100.00
1997	0.00	0.00	77.43	22.57	0.00	0.00	0.00	0.00	100.00
1998	0.00	32.30	42.12	25.58	0.00	0.00	0.00	0.00	100.00
1999	0.00	0.00	40.67	59.33	0.00	0.00	0.00	0.00	100.00
2000	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
2001	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
2002	0.00	40.24	35.51	0.00	3.62	20.62	0.00	0.00	100.00
2003	5.53	43.28	15.15	8.89	6.12	14.88	2.36	3.78	100.00
2004	5.50	47.65	16.39	12.25	4.64	11.35	2.17	0.00	100.00
2005	2.77	53.85	27.28	9.48	0.00	6.06	0.56	0.00	100.00
2006	2.75	53.68	21.40	10.07	0.00	9.70	1.18	1.22	100.00
2007	10.65	39.40	32.09	10.61	0.00	4.78	1.63	0.83	100.00
2008	8.71	35.57	35.13	11.20	0.00	3.91	4.57	0.68	100.00

after 2002 chemical tankers and container ships become the leading niches. In the following 8 years up to today chemical tankers was the top niche and it is followed by container ships consistently despite the fact that the degree of specialization changed in the period. In brief, data suggests that there was no specialization in Turkish shipbuilding industry until 2002 and there was a clear specialization after 2002.

Primary Data

There are 15 observations on specialization of Turkish shipyards made by 7 public, private, academic and civil society representatives. 6 representatives defend the necessity of specialization and argue that specialization is positive. One representative from private sector mentioned the risk associated with specialization, i.e the cost appearing when the price of or demand for that particular ship fall and produce another requires adjustment cost, and is not so sure about the merit of it.

Among the 15 observations 9 supports the argument that there is a specialization trend in Turkish shipbuilding industry especially towards chemical tankers and 4 of them suggest that

Table 3.6: Coefficient of Specialization for Two Leading Niches

	Highest Shared Niche	Coefficient	2nd Highest	Coefficient
1992	N.A.	N.A.	N.A.	N.A.
1993	N.A.	N.A.	N.A.	N.A.
1994	Dry Bulk	Infinity	N.A.	N.A.
1995	Container ship	Infinity	N.A.	N.A.
1996	Container ship	1.83	Tanker	0.84
1997	Container ship	3.43	Dry Bulk	0.29
1998	Container ship	1.72	Chemical Tankers	0.96
1999	Dry Bulk	1.46	Container Ship	0.69
2000	N.A.	N.A.	N.A.	N.A.
2001	N.A.	N.A.	N.A.	N.A.
2002	Chemical Tankers	2.02	Container Ship	1.65
2003	Chemical Tankers	6.11	Container Ship	1.43
2004	Chemical Tankers	5.47	Container Ship	1.18
2005	Chemical Tankers	5.83	Container Ship	1.88
2006	Chemical Tankers	6.95	Container Ship	1.63
2007	Chemical Tankers	3.90	Container Ship	2.84
2008	Chemical Tankers	3.87	Container Ship	3.79

the specialization is not so deep indeed.

In brief, primary data indicates that important part of stakeholders in the shipbuilding industry assumes specialization in particular niches as a positive strategy and most of the observation validates the existence of specialization in Turkish shipbuilding industry.

3.2.3 Level of Interaction with Other Industries

Since the data on inter linkages between shipbuilding sectors and input and output tables are N.A., investigation on this variable is not possible without interview.

There are 27 observations made by unions, producer NGOs, representatives of public institutions and private companies regarding the level of interaction between Turkish shipbuilding industry and other sectors. 4 made by unions and producer NGO representatives are related to the employee linkage and they all argue that human resources in the sector are either quite long time workers or first time workers. In other words, data suggests that there is no interaction with other sectors in terms of human resources.

12 observations are related to vertical interaction with other sectors providing inputs to Turkish shipyards made by private agents, public institution representatives and producer NGOs. 7 indicate that there is no long term cooperation between shipyards and particular input providers. 5 of them indicate that there is no change in this pattern in the last two decades.

11 observations are on the horizontal cooperation or cooperation between shipyards both in Turkey and with international ones. All of them support that there is no non negligible cooperation among the shipyards both nationally and internationally.

In summary, primary data indicates that there is no important cooperation between Turkish shipbuilding industry with other sectors horizontally and vertically. Moreover, there is no change in the situation during the last two decades.

3.2.4 Growth of World GDP and World Trade

In the literature growth of world GDP and world trade are considered among the most important variables affecting the growth of shipbuilding industry due to the fact that primary usage

Table 3.7: Coefficient of Correlations between Growth Rates of Trade and GDP to the Turkish Shipbuilding Industry in Numbers, 1996 - 2008

Sector Growth Number	1996 - 2008	1997 - 2008	1998 - 2008	1999 - 2008	2000 - 2008	2001 - 2008	2002 - 2008	2003 - 2008	2004 - 2008	2005 - 2008	2006 - 2008	2007 - 2008	2008 - 2008
World Trade Volume Growth Rate	0.10	0.11	0.06	0.06	0.08	0.23	0.47	0.47	0.47	0.30	0.41	0.30	1.00
EU Trade Volume Growth Rate	0.25	0.26	0.24	0.25	0.29	0.38	0.40	0.44	0.46	0.48	0.50	0.44	1.00
Turkey Trade Volume Growth Rate	0.15	0.15	0.16	0.13	0.04	0.09	0.53	0.56	0.63	0.44	0.52	0.47	1.00
World GDP Growth Rate	0.08	0.08	0.06	0.04	0.03	0.12	0.33	0.31	0.31	0.17	0.10	0.01	1.00
EU Growth Rate	0.12	0.12	0.10	0.12	0.18	0.32	0.33	0.34	0.35	0.27	0.20	0.10	1.00
Turkey Growth Rate	(0.05)	(0.03)	(0.08)	(0.08)	(0.21)	(0.16)	0.35	0.40	0.41	0.10	0.31	0.09	1.00

of the ships built is to provide transportation especially between long distant coastal locations.

In addition to the world GDP growth and the growth in the volume of world trade one, making an investigation on EU and Turkish growth and trade growth might be reasonable for that most of the finalized ships are purchased by European ship liners.

Coefficient of correlations between the growth rate of Turkish shipbuilding industry in terms of numbers and Dwt's and the growth and trade growth rates of the World, the EU and Turkey are provided in table 3.7 and 3.8.

If the number of ships produced taken as the growth indicator of the industry, it is observed that both GDP growth rates and trade growth rates of the world, the EU and Turkey are positively related with the growth of Turkish shipbuilding industry with the exception of Turkish GDP growth rates between 2001. In addition, there is a shift realized in 2000 and 2001, and beginning with 2002, the relation between GDP and trade growth rates of the World, the EU

Table 3.8: Coefficient of Correlations between Growth Rates of Trade and GDP to the Turkish Shipbuilding Industry in Dwts, 1996 - 2008

Sector Growth DWT	1996 - 2008	1997 - 2008	1998 - 2008	1999 - 2008	2000 - 2008	2001 - 2008	2002 - 2008	2003 - 2008	2004 - 2008	2005 - 2008	2006 - 2008	2007 - 2008	2008 - 2008
World Trade Volume Growth Rate	0.24	0.26	0.20	0.21	0.21	0.56	0.64	0.67	0.71	0.75	0.65	0.71	1.00
EU Trade Volume Growth Rate	0.24	0.22	0.22	0.25	0.25	0.46	0.45	0.52	0.57	0.74	0.73	0.86	1.00
Turkey Trade Volume Growth	0.21	0.25	0.26	0.20	0.22	0.35	0.53	0.59	0.73	0.65	0.64	0.83	1.00
World GDP Growth Rate	0.24	0.32	0.30	0.27	0.27	0.49	0.58	0.57	0.58	0.68	0.67	0.56	1.00
EU Growth Rate	0.12	0.17	0.14	0.21	0.21	0.52	0.52	0.56	0.58	0.72	0.72	0.64	1.00
Turkey Growth Rate	0.26	0.18	0.12	0.12	0.14	0.31	0.59	0.71	0.75	0.73	0.78	0.56	1.00

and Turkey and Turkish shipbuilding industry increased substantially in the positive direction. Among all the variables EU trade volume growth has the strongest relation before 2000 and 2001 and after 2002 Turkish trade volume growth becomes the strongest.

If dwts are taken as the indicator of the growth of Turkish shipbuilding industry, no exception is observed and it is seen that GDP and trade growth of the World, the EU and Turkey are all positively related with the growth of the Turkish shipbuilding industry. Similarly the shift in positive direction in 2000 and 2001 also clearly observable. Before 2000 and 2001 world GDP growth has the strongest positive relation and after 2002 world trade volume growth becomes the strongest one.

When two indicators of growth for Turkish shipbuilding industry are evaluated the value of the coefficient of correlations is higher when dwts are taken as the indicator. Moreover depending on the indicator and the time period before and after 2000 and 2001 the strongest correlated variables changes.

In brief, there is a positive relation between the growth of Turkish shipbuilding industry and the growth of world, EU and Turkey GDPs and trade volumes. In addition, world trade growth rate has the strongest correlation.

Primary Data

There are 20 observations made by 9 experts in public sector, academician, union and producer representatives and representatives of private shipyards. All agree that growth of trade is one of the most important causes of the growth of the shipbuilding industry.

16 of the observations are about identifying the most important among 6 different variables (GDP and trade growth rates of the World, the EU and Turkey). 9 of them favors world trade growth, 3 of them favors EU GDP growth and 2 World GDP growth. 2 observation states that actually all of them are the same.

4 observations indicate that Turkish GDP growth among the least affective one due to the preferences of Turkish shipping companies towards Asian shipyards.

In brief, primary data indicates that growth of trade and GDP are assumed to be one of the reasons for the growth of Turkish shipbuilding industry and world trade growth is thought to be the more relevant one.

3.2.5 The Pattern of World Trade

Another variable which has a potential to explain the growth of Turkish shipbuilding industry is the changes in the pattern of world trade and the appearance of new locuses of production or consumption. Since the appearance of new locations of consumption and production creates a change in the pattern of world trade, it is indicated as potential variable in the literature.

To develop a unit of measurement for change in the pattern of world trade initially world production and consumption levels are divided into 5 groups: North America, South and Central America, Europe, Common wealth of independent states and Asia. Then shares of imports and exports of each 5 region is calculated and the growth rates of the exports and imports are derived. Later average of the growth rate of export and imports are calculated and finally absolute values of the averages of each group is summed and a coefficient reflecting the change of trade pattern of the world derived.

Growth of Turkish shipbuilding industry in dwt and number terms, coefficient reflecting the change in the pattern of world trade, and coefficient of correlations between the growth and the pattern changes are shown in Table 3.9.

Table 3.7 indicates that there is a positive correlation between the growth of Turkish shipbuilding industry in dwt terms with the change in the pattern of world trade and this is also valid in number terms except for 2003 and 2004. Moreover the coefficient of correlation decreased drastically in 2002 in terms of number and in 2003 in terms of dwts

In brief, there is a positive relation between the growth of Turkish shipbuilding industry until 2002 and this relation became unstable afterwards.

Primary Data

The responses of the interviewees to the questions indicate that the effect of the change in the pattern of world trade on Turkish shipbuilding industry is unknown. Only 2 observations are provided and they argue that the change in the pattern of world trade is not important in explaining the growth of the Turkish shipbuilding industry.

Table 3.9: Coefficient of Correlations between Growth of Turkish Shipbuilding Industry in Numbers and dwts to Change in Trade Patterns, 1996 - 2008

	Sector Growth Rate Number	Sector Growth DWT	Sum of Absolute Changes	CC with Number	CC with DWT
1996 - 2008	6.3	174.21	0.45	0.24	0.06
1997 - 2008	47.1	58.21	0.32	0.24	0.07
1998 - 2008	4.0	-16.99	0.57	0.30	0.14
1999 - 2008	-11.5	23.35	0.33	0.34	0.23
2000 - 2008	-13.0	-40.21	0.50	0.30	0.23
2001 - 2008	95.0	49.37	0.73	0.35	0.35
2002 - 2008	-2.6	-6.92	0.26	0.03	0.28
2003 - 2008	15.8	11.75	0.21	-0.06	0.18
2004 - 2008	86.4	97.80	0.38	-0.12	0.07
2005 - 2008	-1.2	28.88	0.71	0.08	0.48
2006 - 2008	32.1	54.03	0.45	0.40	0.53
2007 - 2008	-11.2	8.21	0.53	0.38	0.77
2008 - 2008	52.6	25.38	0.47	1.00	1.00
2008	-12.42	-7.97	0.20		

Table 3.10: Correlations Between The Age of World and Turkish Fleet and The Growth of Turkish Shipbuilding Industry, 2001 - 2008

	Turkey - Number	Turkey - Dwt	World - Number	World - Dwt
2001 - 2008	0.34	(0.09)	0.32	0.09
2002 - 2008	(0.10)	(0.32)	0.42	0.09
2003 - 2008	0.14	(0.07)	0.30	(0.20)
2004 - 2008	0.13	(0.09)	0.28	(0.29)
2005 - 2008	0.40	0.09	0.77	(0.13)
2006 - 2008	0.34	0.40	0.75	(0.14)
2007 - 2008	0.36	0.76	1.00	1.00
2008 - 2008	1.00	1.00	N.A.	N.A.

3.2.6 The Average Age of the National and International Fleet and the Numbers of Old Vessels

Since the efficiency of the ships falls due to physical constraints and more productive equipments are developed in time and since some international rules and national legislations have a limit on the age of ships because of environmental and safety reasons, old ships need to be replaced by the new ones and if the number of old ships increases, indicating an increase in the average age of ships, the demand for new ships increases.

To analyze the relationship of the age of world and Turkish fleets to the growth of Turkish shipbuilding sector, coefficient of correlations indicated in Table 3.10 is utilized.

Table 3.10 indicates that there is no single directional relation of growth of Turkish shipbuilding industry to either to age of Turkish or world fleet. However, when Turkish shipbuilding sector growth is based on the number of ships produced, a positive relation with the age of world fleet and Turkish fleet (with the exception of 2002 - 2008)

Primary Data

7 observations related with the relation between the growth of Turkish shipbuilding industry to age of world and Turkish fleet were made by 5 different interviewees. 3 of them suggested that age of world fleet is important for the growth of Turkish shipbuilding industry and other 4 argued that it is not important. 1 argues that age of Turkish fleet might be relevant for ship repair sector. In brief, primary data indicates no clear relation between the growth of Turkish shipbuilding industry and the change in the age of world and Turkish fleet.

3.2.7 Changes in Exchange Rate

Ship market is one of the most geographically extended markets in the world and local differences in the prices of shipyards can affect the demand from that particular shipyard a lot. Therefore exchange rate can have an important effect on the competitiveness of a shipyard. Another link is through intermediate goods or raw material import like plates and mechanical equipment.

The currencies used in shipbuilding processes are Euro, Dollar and Turkish lira, therefore, Euro and Dollar exchange rates will be used to investigate the relation between exchange rates and the growth of Turkish shipbuilding industry.

Table 3.11 indicates the coefficient of correlations between the growth of Turkish shipbuilding industry in number and dwt terms and Euro and dollar exchange rates.

According to Table 3.11 there is a negative relation between the growth of Turkish shipbuilding industry in dwt and number terms and the value of foreign exchanges after 2002 except between the growth of Turkish shipbuilding industry and the value of Euro. It also suggest that the magnitude of the relation with Dollar is higher than Euros. In brief there is a negative relation between the growth of Turkish shipbuilding industry and the change of the exchange rate after 2002.

Table 3.11: Correlations Between Shipbuilding Growth and Change in the Value of Turkish Lira

	Number - Euro	Number - Dollar	DWT - Euro	DWT - Dollar
2000 - 2008	0.44	0.31	(0.02)	(0.15)
2001 - 2008	0.52	0.47	0.06	0.05
2002 - 2008	(0.17)	(0.36)	(0.43)	(0.49)
2003 - 2008	0.07	(0.25)	(0.22)	(0.33)
2004 - 2008	0.17	(0.27)	(0.09)	(0.38)
2005 - 2008	0.15	(0.12)	(0.29)	(0.31)
2006 - 2008	(0.03)	(0.23)	(0.24)	(0.27)
2007 - 2008	(0.05)	(0.28)	(0.51)	(0.70)
2008 - 2008	(1.00)	(1.00)	(1.00)	(1.00)

Primary Data

There were 11 observations on the relation between the Growth of Turkish shipbuilding industry and the value of Turkish Lira against Dollar and Euro. 9 of them argue that exchange rate is quite important and 2 state that exchange rates are not so important.

Among the 9 observations comparing Euros and Dollars 5 favor Dollar 2 favor Euros and 2 indicates no difference between the currencies. In brief primary data mostly support the statement that exchange rate is an important aspect in explaining the growth of Turkish shipbuilding industry and most of them see dollar as more important.

3.3 Other Variables

In this section, the relevant variables about which there is no secondary data will be discussed. They will be referred as other variables and they are use of outsourcing and subcontracting; government support; degree of vertical integration; wage rate; controlling power of non-wage labor market dynamics by Shipyards; availability of skilled workers; changes in regulatory framework; availability of cheap credit; firm size; managerial capacity and mechanization .

3.3.1 Use of Outsourcing and Subcontracting

There were 15 observations supporting the relevancy of use of outsourcing and subcontractors to the growth of Turkish shipbuilding industry. 8 of them confirmed that most of the

semi-skilled or unskilled workers used in shipbuilding process are provided by subcontractors and 3 suggested that use of subcontractors in recruitment contributed to the profitability of shipyards.

4 observations were about the use of subcontractors in provision of material inputs. 3 indicated that most of the procurement is made by shipping company, for which the ship is built, and one indicated that distributor was responsible from providing the input.

There were 2 observations on outsourcing of project management and administrative task to the use of shipping company, for which the ship is built. They indicated that the management and administrative aspects related with the construction of ships were fulfilled by the shipping company.

1 observation confirmed that subcontractors involved even in some steps of construction such as painting. In brief, primary data indicate that a considerable part of the production process is outsourced and this contributed to performance of shipyard, therefore to the growth of the industry as a whole.

3.3.2 Government Support

There were 5 observations made during the interviews made with public experts and shipyard representatives on the relation of government support to the growth of Turkish shipbuilding industry experienced between 1992 and 2008. 4 of them indicated that there was no positive contribution made by public policies to the growth process and one suggested that land subsidies for the construction of shipyard in Yalova made an important contribution to the shipyard construction process.

2 of the 4 observation arguing for non positive contribution were about the ineffectiveness of central public body (Undersecretary of Maritime Affairs) and 1 was related with the difficulty in buying land due to legislative framework and the last one was about the perception of local government and the attempt of local governors to extract rent out of shipyard construction. In brief, primary data provide no support for the relevancy of government support to the growth of Turkish shipbuilding industry between 1992 and 2008.

3.3.3 Degree of Vertical Integration

6 observations derived from the interviews were on the degree of vertical integration and existence of vertical integration in the form of legal ownership or long term contracts.

3 on them were about the existence of mergers between two vertical firms or takeover of one by the other and all indicated that there had been no vertical merger or acquisition activity. Remaining 3 was about long term contracts and they indicated that there had been no long term cooperation between a shipyard and suppliers and contracts were either short term or there was no contract at all in purchasing inputs used in production process. In brief, primary data do not indicate any positive contributions of vertical integration to the growth of Turkish shipbuilding industry from 1992 to 2008.

3.3.4 Wage Rate

There were 7 observations about the wage rate and 2 of them was on its relation with the growth of Turkish shipbuilding industry. They indicated that wage rate is not one of the growth drivers because it is impossible to compare Turkish wages with incomparably low wages of Chinese and Vietnamese shipbuilding workers.

However, 4 of the 5 remaining observations indicated that the wage of semi-skilled and unskilled workers in Turkish shipyards are very flexible. In brief, although wage rate advantage was not one of the reasons for the growth of Turkish shipbuilding industry, its high flexibility contributed to the profits of shipyards.

3.3.5 Controlling Power of Non-Wage Labor Market Dynamics by Shipyards

11 observations were about the relationship between the growth dynamics of Turkish shipbuilding industry and huge controlling power of non-wage labor market dynamics by shipyards. 2 of them argued that similar to the wage rate, employment conditions is not one of the causes of the growth of Turkish shipbuilding market.

However, 5 of them indicated that the control of labor markets by shipyards, which is obtained through temporary employment of workers and the ability to change the number of workers

in a short time period contributed to the profitability of the shipyards.

Remaining 4 observations indicated that the ability to access to workers with low working class awareness in different parts of Anatolia, especially to the South East was one of the reasons for enhancing this controlling power. In summary, although huge controlling power experienced by shipyards was not one of the reasons for growth of Turkish shipbuilding industry, it increased the profitability of shipyards.

3.3.6 Availability of Skilled Workers

There were 13 observations on the availability of skilled workers and 2 of them were related with the relation between the growth of Turkish shipbuilding industry and availability of skilled workers. They suggested that skilled labor was not quite important because of the labor extensive production process used in the shipyards.

7 of the observations were on the skill development and the quality of training provided to shipyard workers and 4 of them indicated that despite trainees took certificates, training were not effective in developing skills. 3 remaining observations were about the reason for this ineffectiveness and argued that low quality trainers (1 obs) and lack of enthusiasm among the trainees (2 obs) were the causes of this ineffectiveness. In brief, availability of skilled workers was not one of the reasons for the growth of Turkish shipbuilding industry between 1992 and 2008.

3.3.7 Managerial Capacity

7 observations made from the interviews were about the relationship between the managerial capacity of Turkish shipyards and the growth of Turkish shipbuilding sector. 4 of them argue that most of Turkish shipyards are traditional family-based and application of modern management practices is quite limited. Moreover, remaining 3 indicated that in approximately 2 decades between 1992 and 2008, there had been no substantial change in the management capacity of Turkish shipyards. In brief, improvements in the managerial capacity of Turkish shipyards are not one of the reasons for the growth of Turkish shipbuilding industry between 1992 and 2008.

3.3.8 Mechanization

There were 5 observations about the mechanization of shipbuilding processes in Turkish shipyards and its relation to the growth of Turkish shipbuilding industry. 2 of them suggested that a small pace of modernization of machinery started in 2003 and it might contribute to the efficiency of ship construction. However, other 3 indicated that mechanization started in only in 2008 in a 2 or 3 shipyards. In brief, primary data offers no clear direction between mechanization and the growth of Turkish shipbuilding industry from 1992 to 2008.

3.3.9 Firm Size, Changes in Regulatory Frameworks, Availability of Cheap Credit

Observations on the relation between size of Turkish shipyards , changes in regulatory frameworks and availability of cheap credits and the growth of Turkish shipbuilding industry are quite limited. There were 2 observations on firm size, which indicates that shipyards in Tuzla are small scale and remained so between 1992 and 2008, 2 observations on changes in regulatory framework about the relevance of International Maritime Organization on shipbuilding industries and 1 observation about the availability of cheap credit, indicating that it is an important factor. Therefore primary data is insufficient to be able to offer a clear relation with the growth of Turkish Shipbuilding Industry between 1992 and 2008 for firm size, changes in regulatory frameworks and availability of cheap credit.

3.4 Identification of The Growth Dynamics in Turkish Shipbuilding Industry

3.4.1 Methodology for Classification

In this section, secondary and primary data described in the previous chapter will be evaluated by comparing and contrasting and a conclusion on the relation of focus variables with the growth of Turkish shipbuilding industry will be synthesized.

Based on the indicated relations by different data and observations, three different groups: stylized facts (arguments no counter evidence is provided by the data), high probable relations (arguments supported by data in general with small opposition) and indecisive relations (where data supports no argument) are created.

3.4.2 Tier 1: Stylized Facts

3.4.2.1 Existence of A Cluster in Tuzla, Istanbul Was one Cause of the Growth

High ratio of the total number of shipyards in Tuzla to the number of all Shipyards in Turkey and the output of Tuzla shipyards in Dwt terms to total output of Turkish shipyards, location quotient of Tuzla shipbuilding site and the primary data support that Tuzla is a shipbuilding cluster.

3.4.2.2 Cooperation With Other Sectors Was Not A Reason for Growth

In the absence of secondary data, primary data indicates that lack of cooperation in terms of human resources, negligible amount of vertical cooperation with suppliers and lack of horizontal cooperation both nationally and internationally. Thus cooperation with other sectors is not one of the reasons for growth in Turkish shipbuilding industry in the last two decades.

3.4.2.3 World Trade Growth and GDP Growth Were Causes of the Growth

The correlation coefficient between world trade and GDP growth in both number and dwt terms as well as the primary data indicates that growth of the world trade is one of the important reasons for Turkish shipbuilding industry and its importance increase after 2002.

3.4.2.4 Change in the Trade Pattern of World Trade Was a Minor Reason for the Growth between 1992 and 2002

The correlation between the growth rate of Turkish shipbuilding industry in number and dwt terms with the absolute change in the pattern of world trade indicate a positive relation between the growth of Turkish shipbuilding industry and the change in the pattern of world trade before 2002. Primary data indicates that the impact is minor and it is not recent.

3.4.3 Tier 2: Highly Probable Relations

3.4.3.1 Specialization in Chemical Tankers and Partially Containers Was One Cause of Growth

High ratio of chemical tankers and container ship produced, and the leadership position of the former and second position of the latter with high coefficients of specialization and primary data indicate that there is a specialization in Turkish shipbuilding industry after 2002 and further that the specialization is assumed as a positive strategy for the sector. However, although they are much less in number there is also some observations in primary data questioning of the positiveness of specialization and if there is a specialization in Turkish shipyards.

3.4.3.2 Dollar Exchange Rate Was a Minor Variable in Explaining the Growth of Turkish Shipbuilding Industry After 2002

Coefficient of correlation between the change in the value of dollar after 2002 and the primary data suggests that dollar exchange rate is considered an important variable affecting growth of Turkish shipbuilding industry. However, although limited, there is also counter arguments about the importance of exchange rate and dollar in particular.

3.4.3.3 Use of Outsourcing and Subcontracting Was One Cause of Growth

Primary data indicated that big part of production process is outsourced or subcontracted to labor subcontractors, distributors and shipping companies, for which the ship is built and this enhanced the activity of shipyards and contributed to the growth of shipbuilding industry.

3.4.3.4 Government Support and Availability of Skilled Workers Were Not Causes of Growth

Primary data showed that actors in the Turkish shipbuilding sector did not identify any non-negligible contribution of government support and availability of skilled workers to the growth dynamics of the industry between 1992 and 2008.

3.4.3.5 Vertical Integration and Improvements in the Managerial Capacity of Shipyards Were Not Causes of Growth

Primary data do not indicate any positive contributions of vertical integration and increase in managerial capacity to the growth of Turkish shipbuilding industry from 1992 to 2008 because it showed that there exists no non-negligible vertical integration and managerial capacity improvement in the period.

3.4.3.6 Although Wage Rate Advantageous and Huge Controlling Power Experienced by Shipyards Are Not Causes of Growth, They Contributed to the Increase in Profitability of Turkish Shipyards

Primary data suggested that the wage rate as well as employment conditions of workers did not provide comparative advantage to Turkish shipyards due to the existing conditions in Chinese and Vietnamese shipyards. However it also showed that flexibility in the wage rate and employment contributed to the profitability of Turkish shipyards in a substantial manner.

3.4.4 Tier 3: Indecisive Relations

3.4.4.1 Evidences are Conflicting on the Effect of the Change of the Age of World and Turkish Fleet on the Growth

The coefficient of correlations between the change in the age of world and Turkish fleets give different results when growth of Turkish shipbuilding industry is measured in dwts and numbers. Similarly primary data offers two different views on the relation.

3.4.4.2 Primary data offers no clear direction between mechanization and the growth of Turkish shipbuilding industry

There are discussions on the existence of mechanization and the timing of it and primary data offers no clear direction between mechanization and the growth of Turkish shipbuilding industry.

3.4.4.3 primary data is insufficient to be able to offer a clear relation between firm size, changes in regulatory frameworks, availability of cheap credit and the growth of Turkish Shipbuilding Industry

Observations on the relation between size of Turkish shipyards , changes in regulatory frameworks and availability of cheap credits and the growth of Turkish shipbuilding industry are quite limited. Therefore primary data is insufficient to be able to offer a clear relation with the growth of Turkish Shipbuilding Industry between 1992 and 2008 for these variables.

3.4.5 Summary

The results of the data analysis are summarized in Table 3.12. The first column represents the type of statement where SF denotes stylized facts, HPR denotes high probable relations and IR denotes indecisive relations. Table 3.12 indicates that clustering in Tuzla, growth of world GDP and trade and specialization in chemical tankers and container ships, use of outsourcing and subcontracting were the major reasons for the growth of shipbuilding industry during the last two decades. Between 1992 and 2002 change in the pattern of world trade and between 2002 and 2008 dollar exchange rate were minor reasons affecting the growth of Turkish shipbuilding industry from 1992 to 2008. Moreover, cooperation with other sectors, government support, availability of skilled workers, vertical integration, improvement in managerial capacity, wage rate, controlling power experienced by shipyards were not causes of the growth. In addition, a conclusion on the relevancy of age of fleet, mechanization, firm size, change in regulatory frameworks, availability of cheap credit could not be made due to conflicting or lack of evidence.

Table 3.12: Summary of Data Analysis

Type	Variable	Relevance	Degree	Period
SF	Existence of A Cluster in Tuzla, Istanbul	Yes	High	1992 - 2008
SF	Cooperation With Other Sectors	No	N.A.	N.A.
SF	World Trade Growth and GDP Growth	Yes	High	1992 - 2008
HPR	Change in the Trade Pattern of World Trade	Yes	Low	1992 - 2008
HPR	Dollar Exchange Rate	Yes	Low	2002 - 2008
HPR	Use of Outsourcing and Subcontracting	Yes	High	1992 - 2008
HPR	Government Support	No	N.A.	N.A.
HPR	Availability of Skilled Workers	No	N.A.	N.A.
HPR	Vertical Integration	No	N.A.	N.A.
HPR	Improvements in the Managerial Capacity	No	N.A.	N.A.
HPR	Wage Rate Advantageous	No	N.A.	N.A.
HPR	Huge Controlling Power Experienced by Shipyards	No	N.A.	N.A.
IR	Change of the Age of World and Turkish Fleet	Conflicting Data	N.A.	N.A.
IR	Mechanization	Conflicting Data	N.A.	N.A.
IR	Firm size	Insufficient Data	N.A.	N.A.
IR	changes in regulatory frameworks	Insufficient Data	N.A.	N.A.
IR	availability of cheap credit	Insufficient Data	N.A.	N.A.

CHAPTER 4

CONCLUSION

The thesis attempted to analyze the growth dynamics of the Turkish shipbuilding industry in the last two decades through utilizing descriptive statistics as well data generated by semi structured interviews. Interviews covered 16 people working in 4 NGOs, 3 Magazines, 2 government units, 2 Universities and 2 Shipyards. According to these data Tuzla is detected as the main shipbuilding region and it is discovered that existence of a cluster in Tuzla, growth in World Trade and specialization in chemical tankers and container ships are the main reasons for the growth of the industry and change in the trade pattern of world trade has a minor role supporting growth. It also found that exchange rate acted as a minor growth decreasing factor and cooperation with other sectors was not a reason behind it.

4.1 Interpretation of the Results

The shipbuilding cluster located in Tuzla contribute to the growth of Turkish shipbuilding industry through several channels. The first one is reducing the time for labor mobilization. There is a labor market in Tuzla, to which workers who want to work in the shipbuilding activities go and wait for new jobs. Whenever a subcontractor for a building of a ship comes he can find workers in quite a short time. In addition, skilled workers like welders and dyers also goes to labor markets. In other words, there is a pool of available and skilled workers which reduces the time for labor mobilization substantially which in turn contributes to the decrease in the time ship is built and the cost of accessing workers. Since ship construction time is one of the most important criteria, and labor is an important component of shipbuilding process, reduction in time and cost of labor mobilization create an important advantage for the shipyards in international shipbuilding market.

The second channel is to create a supplier base. Since the supply chain in Turkish shipbuilding industry is quite internationalized, identifying the most appropriate input provider requires extensive market knowledge as well as capabilities to import them smoothly and efficiently. A scale threshold is required for suppliers to make these activities in a profitable manner. Tuzla shipbuilding cluster provided this opportunity and enhanced the procurement efficiency of the shipyards substantially. Indeed, most of the shipyards outsourced purchasing processes to these input suppliers and freed themselves from having a purchasing department. Therefore, the cluster provided a double advantage of both reducing the input prices and not spending money to a permanent and costly purchasing department.

The third channel is enhancing training opportunities for workers. Geographical concentration contributed to the activities of GISBIR, the Union of Shipbuilders, and as indicated by the interviews it especially enhanced the worker training activities by decreasing the training cost with scale efficiency due to the increase in number of trainees and with the decrease in transportation and the opportunity to come back to work after training due to the proximity of training location.

In brief, Tuzla shipbuilding cluster enhanced the growth of shipbuilding industry through reducing time and cost of labor mobilization, decreasing the cost of purchasing necessary inputs and creating lower cost training opportunities for workers. However, cooperation-based cluster contribution channels is restricted to the area of decreasing worker training cost. Primary data collected indicated that cooperation for finding solution to common problems, knowledge spillovers through co-production, transfer of skilled staff between shipyards are not the channels for Tuzla cluster to contribute to the growth of Turkish shipbuilding industry. The growth in world trade is discovered to be one of the biggest driver of the growth of Turkish shipbuilding industry. Since most of the ships produced are used for freight purposes and seaborne trade is the largest means for freight in the world, increased trade led to increase in demand for ships. Some of the excess demand is responded by increasing utilization rates of existing commercial fleet but it also caused a dramatical increase in orders for new ships. This demand resulted in a boom for Shipyards all around the world including Turkish ones.

Among the overall increase in world trade, the increase in demand for petroleum products and chemical products has the largest impact on Turkish shipbuilding industry which expressed itself in the number of chemical containers Turkish shipyards built and finished or semi-

finished products contributing to the growth of container ship produced by Turkish shipyards.

Shipbuilding markets are one of the most international markets existing and different shipyards and regions competes for orders and each country or region is known by their niches by the shipping companies. Turkish shipyards' specializing in small and mid-size chemical tankers and small container vessel facilitated the order books of Turkish shipyards by creating a niche in the global market, where a group of countries like Japan, Germany and South Korea, by utilizing their technologically advanced structure, are specialized in high-tech and high-value added niches like LNG Carriers and Cruise Ships and where another group of countries such as China and Vietnam, using their low cost labor advantages and specialized large scale containers, specialized in bulk carriers and tankers. Specialization in these segments directed the orders of ships to Turkey, even making her the leading producer in chemical tankers between 10.000 to 30.000 dwt.

Change in the pattern of world trade and creation of new supply centers, China and other south and southeast Asian countries, and increasing demand in high income countries led by the United States, enhanced the increase in the trade volume and resulted in not only demand for new ships but also larger and advanced ships. However, it is understood that this demand has made no observable contribution to the growth of Turkish shipbuilding industry. The reason can be found in the nature of the demand created. This finding supports the arguments that demand for larger ships are absorbed by low-labor cost producers as China and for advanced ships high-tech shipyards in Japan and South Korea were the targets of the orders. Since Turkish shipyards has neither low-cost labor advantages nor high technological base, the effect of change in the pattern of world trade was negligible.

Despite the fact the existing of cooperation with other sectors and in the sector proved to make important contributions to the growth of some manufacturing sectors, Turkish shipbuilding industry has not benefited from it. Interviews indicate that the most important reasons for this situation is observed to be the traditional family based, low institutionalized shipbuilding companies and ineffectiveness of state and sector NGOs in facilitating cooperation. Turkish shipyards usually directed by "old style workshop minded" managers who lack modern management skills with a low awareness of the merits of cooperation both within the sector and with other sectors. Moreover, no effective state or NGO initiative, which can create an awareness are organized either due to the administrative problems as in the case of preparing

the master plan for the sector, or lack of resources as in the case of the inability to discuss yearly maritime sector reports by the stakeholders in Turkish shipbuilding sector.

Exchange rate advantages was not an important driver for the growth of Turkish shipbuilding industry unlike some other leading shipbuilding countries in their initial take off stages. The first reason is that there was a horizontal movement in the value of Turkish lira against dollars exchange rate did not change favoring the Turkish shipyards especially after 2002. Secondly both ship construction and larger share of inputs transactions, machinery and steel plate, are made in dollars restricting the impact of exchange rate movements.

Three pillar outsourcing, outsourcing recruitment, purchasing and administrative and management tasks to recruitment subcontractors, distributors, shipping companies and others, was one of the important reasons for the growth of shipbuilding industry. Speed of construction is one of the most important factors determining the order book of individual shipyards. Moreover, shipbuilding process is a detailed process requiring huge expertise in different areas.

The first pillar is about recruitment. Considering recruitment of skilled experts, even if such experts are available with reasonable costs, employing and managing such them requires strong institutional capabilities, especially a developed human resources department. For unskilled workers, availability of a huge labor pool which can be utilized in a short time period is quite substantial in determining the speed of construction and therefore the number of contracts. Outsourcing the tasks for skilled workers to other specialized companies and using recruitment subcontractors which have access to huge labor pool in east and southeast Anatolia contributed to the speed of mobilizing period and institutional costs associated with management decreased substantially.

Second pillar of outsourcing is outsourcing for purchasing to distributors which represent international shipbuilding project management and purchasing companies. Similar to other complex manufacturing sectors shipbuilding requires purchasing huge number of inputs from a world scale input market. Therefore, identifying the optimum input supplier and logistics support to bring it to shipyards requires expertise and staff dealing with it. Most of Turkish shipyards utilized distributors to obtain most of inputs and decreased costs, through cheaper inputs and money not spent to keeping a purchasing department, and speed of the provision process of important amount of inputs.

Third and last pillar of outsourcing is about project management and administrative skills to shipping companies or project managers. Because of the legislative restriction, incentive certificate is issued to a single person and most of the cases he was a staff of shipping company. In addition, similarly, project managers were also staff of shipping companies, sometimes the same person. Therefore, management and administrative tasks are done by shipping companies or consultants and this provided freedom for shipyards and decreased costs of employing people responsible from these tasks.

However, it is reasonable to assume that outsourcing important steps of shipbuilding process also created vulnerability. First it inhibited the development of recruitment, purchasing, project management and administrative capacity in the shipyard and prevented appearance of gains from knowledge accumulation. Secondly, it created a dependency to other agents. Especially, the control of all shipbuilding process by the customer decreased the leverage of shipyards. Thirdly, shipyard activity became a limited manufacturing activity and a pressure change for institutional change was quite limited.

4.2 Prospects and Policy Recommendations

Assuming that there is no structural change in the Turkish shipbuilding sector growth dynamics, the trends in the growth of world trade and GDP will be the main driver of the growth of the industry and the magnitude of the growth will be modified by the capacity of the cluster in Tuzla and degree of specialization of Turkish shipyards and efficiency of the outsourcing mechanism with a possible minor impact of exchange rate.

Despite the huge decrease in world trade and GDP growth rates in 2008, IMF [52] expects a recovery in 2010 and estimates the trends in the growth of world GDP and world trade volume to continue after 2011 suggesting the trend in the growth of Turkish shipbuilding industry to continue. However, as indicated by the interviews growth of Tuzla cluster is limited by the absence of suitable coastal land, and without huge investment required to develop a secondary shipbuilding area supporting Tuzla and relocating some shipyards further expansion of the cluster is not possible. In addition, no evidence causing a change in the degree of specialization in the industry, three pillar outsourcing organization and exchange rate exist. Therefore, after 2011 a positive growth with a smaller magnitude compared two last two decades is ex-

pected for the Turkish shipbuilding industry. However, this growth will be vulnerable to the shocks affecting actors which Turkish commercial shipbuilding activity depend on.

Table 4.1: Relevant Variables and Policy Scale

Variable	Relevance	Degree	Shipyard Control	Industry Control	Public Policy Control
Existence of A Cluster in Tuzla, Istanbul	Yes	High	No	No	Yes
World Trade Growth and GDP Growth	Yes	High	No	No	No
Change in the Trade Pattern of World Trade	Yes	Low	No	No	No
Dollar Exchange Rate	Yes	Low	No	No	Yes
Use of Outsourcing and Subcontracting	Yes	High	Yes	Yes	Yes

As indicated by Table 3.12, existence of a cluster in Tuzla, world GDP and trade growth, dollar exchange rate, use of subcontracting and outsourcing are the variables that created the growth of Turkish shipbuilding industry between 1992 and 2010. Among these 5 variables shipyards and the shipbuilding sector can only affect the use of outsourcing and subcontracting. Therefore, as indicated by Table 4.1 shipyards individually and shipbuilding sector as a whole might try to improve the efficiency of their outsourcing mechanism and increase the growth rate of Turkish shipbuilding industry by exploiting the gains from outsourcing improvement. Government can improve the cluster efficiency and outsourcing and subcontractor efficiency or affect the exchange rate to create growth for the industry. Since world trade and GDP growth and change in the trade pattern of world trade can not be controlled or affected by individual shipyards, shipbuilding industry as a whole and public policies, it is out of the scope of policy suggestions.

4.3 Further Study Options and Suggestions

The problems in available data, lack of a single comprehensive data set and the data with low quality, has created important restrictions on this thesis and caused the quantitative method

utilized in the thesis be restricted to basic statistics. Although primary data is generated and utilized to test the arguments supported by the basic statistics, the strength of conclusions reached are limited by the quality of data and they are indicative in nature. Therefore, they need to be tested by quantitative studies. Thus, the first potential extension to this thesis is initially to construct data using this thesis as a guide to test the conclusion reached either partially or as a whole using state of art quantitative methods.

Another possible extension to this thesis is studying the link between the growth of Turkish commercial shipbuilding industry and the growth of world trade. The thesis identified the growth in world GDP and trade as the driver of the growth of the industry and attached special importance to growth of trade in petroleum products and chemical products as well as growth in semi-finished and finished products. However, it did not explore the relative importance of these product markets in contributing to the growth of Turkish shipbuilding industry. Moreover, these sectors can be divided further into other categories. Identification and testing relative importance of these sub-categories might improve the results of this thesis by providing a more detailed picture of the link.

A further extension is to investigate the characteristics of Tuzla cluster. The thesis identified the linkage between the growth of Turkish shipbuilding industry and the dynamics of Tuzla cluster. However, it did not focused on why the cluster failed to achieve some other potential sources such as the ones created by cooperation, solution to common problems and knowledge spillovers. Analyzing Tuzla as a cluster and explaining the existing characteristics might both contribute to explain the growth of the industry and to develop policies for future.

REFERENCES

- [1] Arjen van Klink. Cycles in industrial clusters: the case of the shipbuilding industry in the northern netherlands. *Tijdschrift voor Economische en Sociale Geografie*, 92(4):449–463, November 2001.
- [2] K.H.M. Knarvik and Frode Steen. Self-reinforcing agglomerations? an empirical industry study. Working papers, Norwegian School of Economics and Business Administration-, 1997.
- [3] Willem Winden and Luis Miguel Carvalho. Exploration and exploitation networks in space: The case of the shipbuilding cluster of turku in finland. In Ulf Matthiesen and Gerhard Mahnken, editors, *Das Wissen der Städte*, pages 379–392. VS Verlag für Sozialwissenschaften, 2009.
- [4] P. W. De Langen. Clustering and performance: the case of maritime clustering in the netherlands. *Maritime Policy and Management: The flagship journal of international shipping and port research*, 23(3):209–211, sep 2002.
- [5] Milford Bateman, Marija Kaštelan Mrak, and Maja Vehovec. Industrial restructuring and the promotion of small enterprise clusters : the case of the shipbuilding and repair industry in the republic of croatia. *Journal of Applied Management Studies*, 7(1):9–31, 1998.
- [6] Rebecca Achee Thornton and Peter Thompson. Learning from experience and learning from others: An exploration of learning and spillovers in wartime shipbuilding. *American Economic Review*, 91(5):1350 – 1368, 2001.
- [7] Technology Directorate for Science and Industry. Trade and structural adjustment: Embracing globalisation. Technical report, OECD, 2005.
- [8] Mark Wickham and Linda Hall. An examination of integrated marketing communications in the business to business environment: The case of the tasmanian light shipbuilding cluster. *Journal of Marketing Communications*, 12(2):95 – 108, 2006.
- [9] D. Todd. Strategies of growth, diversification and rationalization in the evolution of concentration in british shipbuilding. *Regional Studies*, 18(1):55–67, February 1984.
- [10] D. Todd. Industrial inertia versus relocation: A shipbuilding illustration. *The Professional Geographer*, 35(3):286–298, 1983.
- [11] Seizo Motora. A hundred years of shipbuilding in japan. *Journal of Marine Science and Technology*, 2(4):197, 1997.
- [12] C. Pitelis. Industrial strategy. *Journal of Economic Studies*, 21(5), 1994.
- [13] Koenig P.C. Synthesizing an approach to strategy and structure in heavy industry. *Engineering management journal*, 9(4):25–31, 1997.

- [14] Amrik S. Sohal and Bill Ferme. An analysis of the south korean automotive, shipbuilding and steel industries. *Benchmarking, An International Journal*, 3(2):15, 1996.
- [15] C.N.R.W. Greenwood. Globalization, maritime strategy, and the survival of the canadian marine industry. Technical report, CANADIAN FORCES COLLEGE NSSC 7, 2005.
- [16] Zhang Jiaguo. Outlook of china's shipbuilding industry and its demand for steel. Technical report, Economic Research Center of China Shipbuilding Industry Corporation, 2007.
- [17] MoLIT. Issues affecting the shipbuilding market. Technical report, Ministry of Land, Infrastructure and Transport, 2006.
- [18] Joe Sanderson. Opportunity and constraint in business-to-business relationships: insights from strategic choice and zones of manoeuvre. *Supply Chain Management: An International Journal*, 9(5):392–401, 2004.
- [19] Mark Wickham. The development of competitive industries: The role of state government actors. *Australian Journal of Public Administration*, 66(1):38, 2007.
- [20] Mark Beeson. Who pays the ferryman? industry policy and shipbuilding in australia. *Australian Journal of Political Science*, 32(3):437, 1997.
- [21] Jr. Pires, Floriano C. M. Shipbuilding and shipping industries: Net economic benefit cross-transfers. *Maritime Policy and Management*, 28(2):157 – 174, 2001.
- [22] David Glen. Shipbuilding disputes: the wto panel rulings and the elimination of operating subsidy from shipbuilding. *Maritime Policy and Management*, 33(1):1, 2006.
- [23] Carl Hamilton. Public subsidies to industry the case of sweden and its shipbuilding industry. Technical Report 566, World Bank, 1983.
- [24] John King. New directions in shipbuilding policy. *Marine Policy*, 23(3):191 – 205, 1999.
- [25] Matthew Flynn. Prc maritime and the asian financial crisis. *Maritime Policy and Management*, 26(4):337, 1999.
- [26] Simon Johnson, David Kotchen, and Gary W. Loveman. Complementarities and the managerial challenges of state enterprise restructuring: evidence from two shipyards. *Economics of Transition*, 4(1):31–42, 1996.
- [27] J. Mawson, K. Shaw, J. Tuppen, M. Andrews, S. Bradley, M. Campbell, S. Baldwin, M. Coombes, S. Openshaw, C. wong, and S. Raybould. Policy review section. *Regional Studies*, 27(3):251, 1993.
- [28] Joey Lee In Karp Cho. Shipbuilding, sectoral report on june 9. Technical report, Good-morning Shinhan Securities, 2008.
- [29] Jennifer Lee Martin Song. Korea industry analysis shipbuilding/shipping. Technical report, Woori Investment and Securities, Sep. 2008.
- [30] CESA. Global shipbuilding - demand and supply balance. Technical Report C/WP6(2006)25, Community of European Shipyards' Associations (CESA), December 2006.

- [31] Erik Ranheim. Tanker fleet phase out and newbuilding demand until 2015. Technical report, INTERTANCO, dec 2006.
- [32] Tim Kent. A view on world shipbuilding to 2015 and some technical challenges that may arise. Technical report, Lloyd's Register, 2006. C/WP6(2006)20.
- [33] Chinmay Gandre. Indian shipbuilding sector. Technical report, Asit C. Mehta Investment Intermediates, Sep. 2008.
- [34] KOSHIPA. The factors affecting the world shipbuilding supply and demand. Technical Report 41813255, Korean Shipbuilder's Association, 2008.
- [35] MoLIT. Japanese shipbuilding policy since 2001. Technical report, Ministry of Land, Infrastructure and Transport, 2006. C/WP6(2006)11.
- [36] MoLIT. Impact of international safety and environmental regulations on the shipbuilding industry. Technical report, Ministry of Land, Infrastructure and Transport, Japan, 2006.
- [37] WPON Shipbuilding. The impact of the new safety and environmental regulations on the shipbuilding industry. Technical report, Chinese Shipbuilding Delegation to OECD, 2006.
- [38] Boa Zhang Lu, Alan S. T. Tang. China shipbuilding management challenges in the 1980s. *Maritime Policy and Management*, 27(1):71, 2000.
- [39] K. Ohno. Exchange rate management in developing Asia. *Asian Development*, 1999.
- [40] Chia-Chan Chou and Pao-Long Chang. Core competence and competitive strategy of the taiwan shipbuilding industry, a resource-based approach. *Maritime policy and management*, 31(2):125–137, 2004.
- [41] G. P. F. Steed. The changing milieu of a firm, a case study of a shipbuilding concern. *Annals of the Association of American Geographers*, 58(3):506–525, 1968.
- [42] M. Vittanen, T. Karvonen, J. Vaiste, and H. Hernesniemi. The Finnish maritime cluster. *Technological Review*, 145:1–187, 2003.
- [43] Michael E. Porter. Clusters and the new economics of competition. *Harvard Business Review*, 76(6):77 – 90, 1998.
- [44] R. Martin and P. Sunley. Deconstructing clusters: chaotic concept or policy panacea? *Journal of Economic Geography*, 3(1):5, 2003.
- [45] Leroy P. Jones. The measurement of hirschmanian linkages. *Quarterly Journal of Economics*, 90(2):323 – 333, 1976.
- [46] J.W. McGilvray. Linkages, key sectors and development strategy. *Structure, system and economic policy*, pages 49–56, 1977.
- [47] Dan O'Donoghue and Bill Gleave. A note on methods for measuring industrial agglomeration. *Regional Studies*, 38(4):419–427, June 2004.
- [48] Joseph Beyene and Rahim Moineddin. On the location quotient confidence interval. *BMC Medical Research Methodology*, 5(1):32, 2005.

- [49] P. Miller, R. Botham, H. Gibson, R. Martin, and B. Moore. Business clusters in the uk—a first assessment, report for the department of trade and industry by a consortium led by trends business research, 2001.
- [50] R. Leigh. The use of location quotients in urban economic base studies. *Land Economics*, 46(2):202–205, 1970.
- [51] Council Working Party on Shipbuilding. Compensated gross ton (cgt) system. Technical report, OECD, 2007.
- [52] The Staff of IMF. World economic outlook recovery, risk and rebalancing. Technical report, IMF, 2010.

Appendix A

Focus Variables and Related Questions Asked to Interviewees

Table A.1: Questions Directed to GISBIR

No	Question - Description	Relevant Data	Shipbuilders Association (GISBIR)
1	Type of imported inputs	Level of Agglomeration	What shipbuilders import mostly?
2	Inputs from the suppliers out of the region of operation	Level of Agglomeration	Do your members purchase inputs from other regions?
3	Supply Chain in Turkish shipbuilding sector	Other - Industry Structure	Can you briefly describe the shipbuilding supply chain in Turkey?
4	Changes in the ratio of imports through the years	Level of Agglomeration	Can you explain the import pattern of shipyards and if it changed through time?
5	Changes in the locations of input providers	Level of Agglomeration	Can you explain the procurement pattern of shipyards and if it changed through time?
6	Advantage of Specialization in particular vessels	Degree of Specialization in Particular Niches	Do you observe any changes in the ships built? Can you describe which firms specializes in what types of vessels?

7	Degree of specialization in particular vessels	Degree of Specialization in Particular Niches	Do you think there is a trend for specialization among your members?
8	Interactions with other sectors	Level of Interaction with Other Sectors	Is there any long term cooperation with other agents in the sector among your members?
9	Usage of methods/processes developed in other sectors?	Level of Interaction with Other Sectors	Do your members use methods/processes developed in other sectors?
10	Similar skill usage with other sectors	Level of Interaction with Other Sectors	Which sectors your members transfer employees? Can you identify any pattern?
11	similar input usage with other sectors	Level of Interaction with Other Sectors	Does shipyards in Turkey shares inputs with other industries? IF yes can you explain which ones which inputs?
12	World GDP Growth	Growth of World GDP	Do you think growth of World GDP has a big effect on Turkish Shipbuilding Industry?
13	European GDP Growth	Growth of World GDP	Do you think European Growth is more important than World growth in explaining changes in shipbuilding volume?
14	Growth of World Trade	Growth of World Trade	Do you think growth of World Trade has a big effect on Turkish Shipbuilding Industry?
15	Growth of European Trade	Growth of World Trade	Do you think growth of European Trade has a big effect on Turkish Shipbuilding Industry?

16	Location Change in World Trade	Change in the Pattern of World Trade	When you consider the flags of new ships, can you observe a change?
17	Age of Fleet	Increase in the Average Age of National and International Fleet	Do you think the age of fleet is one of the reasons for the vessel demand? Is it true for domestic demand as well as foreign demand?
18	Exchange Rate	Exchange Rate	Do you think exchange rate is one of the variables affecting shipbuilding demand?
19	Exchange Rate	Exchange Rate	Which currency is more relevant in explaining the changes in demand for Turkish shipyards output?
20	Mergers and Acquisitions	Degree of Vertical Integration	Do you observe any vertical M&A activity among your members?
21	Variables All	Other - Variables	What are the basic reasons for the growth of shipbuilding industry?
22	Labor Demand	Other - Labor Demand	Do you think there is a change in Labor productivity over years?
23	Labor Demand	Other - Labor Demand	How the Union is perceived among shipyards? Is there a concrete impact of the Union in recent years?

Table A.2: Questions Directed to Chamber of Shipping

No	Question - Description	Relevant Data	Chamber of Maritime Trade
1	Supply Chain in Turkish shipbuilding sector	Other - Industry Structure	Do shipping companies in Turkey use the ships themselves or hire them to international companies more?
2	Advantage of Specialization in particular vessels	Degree of Specialization in Particular Niches	For which vessel types Turkish shipping companies prefer Turkish shipyards? What are the vessel types do they purchase from Turkish shipyards?
3	Degree of specialization in particular vessels	Degree of Specialization in Particular Niches	Which vessel type has the largest demand in the future and which vessels shipping companies prefer Turkish shipyards to specialize?
4	World GDP Growth	Growth of World GDP	Do you think growth of World GDP has a big effect on Turkish Shipbuilding Industry?
5	European GDP Growth	Growth of World GDP	What are the main determiners of the ship demand of your members?
6	Growth of World Trade	Growth of World Trade	In your opinion Is world trade one of the important variables for shipbuilding demand?
7	Growth of European Trade	Growth of World Trade	In your opinion Is European trade one of the important variables for shipbuilding demand?

8	Location Change in World Trade	Change in the Pattern of World Trade	When you consider the flags of new ships, can you observe a change?
9	Age of Fleet	Increase in the Average Age of National and International Fleet	How the average age of your members fleet over time?
10	Exchange Rate	Exchange Rate	Do you think exchange rate is one of the variables affecting shipbuilding demand?
11	Exchange Rate	Exchange Rate	Which currency is more relevant in explaining the changes in demand for Turkish shipyards output?
12	Mergers and Acquisitions	Degree of Vertical Integration	Is any of your members also engages in shipbuilding activities?

Table A.3: Questions Directed to State Planning Organization
Shipbuilding Commission

No	Question Description	Relevant Data	State Planning Organization, Shipbuilding Commission
1	Type of imported inputs	Level of Agglomeration	Can you explain the international trade pattern of Turkish shipbuilding Industry?
2	Inputs from the suppliers out of the region of operation	Level of Agglomeration	Can you identify a cluster in Turkey? If yes can you explain how the value chain is structured?
3	Supply Chain in Turkish shipbuilding sector	Other - Industry Structure	Can you briefly describe the shipbuilding supply chain in Turkey? Could you give examples of research or studies in Turkey on Turkish shipbuilding supply chain?
4	Changes in the ratio of imports through the years	Level of Agglomeration	Could you identify any changes in imports of the industry in your research?
5	Changes in the locations of input providers	Level of Agglomeration	Can you explain the procurement pattern of shipyards and if it changed through time?
6	Advantage of Specialization in particular vessels	Degree of Specialization in Particular Niches	Do you agree with the merits of specialization?
7	Degree of specialization in particular vessels	Degree of Specialization in Particular Niches	Do you observe such a trend in Turkish shipbuilding industry?
8	Interactions with other sectors	Level of Interaction with Other Sectors	Can you observe any interaction of shipyards with other sectors?

9	Usage of methods/processes developed in other sectors?	Level of Interaction with Other Sectors	Can you identify any similarity with other manufacturing industries to shipbuilding?
10	Similar skill usage with other sectors	Level of Interaction with Other Sectors	Have you made or read any research on Labor structure of the industry? Can you identify any pattern?
11	similar input usage with other sectors	Level of Interaction with Other Sectors	Does shipyards in Turkey shares inputs with other industries? IF yes can you explain which ones which inputs?
12	World GDP Growth	Growth of World GDP	Have you find any relation between World GDP growth and Turkish shipbuilding industry
13	European GDP Growth	Growth of World GDP	Have you find any relation between European GDP growth and Turkish shipbuilding industry
14	Growth of World Trade	Growth of World Trade	Do you know any study establishing connection between world trade and shipbuilding growth
15	Growth of European Trade	Growth of World Trade	Do you know any study establishing connection between European trade and shipbuilding growth
16	Age of Fleet	Increase in the Average Age of National and International Fleet	Can you explain the behavior of the average age of your fleet?

17	Exchange Rate	Exchange Rate	Can you explain how the exchange rate in dollar and Euro terms affects shipbuilding output?
18	Exchange Rate	Exchange Rate	Is it Dollar or Euro which is used more in the reports investigating the relation between exchange rate and output of Turkish shipyards?
19	Mergers and Acquisitions	Degree of Vertical Integration	Do you observe any vertical M&A activity among Turkish shipyards?
20	Variables All	Other - Variables	What are the main variables explaining the growth of shipbuilding industry suggested by your researches?
21	Labor Demand	Other - Labor Demand	Have you observed any change in labor productivity over years?

Table A.4: Questions Directed to Undersecretariat of Maritime Affairs

No	Question - Description	Relevant Data	Undersecretariat of Maritime Affairs
1	Type of imported inputs	Level of Agglomeration	Can you explain the international trade pattern of Turkish shipbuilding Industry?
2	Inputs from the suppliers out of the region of operation	Level of Agglomeration	Can you identify a cluster in Turkey? If yes can you explain how the value chain is structured?
3	Supply Chain in Turkish shipbuilding sector	Other - Industry Structure	Can you briefly describe the shipbuilding supply chain in Turkey? Could you give examples of research or studies in Turkey on Turkish shipbuilding supply chain?
4	Changes in the ratio of imports through the years	Level of Agglomeration	Have you received any application or request from shipyards about importing particular goods?
5	Changes in the locations of input providers	Level of Agglomeration	Can you explain the procurement pattern of shipyards and if it changed through time?
6	Advantage of Specialization in particular vessels	Degree of Specialization in Particular Niches	Do you agree with the merits of specialization?
7	Degree of specialization in particular vessels	Degree of Specialization in Particular Niches	Do you observe such a trend in Turkish shipbuilding industry?

8	Interactions with other sectors	Level of Interaction with Other Sectors	Is there any mergers or acquisitions you have been informed?
9	Similar skill usage with other sectors	Level of Interaction with Other Sectors	Can you identify any pattern in labor structure?
10	similar input usage with other sectors	Level of Interaction with Other Sectors	Does shipyards in Turkey shares inputs with other industries? IF yes can you explain which ones which inputs?
11	World GDP Growth	Growth of World GDP	Do you think growth of World GDP has a big effect on Turkish Shipbuilding Industry?
12	European GDP Growth	Growth of World GDP	Do you think growth of European GDP has a big effect on Turkish Shipbuilding Industry?
13	Growth of World Trade	Growth of World Trade	Do you know any study establishing connection between world trade and shipbuilding growth
14	Growth of European Trade	Growth of World Trade	Do you know any study establishing connection between European trade and shipbuilding growth
15	Location Change in World Trade	Change in the Pattern of World Trade	When you consider the flags of new ships, can you observe a change?
16	Age of Fleet	Increase in the Average Age of National and International Fleet	Can you explain the behavior of the average age of your fleet?

17	Exchange Rate	Exchange Rate	Can you explain how the exchange rate in dollar and Euro terms affects shipbuilding output?
18	Exchange Rate	Exchange Rate	Is it Dollar or Euro which is used more in the reports investigating the relation between exchange rate and output of Turkish shipyards?
19	Mergers and Acquisitions	Degree of Vertical Integration	Do you observe any vertical M&A activity among Turkish shipyards?
20	Variables All	Other - Variables	What are the main variables explaining the growth of shipbuilding industry suggested by your researches?
21	Labor Demand	Other - Labor Demand	Have you observed any change in labor productivity over years?

Table A.5: Questions Directed to Shipbuilders

No	Question - Description	Relevant Data	Shipbuilders
1	Type of imported inputs	Level of Agglomeration	Can you inform us about the type of inputs you import?
2	Inputs from the suppliers out of the region of operation	Level of Agglomeration	Do you purchase inputs from the suppliers out of the region you operate?
3	Supply Chain in Turkish shipbuilding sector	Other - Industry Structure	Do you buy each input and process in the yard or do you buy intermediate goods from intermediators?
4	Changes in the ratio of imports through the years	Level of Agglomeration	Can you identify any changes in the ratio of imports through the years?
5	Changes in the locations of input providers	Level of Agglomeration	Can you identify any changes in the locations of your input providers?
6	Advantage of Specialization in particular vessels	Degree of Specialization in Particular Niches	It is told that Turkish shipyards needs to specialize in several niches. Do you agree?
7	Degree of specialization in particular vessels	Degree of Specialization in Particular Niches	Do you think there is a trend for specialization in your company?
8	Interactions with other sectors	Level of Interaction with Other Sectors	Can you observe an interaction with other sectors through time
9	Usage of methods/processes developed in other sectors?	Level of Interaction with Other Sectors	Do you use methods/processes developed in other sectors?

10	Similar skill usage with other sectors	Level of Interaction with Other Sectors	Have you ever worked in other sectors? If you did which sectors?
11	similar input usage with other sectors	Level of Interaction with Other Sectors	Do you use the same inputs with other industries?
12	World GDP Growth	Growth of World GDP	Do you think growth of World GDP has a big effect on Turkish Shipbuilding Industry?
13	European GDP Growth	Growth of World GDP	Do you think European Growth is more important than World growth in explaining changes in shipbuilding volume?
14	Growth of World Trade	Growth of World Trade	Do you think growth of World Trade big effect on Turkish Shipbuilding Industry?
15	Growth of European Trade	Growth of World Trade	Do you think increase in European trade is more important than World trade volume in explaining changes in shipbuilding volume?
16	Location Change in World Trade	Change in the Pattern of World Trade	Is there a change in the countries of your customers? If yes can you explain how?
17	Age of Fleet	Increase in the Average Age of National and International Fleet	Do you observe any effect of the age of fleet on the demand for your shipyard?
18	Exchange Rate	Exchange Rate	Are you affected by the changes in exchange rates?
19	Exchange Rate	Exchange Rate	Do you use Dollar or Euro more?

20	Mergers and Acquisitions	Degree of Vertical Integration	Do you know any firms merged with or acquired a firm in steel, machine etc similar relevant industries?
21	Labor Demand	Other - Labor Demand	Have you observed any change in labor productivity over years?
22	Labor Demand	Other - Labor Demand	Do you think the Union has any impacts on your activities?

Table A.6: Questions Directed to Shipbuilding Magazines

No	Question - Description	Relevant Data	Magazine
1	Inputs from the suppliers out of the region of operation	Level of Agglomeration	which Turkish intermediate good producers give advertisement in your magazine. Can you identify any pattern from the advertisement requests?
2	Supply Chain in Turkish shipbuilding sector	Other - Industry Structure	Can you tell us the outputs of your customers?
3	Changes in the ratio of imports through the years	Level of Agglomeration	Is there any recent foreign input suppliers giving advertisements to your magazine?
4	Changes in the locations of input providers	Level of Agglomeration	Is there any changes in the companies purchasing advertisement from your magazine?

Table A.7: Questions Directed to Labor Unions

No	Question - Description	Relevant Data	Labor Union
1	Supply Chain in Turkish shipbuilding sector	Other - Industry Structure	Which sectors workers can be members of your union?
2	Advantage of Specialization in particular vessels	Degree of Specialization in Particular Niches	Can you describe practical impacts of such a specialization on labor?
3	Interactions with other sectors	Level of Interaction with Other Sectors	Can you describe practical impacts of such a M&A on labor?
4	Similar skill usage with other sectors	Level of Interaction with Other Sectors	Are your members first time union members or did they come from other unions?
5	Mergers and Acquisitions	Degree of Vertical Integration	Can you describe practical impacts of such a M&A on labor?
6	Labor Demand	Other - Labor Demand	How the employment changes over time? Can you observe any pattern to labor?
7	Labor Demand	Other - Labor Demand	How the number of your members change over time? Is there a pattern?

Table A.8: Questions Directed to Academicians

No	Question - Description	Relevant Data	Academicians, Istanbul Technical University
1	Type of imported inputs	Level of Agglomeration	What do Turkish shipbuilders import and what are the source countries?
2	Inputs from the suppliers out of the region of operation	Level of Agglomeration	Can you identify any linkages in Tuzla among the shipyards and other firms?
3	Supply Chain in Turkish shipbuilding sector	Other - Industry Structure	Can you briefly describe the shipbuilding supply chain in Turkey? Could you give examples of research or studies in Turkey on Turkish shipbuilding supply chain?
4	Changes in the ratio of imports through the years	Level of Agglomeration	Can you identify any changes in the structure of imports in the industry?
5	Changes in the locations of input providers	Level of Agglomeration	Can you explain the procurement pattern of shipyards and if it changed through time?
6	Advantage of Specialization in particular vessels	Degree of Specialization in Particular Niches	Do you agree with the merits of specialization?
7	Degree of specialization in particular vessels	Degree of Specialization in Particular Niches	Do you observe such a trend in Turkish shipbuilding industry?
8	Interactions with other sectors	Level of Interaction with Other Sectors	Can you observe any interaction of shipyards with other sectors?

9	Similar skill usage with other sectors	Level of Interaction with Other Sectors	Have you made or read any research on Labor structure of the industry?
10	similar input usage with other sectors	Level of Interaction with Other Sectors	Does shipyards in Turkey shares inputs with other industries? IF yes can you explain which ones which inputs?
11	World GDP Growth	Growth of World GDP	Do you think growth of World GDP has a big effect on Turkish Shipbuilding Industry?
12	European GDP Growth	Growth of World GDP	Do you think European Growth is more important than World growth in explaining changes in shipbuilding volume?
13	Growth of World Trade	Growth of World Trade	Do you know any study establishing connection between world trade and shipbuilding growth
14	Growth of European Trade	Growth of World Trade	Do you know any study establishing connection between European trade and shipbuilding growth
15	Location Change in World Trade	Change in the Pattern of World Trade	Do you observe any impacts due to the rise of China and India and relocation of world manufacturing?
16	Age of Fleet	Increase in the Average Age of National and International Fleet	Do you think average age of fleet is one of the variables affecting shipbuilding demand?

17	Exchange Rate	Exchange Rate	Do you think exchange rate is one of the variables affecting shipbuilding demand?
18	Exchange Rate	Exchange Rate	Is it Dollar or Euro which is used more in the reports investigating the relation between exchange rate and output of Turkish shipyards?
19	Mergers and Acquisitions	Degree of Vertical Integration	Do you observe any vertical M&A activity among Turkish shipyards?
20	Variables All	Other - Variables	What are the main variables explaining the growth of shipbuilding industry suggested by your researches?
21	Labor Demand	Other - Labor Demand	Have you observed any change in labor productivity over years?

Appendix B

Observations Made From Semi Structured Interviewees

Table B.1: Observations Made From Semi Structured Interviewees

No	Statement	Related Focus variable	Other Variable
1	Now except in 2 shipyards wages are frozen	N.A.	Union Membership
2	Members of 14th job branch can join the union	N.A.	Union Membership
3	Now except in 2 shipyards wages are frozen	N.A.	Wage Rates
4	In common agreement we agreed to increase the wages equal to inflation but wages are frozen	N.A.	Wage Rates
5	However, there was a decrease in the salary of non-union engineers up to 40%	N.A.	Wage Rates
6	The employment fall from 40.000 to 9.000 from 2008 to 2010	N.A.	Employment
7	There is no mergers and acquisitions in the sector	Vertical Integration	Integration
8	New members are young aged 20 to 25 coming from Anatolia	Level of Interaction with Other Sectors	Employment

9	Most of these people have no other job and their unemployment salaries about to expire soon	N.A.	Employment
10	Most of the laid offs turned back to their villages	N.A.	Employment
11	We trained some of the workers for 3 months	N.A.	Worker Training
12	The crises affected all shipyards even the top one:	N.A.	Crises
13	Most of the methods of management remained the same during the boom years	N.A.	Management Capacity
14	From 2002 to 2008 number of members are increased by 2000 from 5500 to 7500 but we lost all of them after 2008	N.A.	Union Membership
15	Banks used to watch the shipyards to give credits but now there is none around	N.A.	Finance
16	During the boom years new machines are purchased, rather than labor machines are used and even manufacturing line was started	N.A.	Production Method
17	Most of laid offs passed to other sectors most probably never to return. So we lost 5 years of training and skill improvements	N.A.	Skills
18	The growth of world economy is the determining factor Turkish economy has no role.	World GDP Growth	World GDP
19	Only 2 of the shipyards, SEDEF and RMK are a member of Big Corporations, other has no relation with other firms	Vertical Integration	N.A.
20	Military projects help a little bit to keep some shipyards busy	N.A.	Demand

21	In 2001 we used to use only 10% of available capacity but in 2008 it was 90%	N.A.	Capacity Usage
22	Turkish started to give orders to outside because they want to have bigger ships	World GDP Growth	Turkey GDP
23	Foreign shipyards might built a 30 mil Euro ship just for 25 millions	N.A.	Comparative Costs
24	Only 1% of the laid off will turn to shipbuilding again	N.A.	Skills
25	One solution to keep the industry alive is shifting the orders of Turkish shippers to Turkey	Suggestion	N.A.
26	Repairing shipyards will be better relatively	N.A.	Ship Repairing Sector
27	Government at least might postpone payment of utility bills	Suggestion	N.A.
28	The members are from shipyards and their subcontractor	N.A.	Union Membership
29	95% of our members work in subcontractor	N.A.	Union Membership
30	Using subcontractor increasing is a method to decrease costs and transfer SHE risks and liabilities	N.A.	Cost
31	After December 2009 shipbuilding stopped.	N.A.	Orders
32	New ships are ordered to China	N.A.	Comparative Costs
33	Since repairing requires much less labor employment has stopped	N.A.	Employment
34	Until 1992 we were a part of DOK-IS.	N.A.	Union Membership

35	Until 2002 workers usually went to DOK-IS after that our numbers started increase more	N.A.	Union Membership
36	DOK-IS took shipyard workers we usually got subcontractor members	N.A.	Union Membership
37	There was a small continuous increase in our membership until the crises	N.A.	Union Membership
38	Crises caused a huge unemployment. Some of them went to villages some of them moved to steel construction	Level of Interaction with Other Sectors	Employment
39	Most workers are temporary workers now	N.A.	Employment
40	Since lack of training was not the reason for accidents, training did not affect the accidents	N.A.	Skills
41	Trainings provided are quite bad. It has nothing to do with actual work	N.A.	Skills
42	All technical staff are certificate holders in shipyards	N.A.	Skills
43	Our safety trainings are ineffective	N.A.	Skills
44	New workers coming were originated in some areas (Kastamonu, Eregli, Sivas and Kurdish Villages)	N.A.	Employment
45	The quality of trainers are low	N.A.	Skills
46	There are lots of skilled workers unemployed	N.A.	Employment
47	Most of our members are first time union members	Level of Interaction with Other Sectors	Employment
48	After 2008 number of members decreased substantially	N.A.	Union Membership

49	The origin of the worker has no relation with the wage	N.A.	Wage Rates
50	Until 2008 shipyards used to same methods all the time. But from 2008 on there are changes in production. But now due to crises every they are in vain	N.A.	Production Method
51	Some wages decreased to half and over times are now common	N.A.	Wage Rates
52	Only shipyards themselves give advertisements no subcontractor gives ads	Degree of Vertical Integration	Advertisement
53	The ones who gives most ads are machinery sellers. No producers.	N.A.	Advertisement
54	Ship Liners and sometimes sub industry firms give ads as well	N.A.	Advertisement
55	No foreign input producer give ads	N.A.	Advertisement
56	There is no change in advertisement patterns	N.A.	Advertisement
57	Ads depend on the idea of managers. If they like ads they give if they do not they don't give	Management Capacity	Advertisement
58	No foreign input producer give ads	N.A.	Advertisement
59	Our sales are constant.	Management Capacity	Advertisement
60	No foreign input producer give ads	N.A.	Advertisement
61	The biggest imports are steel plates from Ukraine and India with US dollars. However we buy steel from Turkey too.	Exchange Rate	N.A.
62	The biggest imports are steel plates from Ukraine and India with US dollars. However we buy steel from Turkey too.	Level of Interaction with Other Sectors	Inputs

63	Second import type is machinery	Level of Interaction with Other Sectors	Inputs
64	Tuzla, Çanakkale, Yalova and Kocaeli import from same sources	Level of Interaction with Other Sectors	Inputs
65	Most of the distributors are located in Tuzla	Level of Agglomeration	N.A.
66	Imports of machinery made through distributors	N.A.	Supply Chain
67	Nobody knows the value added by Turkish shipyards	N.A.	Value Added
68	Supply chain depends on the contract. Most of the case ship liner uses shipyard as a subcontractor and design the input suppliers etc.	Degree of Vertical Integration	Supply Chain
69	there is no change in procurement pattern	N.A.	Supply Chain
70	Chemical tanker production is common. But usually types of ships produces changes	Specialization in Particular Niches	N.A.
71	RMK, Dearsan and Anatolia is the most specialized ones but they produce diversified ships	Specialization in Particular Niches	N.A.
72	But currently there is no production	N.A.	Crises
73	I do not think there is important degree specialization	Specialization in Particular Niches	N.A.

74	There is almost no cooperation between shipyards. Before crises all of them were full now no production so nothing to cooperate	Level of Interaction with Other Sectors	Cooperation
75	Sometimes painting team comes as a subcontractor they can also in other sectors.	Level of Interaction with Other Sectors	Inputs
76	SEDEF automated its processing	N.A.	Production Method
77	Usually workers are trained from scratch, they do not come from other sectors	Level of Interaction with Other Sectors	Employment
78	Shipbuilders are mostly only shipbuilders. They are not part of a big group.	Degree of Vertical Integration	N.A.
79	Shipyards does not cooperate with other sectors in purchasing the inputs	Level of Interaction with Other Sectors	Cooperation
80	World commodity market growth is our only hope	World GDP Growth	World Trade
81	We usually sell to Europe	World GDP Growth	EU Growth
82	I see no difference between European growth and world. But we respond more to world growth I think	World GDP Growth	Comparison
83	Because of the Petrobras's purchases of local ships Brazil will become an important player. China of course is leading.	N.A.	World Actors
84	Usually cheap flags are preferred for ships build in Turkey	pattern of world trade	Flags
85	Greek ship liners usually come to repair their ship in Turkey	N.A.	Ship Repairing Sector

86	Our shipping companies order new ships from China	N.A.	Turkish Shipping Companies
87	I do not think age of fleet is important	Age of Fleet	N.A.
88	It only affects the repairing industry	Age of Fleet	Ship Repairing Sector
89	Prices of inputs are much more important than exchange rates in the past I think. One tonnes of steel was 1600 dollar now it is 600.	Exchange Rate	N.A.
90	We cant say that Euro is more important cause we usually use dollar	Exchange Rate	N.A.
91	There is no mergers or acquisitions in the sector	N.A.	Integration
92	The increase in world trade is the most important reason for the growth of Turkish shipbuilding industry	World GDP Growth	World Trade
93	There was an improvement in labor productivity	N.A.	Labor Productivity
94	Second reason for the growth of Turkish shipyards is proximity to Europe	N.A.	Location
95	I do not have any information on how unions are perceived by producers.	N.A.	Union Membership
96	But sometimes foreign financed media creates wrong information. Actually the number of accidents per worker is lower than Norway.	N.A.	Media
97	I do not know how we can solve the current problem. Unfortunately until the balance of demand and supply established we cant to anything	Suggestion	N.A.

98	Net value added produced in Turkey is 31% (21 % for labor and 10% for gross profit)	N.A.	Value Added
99	70% of the cost of the ship is materials and machinery	N.A.	Production Method
100	65% of the materials used are produced in Turkey	N.A.	Value Added
101	50% of the demand of Turkish shipping companies are local. (depending on tonnage between 30% to 70%)	N.A.	Turkish Shipping Companies
102	Main components of ships are imported.	increase in Firm Size	Supply Chain
103	The problems for producing inputs in Turkey are 1) Intellectual Property 2) Certification 3) Maintenance Support	Level of Interaction with Other Sectors	Inputs
104	Tuzla is really a developed cluster. It is quite distinctive in the World	Level of Agglomeration	
105	The management style and structure of Turkish shipyards are different	N.A.	Management Capacity
106	The only world scale shipyard is Pendik	N.A.	Shipyards
107	Tuzla competes with European shipyards not with Asians. So its future depends on their performance	N.A.	Competitor
108	Yalova needs to improve its problems. First it need to fix its backyard (infrastructure, housing problem)	Level of Agglomeration	N.A.
109	Yalova is designed as a supportive place where the ships are constructed and then brought to Tuzla for hardware	Level of Agglomeration	N.A.

110	Until 2009 Subsidy Certificate (Tesvik Belgesi) was given to individual shipping companies. So they used to arrange the design using the shipyards as subcontractor	N.A.	Supply Chain
111	I completely agree with the merits of specialization	Specialization in Particular Niches	N.A.
112	After 2009 shipyards started Turnkey production	N.A.	Production Method
113	Japan and South Korea has their own niches. Turkey is the world leader in chemical tankers between 1k to 20k dwt tankers	Specialization in Particular Niches	N.A.
114	One problem with the specialization is the changes in the markets. Now dry bulk is going to be the next thing	Specialization in Particular Niches	N.A.
115	New legislation on double hull requirement was one of the reasons for Turkey become an important player	Changes in Legislative Frameworks	N.A.
116	Some shipyards specialize. Proteksan on Yachts, Uzman on tugboats, RMK, Dearsan and Yildiztekne on Military Ships.	Specialization in Particular Niches	N.A.
117	Tuzla itself is a brand	Level of Agglomeration	N.A.
118	In 2000 we have applications for 128 new shipyards and 15-20 of them are constructed. Also some shipyards became small ship workshops after a legislative change	N.A.	Shipyards
119	The financial crises affected shipbuilding sector a lot. Now everyone is waiting	N.A.	Crises

120	In 2000 there were 13.000 employees all of whom are skilled. After the boom the number jumped suddenly and we could not provide enough training	N.A.	Skills
121	Another trend is the increase in the use of subcontractor. It caused the productivity decrease cause they employ less skilled cheap labor	N.A.	Employment
122	The craziness of shipbuilders to growth caused us and Giber not to catch up with the number of increase in the workers	N.A.	Skills
123	Shipyards are not allowed to any other activities	Degree of Vertical Integration	N.A.
124	Shipyards demands some freedom but has none yet	Degree of Vertical Integration	N.A.
125	Shipyards are not allowed to any other activities	Level of Interaction with Other Sectors	Cooperation
126	Shipyards demands some freedom but has none yet	Level of Interaction with Other Sectors	Cooperation
127	Yes. I am sure that growth of world gap has an impact on the growth	World GDP Growth	World GDP
128	I do not agree EU being more important. I think shipbuilding market is a single world market	World GDP Growth	Comparison
129	Fast growth of Turkish shipyards disturbed some European ones and they tried to finance news on accidents in Tuzla	N.A.	Media

130	Yes European growth is another reason for the growth of Turkish shipbuilding industry	World GDP Growth	EU Growth
131	There is no change in flags	pattern of world trade	Flags
132	IMO discusses to enact new standards to help the sector	N.A.	Changes in Legislative Frameworks
133	We are too weak in IMO. We could not send the same expert to IMO more than 2 times yet.	N.A.	International
134	exchange rate is quite important for the growth	Exchange Rate	
135	There is no difference between Euro and Dollar	Exchange Rate	
136	I observed no Merger and acquisition activity	N.A.	Integration
137	I think the most important reason explaining the growth is the cycle in the industry	N.A.	Cycle of Shipbuilding Industry
138	30% or 40% of new demand was speculative. That is one of the reasons for the crises	N.A.	Crises
139	Increase in oil prices is another reason for growth	World GDP Growth	World Trade
140	We were too slow to make shipyards master plans. It became on recently but now crises came	N.A.	Government Support
141	Labor productivity decreased due to sudden boom	Wage Rates	N.A.

142	One of the advantages of Turkish shipyards they work in every level of production process	N.A.	International
143	the first impact of improving world trade is observed in shipbuilding industry	World GDP Growth	World Trade
144	If Turkish shipyards can survive this crises then they have quite bright prospects	N.A.	International
145	Shipyards are still managed traditionally. They need to be institutionalized	N.A.	Management Capacity
146	But there is a small progress in institutionalization	N.A.	Management Capacity
147	there was a lot of cancelation of contracts	N.A.	Crises
148	No shipyard has a plan B	N.A.	Management Capacity
149	Shipyards owners are not good managers. Since they become rich for the first time they were quite inexperienced in using their surplus	N.A.	Management Capacity
150	Some big investors entered to sector recently	N.A.	Entrance to Sector
151	Recently some cooperation between shipping companies, shipbuilders happened	Level of Interaction with Other Sectors	Cooperation
152	Recently some cooperation between shipping companies, shipbuilders happened	Degree of Vertical Integration	N.A.
153	Credit availability is quite substantial I shipbuilding	Finance	Availability of Cheap Credit
154	Brazil, Vietnam, Philippines are new competitions of Turkey	N.A.	International

155	European countries secretly subsidized their shipbuilding industries like Netherlands	N.A.	International
156	we can not compete with far east	N.A.	International
157	Currently the policy is let the weak die, survivors are ours	N.A.	Government Support
158	There is a slight improvement in machinery production but most of them are imported	Level of Interaction with Other Sectors	Inputs
159	One problem of Tuzla was lack of land	N.A.	Constraints
160	The capacity usage was near 10% until 2003	N.A.	Production Method
161	World trade growth is quite important for shipbuilding industry	World GDP Growth	World Trade
162	Number of shipyards climbed to 60 from 30.	N.A.	Shipyards
163	Both shipping and shipbuilder might buy the inputs	Degree of Vertical Integration	N.A.
164	After 2009 crises the number of employed people decreased to 15.000 from 35.000	N.A.	Employment
165	Specialization is one of the reasons for the success of Turkish shipbuilding	Specialization in Particular Niches	N.A.
166	We can not compete with far east due to their low labor costs	N.A.	Wage Rates
167	But specialization is not so deep. If there is no order than accepts anything	Specialization in Particular Niches	N.A.

168	Sometimes small shipyards are bought by large ones. But there is no integration or merging	N.A.	Integration
169	Subcontractor brought a lot of workers from east	N.A.	Employment
170	Turkish legislation forbid shipyards to any other activity	Level of Interaction with Other Sectors	Cooperation
171	Since the sector exports more to Europe, Europe is more important	World GDP Growth	Comparison
172	Yalova municipality provides education	N.A.	Skills
173	A lot of people benefited land subsidies and subsidy for preparing plans for Yalova shipyard area	N.A.	Government Support
174	Netherlands is quite important.	World GDP Growth	EU Growth
175	I think age of fleet is an important reason for shipbuilding demand	Age of Fleet	
176	Exchange rate is important only in buying steel plates	Exchange Rate	
177	Sometimes foreign input provides sell the steel it produced for you to others	Level of Interaction with Other Sectors	Inputs
178	Dollar is more common in transactions	Exchange Rate	
179	Since shipping companies prevent shipyards can not institutionalize	N.A.	Management Capacity
180	Skills of workers is an important reason for the growth of Turkish shipbuilding industry	N.A.	Skills

181	All machinery are imported	Level of Interaction with Other Sectors	Inputs
182	Value added in turkey is 65%	N.A.	Value Added
183	We are good at design	N.A.	Supply Chain
184	Tuzla can be classified as a cluster	Level of Agglomeration	
185	I think most shipyards will turn to small scale production in Tuzla	N.A.	Firm Size
186	Bulgaria, Romania and Russian can be our competitions	N.A.	International
187	One of the problems of Yalova is buying agricultural land since it is regulated by special law	Level of Agglomeration	Shipyards
188	Crises came before we expected. We though it will be in 2014 but US financial crises make it happen earlier	N.A.	Crises
189	Since subcontractors are common wages are quite different	N.A.	Wage Rates
190	We created a database but entering data is a problem for us	Changes in Legislative Frameworks	
191	Municipalities usually see shipbuilding as a source of rent	N.A.	Government Support
192	We do not know trade pattern of Turkish shipyards	Level of Interaction with Other Sectors	Inputs
193	Tuzla can be a cluster cause secondary industry is quite developed there	Level of Agglomeration	N.A.

194	We do not know Supply chain for Turkish shipbuilding industry	Level of Interaction with Other Sectors	Inputs
195	We agree to the merits of specialization.	Specialization in Particular Niches	N.A.
196	We prepared a report suggesting that Turkish shipyards should position themselves to supply ships to Europe and Yachts, Ro-Ro and Ferries can be potentials	Specialization in Particular Niches	N.A.
197	We observe a trend for specialization since the trend is towards there	Specialization in Particular Niches	N.A.
198	I think there is an agreement between Isdemir and shipbuilders	Level of Interaction with Other Sectors	Cooperation
199	I do not think there is a similar industry to shipbuilding	Level of Interaction with Other Sectors	Cooperation
200	Turkish shipbuilding industry is quite labor intensive	N.A.	Wage Rates
201	since subcontractors are common productivity of workers are quite low	N.A.	Skills
202	temporary contracts are the common method preventing knowledge accumulation	N.A.	Skills
203	I think World is more important than Europe cause Europeans sell to world	World GDP Growth	Comparison
204	I think age of fleet is not important cause Turkish shipping companies are reluctant in retiring old ships	Age of Fleet	

205	Also Turkish shipping companies orders to foreign shipyards	N.A.	International
206	But I think the age of world fleet is an important variable	Age of Fleet	
207	I do not think that dollar is effective. Euro is more	Exchange Rate	
208	I do not observe any merger. I do not know actually	N.A.	Firm Size
209	I think world trade is the most important reason for growth in Turkish shipbuilding Industry	World GDP Growth	World Trade
210	IMO regulation is the second important reason for growth	N.A.	Changes in Legislative Frameworks
211	Shipbuilding market is cyclical	N.A.	Cycle of Shipbuilding Industry
212	There are too many small shipyards in Turkey. I do not think they are efficient	N.A.	Firm Size
213	Firms size needs to be increased, a Turkish brand needs to be created, markets needs to be analyzed, training workers are important	Suggestion	N.A.
214	75% of shipbuilding activities of in Turkey are in Tuzla	Level of Agglomeration	N.A.
215	We buy most of our small items and machinery in Tuzla. Steel comes outside	Level of Agglomeration	N.A.
216	Inputs are provided by Tuzla. We purchase only tools and other small equipments from here.	Level of Agglomeration	N.A.

217	Turkey is the leader in Chemical tankers up to 30000 dwt.	Specialization in Particular Niches	N.A.
218	We produced chemical tankers and tanker mostly	Specialization in Particular Niches	N.A.
219	we are an important container ship producer in Europe	Specialization in Particular Niches	N.A.
220	I do not think there is any cooperation with other industries	Level of Interaction with Other Sectors	Cooperation
221	The cooperation with other layers of supply chain is quite restricted	Level of Interaction with Other Sectors	Cooperation
222	We have some reliable suppliers but we purchase tools from different firms	Level of Interaction with Other Sectors	Inputs
223	We do not have a permanent contract with distributors or foreign firms	Level of Interaction with Other Sectors	Inputs
224	Usually important part of the procurement made by shipping company	Level of Interaction with Other Sectors	Inputs