ANALYSIS OF THE RELATIONSHIP BETWEEN DEFENCE AND CIVIL INDUSTRIES: POLICY RECOMMENDATIONS FOR TURKEY

A THESIS SUBMITTED TO
THE GRADUATE SCHOOL OF SOCIAL SCIENCES
OF
MIDDLE EAST TECHNICAL UNIVERSITY

BY

FERİDÜDDİN EMRE ERDOĞAN

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR
THE DEGREE OF MASTER OF SCIENCE
IN
THE DEPARTMENT OF SCIENCE AND TECHNOLOGY POLICY STUDIES

NOVEMBER 2020

Approval of the thesis:

ANALYSIS OF THE RELATIONSHIP BETWEEN DEFENCE AND CIVIL INDUSTRIES: POLICY RECOMMENDATIONS FOR TURKEY

submitted by **FERİDÜDDİN EMRE ERDOĞAN** in partial fulfillment of the requirements for the degree of **Master of Science in Science and Technology Policy Studies, the Graduate School of Social Sciences of Middle East Technical University** by,

Prof. Dr. Yaşar KONDAKÇI
Dean
Graduate School of Social Sciences _____

Prof. Dr. M. Teoman PAMUKÇU
Head of Department
Science and Technology Policy Studies _____

Prof. Dr. Erkan ERDİL
Supervisor
Department of Economics _____

Dr. E. Serdar GÖKPINAR
Co-Supervisor
Technology Development Foundation of Turkey (TTGV) _____

Examining Committee Members:

Prof. Dr. M. Teoman PAMUKÇU (Head of the Examining Committee)
Middle East Technical University
Science and Technology Policy Studies _____

Prof. Dr. Erkan ERDİL (Supervisor)
Middle East Technical University
Department of Economics _____

Assist. Prof. Dr. Emek Barış KEPENEK
Başkent University
Department of Sociology _____

I hereby declare that all information in this document has been obtained and presented in accordance with academic rules and ethical conduct. I also declare that, as required by these rules and conduct, I have fully cited and referenced all material and results that are not original to this work.

Name, Last name : Feridüddin Emre ERDOĞAN

Signature :

ABSTRACT

ANALYSIS OF THE RELATIONSHIP BETWEEN DEFENCE AND CIVIL INDUSTRIES: POLICY RECOMMENDATIONS FOR TURKEY

ERDOĞAN, Feridüddin Emre

M.S., The Department of Science and Technology Policy Studies

Supervisor : Prof. Dr. Erkan ERDİL

Co-Supervisor: Dr. E. Serdar GÖKPINAR

November 2020, 186 pages

Nations have been putting great efforts in developing their defence industry, and it is usually located in the centre of their internal and international policies. Increase in defence expenditures necessitate to create rational, durable and sustainable connections between defence and civil industries. Defence industry contributes to the development of absorptive capacity of a nation by promoting the high-end and unique discoveries and facilitating the process of learning. Today the current technological diffusion between defence and civil industries is two-sided and civil industries are increasing their share in knowledge generation compared to the past. Thus, dual-use applications become crucial for commercialization and utilization to achieve mutual growth. Main objective of this study is to bring light on three points: determination of the relations between defence and civil industries, the evaluation of defence industry's effect on civil industries and the revealing of best practices for beneficial inter-industry collaboration. Methodology of this study is based on the qualitative approach. The research data is collected via qualitative semi-structured interviews that is conducted

with twenty-one participants from three domestic target groups selected by quota sampling method. The data gathered from interviews are analysed through the data-driven coding process in three stages. This study includes up-to-date policy recommendations for strengthening the relationship between defence and civil industries based on rational analyses and best practice examinations for policymakers in Turkey. As a result, this study suggests five ways for establishing valuable relation mechanisms between industries and seven methods for updating defence industrial and technological base of Turkey.

Keywords: Defence Industry, Dual-Use, Inter-Industry Relations, Effects of Defence Industry, Turkish Defence Industry

ÖZ

SAVUNMA SANAYİİNİN SİVİL SANAYİLERLE İLİŞKİSİNİN ANALİZİ:
TÜRKİYE İÇİN POLİTİKA ÖNERİLERİ

ERDOĞAN, Feridüddin Emre
Yüksek Lisans, Bilim ve Teknoloji Politikası Çalışmaları Bölümü
Tez Yöneticisi: Prof. Dr. Erkan ERDİL
Ortak Tez Yöneticisi: Dr. E. Serdar GÖKPINAR

Kasım 2020, 186 sayfa

Ülkeler, genellikle dahili ve harici politikalarının merkezine koydukları savunma sanayiinin gelişimi için büyük çaba içerisine girmektedirler. Savunma bütçe ve harcamalarındaki artış, savunma sanayii ile sivil sanayiler arasında rasyonel, sağlam ve sürdürülebilir ilişkiler kurulmasını zorunlu hale getirmektedir. Savunma sanayii, en ileri ve özgün buluşları teşvik ederek ve öğrenme süreçlerini hızlandırarak ülkelerin özümseme kapasitesinin gelişimine katkıda bulunmaktadır. Teknolojik yayılım günümüzde savunma ve sivil sanayiler arasında çift yönlü gerçekleşmekte olup, sivil sanayiler bilgi üretimindeki paylarını eski döneme oranla önemli ölçüde arttırmaktadır. Bu sebeple çift kullanım uygulamaları ticarileşme ve faydalanma imkanları açısından ve iki tarafın ortak gelişimi için kritik önemdedir. Bu çalışmanın üç ana hedefi; savunma ve sivil sanayilerin ilişkileri ile savunma sanayiinin sivil sanayiler üzerindeki etkilerini değerlendirmek ve sanayiler arası işbirliğinde en iyi uygulamaları ortaya koymaktır. Bu çalışma, metodolojisi itibariyle nitel/kalitatif

yaklaşımı benimsemektedir. Araştırma verileri, üç hedef gruptan kota örneklemesi metoduyla belirlenmiş toplam yirmi bir kişiyle ve yarı yapılandırılmış nitel mülakatlardan derlenmiştir. Mülakatlardan toplanan veriler üç aşamalı veri güdümlü kodlama sürecine tabi tutularak analiz edilmiştir. Bu çalışma, Türkiye'deki karar alıcılar için iyi uygulama örneklerine ve rasyonel analizlere dayanan ve savunma ve sivil sanayilerin ilişkilerini güçlendirmeyi amaçlayan en güncel politika tavsiyelerini içermektedir. Sonuç itibariyle, bu çalışma sanayiler arası ilişki mekanizmalarına yönelik beş farklı, Türkiye'nin savunma sanayi ve teknoloji altyapısını güçlendirmeye dair yedi farklı politika önerisi sunmaktadır.

Anahtar Kelimeler: Savunma Sanayii, Çift Kullanım, Endüstriler Arası İlişkiler, Savunma Sanayiinin Etkileri, Türk Savunma Sanayii

To my beloved wife and my great family

ACKNOWLEDGMENTS

It is impossible to know every detail of a particular subject, even if it is your primary field of working. To acknowledge this fact in the first place is what motivates us to keep learning. Every thesis is a learning process, and I have deeply experienced such a process in this study.

First, I want to express my deepest gratitude to my supervisor Prof. Dr. Erkan Erdil and co-supervisor Dr. E. Serdar Gökpınar for their generous guidance, criticism and encouragement over the course of this study. The beginning point of the study and the novel descriptions for inter-industry relations emerged upon suggestions of Dr. Gökpınar. Upon the advice of Professor Erdil, a significant amount of time was spent on the methodology in particular. His recommendations for resources, like Bryman's "Social Research Methods" for methodology, contributed to this study remarkably. Invaluable contributions have been made via other communication methods when we were unable to schedule face to face meetings with advisors due to the COVID-19 pandemic.

In addition, I am grateful to all my friends and colleagues who lend help by proofreading, and to all interviewees who shared their precious time with me. I would like to extend my appreciation to the examining committee members; Prof. Dr. M. Teoman Pamukçu and Assist. Prof. Dr. E. Barış Kepenek for their substantial comments.

Last, I thank to my father, who is also an academic, for his essential recommendations upon his academic experience and to my mother for encouraging me for further academic steps. My sister deserves thanks for suggesting word by word corrections. Above all, I owe my beloved wife a debt of gratitude for making an unprecedented effort to keep me motivated, showing great patience and providing her full support throughout this study.

TABLE OF CONTENTS

PLAGIARISM iii

ABSTRACT iv

ÖZ vi

DEDICATION viii

ACKNOWLEDGMENTS ix

TABLE OF CONTENTS x

LIST OF TABLES xiv

LIST OF FIGURES xv

LIST OF ABBREVIATIONS xvi

CHAPTERS

1. INTRODUCTION 1

1.1 Principles and Purpose of the Thesis 2

1.1.1 Statement of Topic 2

1.1.2 Aim of the Study 3

1.1.3 Significance of the Study 3

1.2 Features of Research 4

1.2.1 Research Questions 4

1.2.2 Research Methodology 5

1.3 Organization of the Thesis 5

1.4 Summary of Findings and Conclusions 6

2. DEFENCE AND CIVIL INDUSTRIES: IDENTIFICATION, BOUNDARIES AND CHARACTERISTICS 8

2.1 Identifying Defence and Civil Industries 9
2.2 Differences Between Characteristics 15
2.2.1 Standards and Regulations.....16
2.2.2 Confidentiality 20
2.2.3 Contracts and Enforcements 22
2.2.4 Market Dynamics 23
2.2.5 Government Sponsorship 25
2.3 Civil Industries in Relation with Defence Industry 27
2.4 Summary of the Chapter.....32
3. ANALYSIS OF INTER-INDUSTRY RELATIONS FOR DEFENCE INDUSTRY.....34
3.1 How Industries Relate With Each Other? Areas of Inter-Industry Relations.35
3.2 Describing Relation Types: Interaction, Intersection, Integration and Interdependence.....37
3.2.1 Types of Interaction.....38
3.2.2 The Role of Intersection 38
3.2.3 Integration: A Necessity? 39
3.2.4 Is There a Unilateral or Dual Dependence?.....41
3.3 Specifying the Level of Relationship for Countries.....41
3.4 Specifying the Current Status in Turkey 46
3.5 Intersection of Sets: Dual-Use Technologies and Products 47
3.5.1 Countries' Perspectives on Dual-Use Technologies 49
3.5.2 Regulations for Dual-Use Items.....51
3.6 Current Status of Relational Flows of Technology.....53
3.7 Summary of the Chapter.....56

4. EFFECTS OF BOOSTING DEFENCE INDUSTRY ON OTHER INDUSTRIES 58
4.1 Literature Outputs from History of Industries: What We Experienced Until Now 60
4.2 Specific Experience of Turkey on Defence Industry 63
4.3 Identifiable Positive/Negative Effects 67
4.3.1 Human and Capital Resources 69
4.3.2 Technology Push 71
4.4 Examples of Best Practice for Common Interest of Industries 73
4.5 Additional Remarks Regarding COVID-19 Case 75
4.6 Summary of the Chapter 76
5. METHODOLOGY 78
5.1 Literature Review 79
5.2 Research Design: Qualitative Approach 80
5.3 Data Collection: Semi-Structured Interviews 81
5.3.1 Target Group for Interviews (Sampling) 85
5.3.2 Demographics of Interviewees 88
5.3.3 Length of Interviews 91
5.3.4 Recording of Interviews 94
5.3.5 Ethical Issues on Interviews 95
5.4 Data Analysis: Coding Process 96
5.5 Summary of the Chapter 98
6. DATA AND FINDINGS 99
6.1 Analysis of Interviews 99
6.2 Summary of Findings 100
6.2.1 Summary of Part A: Introduction 101

6.2.2 Summary of Part B: Body....105
6.2.3 Summary of Part C: Ending....120
6.3 Discussion: Comparison of this Study with the Literature....127
6.4 Summary of the Chapter....130
7. CONCLUSIONS AND POLICY RECOMMENDATIONS....133
7.1 Conclusions....134
7.2 Policy Focus and Recommendations....136
7.2.1 Policy Recommendations for Valuable Relation Mechanisms....137
7.2.2 Policy Recommendations for Updating Defence Industrial Base....141
7.3 Limitations of the Study....145
7.4 Discussion for Further Studies....145
7.5 Last Remarks on the Study....146
REFERENCES....147
APPENDICES
A. APPROVAL OF THE METU HUMAN SUBJECTS ETHICS COMMITTEE....165
B. TEXT FOR INVITATION TO PARTICIPATION TO THE RESEARCH 166
C. INTERVIEW QUESTIONS (SEQUENTIAL DESIGN)....167
D. TURKISH SUMMARY/TÜRKÇE ÖZET....170
E. THESIS PERMISSION FORM/TEZ İZİN FORMU....186

LIST OF TABLES

Table 1: Defence Activities in NACE Rev. 2 Codes 12

Table 2: Defence Activities in NAICS Codes 14

Table 3: International agreements and groups regarding export control 17

Table 4: International conventions and treaties regarding arms control and disarmament 18

Table 5: UN-related areas of arms control and disarmament 20

Table 6: Comparison of defence and ideal free markets 24

Table 7: Top 10 Defence Companies in the World, 2020 28

Table 8: Average time period for granting export license for several countries 45

Table 9: Typology of defence conversion 46

Table 10: Distribution of interviewees' experiences 90

Table 11: Statistical Data on Interview Length (1) 92

Table 12: Statistical Data on Interview Length (2) 93

Table 13: Variables and Final Codes of Part A 104

Table 14: Variables and Final Codes of Part B 117

Table 15: Variables and Final Codes of Part C 125

Table 16: All Variables of Interview Study (Part A, Part B, Part C) 132

Table 17: Summary of Recommendations for Establishing Valuable Relation Mechanisms 140

Table 18: Summary of Recommendations for Updating Defence Industrial Base 143

LIST OF FIGURES

Figure 1: Overview of export controls for arms and dual-use items 18

Figure 2: Survivability Onion 21

Figure 3: Defence Contract Obligations of DoD by Platform Types (2000-2017)...29

Figure 4: DoD Vendor Count by Platform Portfolio (2005-2017).....30

Figure 5: Turnover and employment rates of EU.....31

Figure 6: Turnover rate of Turkish defence industry 32

Figure 7: Total expenditure on R&D by sectors in the UK 54

Figure 8: Classification of R&D (sector spending and number of companies) 55

Figure 9: Military expenditure of Turkey (% of GDP).....67

Figure 10: Ingredient technologies of an iPhone.....72

LIST OF ABBREVIATIONS

CBRN	Chemical, biological, radiological, and nuclear
CNC	Computer numerical control
COTS	Commercial/consumer off-the-shelf
COVID-19	Coronavirus pandemic disease (SARS-CoV-2)
DARPA	U.S. Defense Advanced Research Project Agency
DoD	U.S. Department of Defence
DPT	Republic of Turkey State Planning Organization (Devlet Planlama Teşkilatı)
EC	European Commission
EU	European Union
GDP	Gross domestic product
HR	Human Resources
ICT	Information and communication technologies
IPR	Intellectual property rights
ISIC	International Standard Industrial Classification of All Economic Activities
IT	Information technology

KB	Republic of Turkey Ministry of Development (T.C. Kalkınma Bakanlığı)
METU	Middle East Technical University
MSB	Republic of Turkey Ministry of National Defence (T.C. Milli Savunma Bakanlığı)
NACE	Nomenclature Statistique des Activités Économiques dans la Communauté Européenne (Statistical Classification of Economic Activities in the European Community)
NAICS	North American Industry Classification System
NASA	U.S. National Aeronautics and Space Administration
NATO	North Atlantic Treaty Organization
NDA	Nondisclosure agreements
NGO	Non-governmental organization
QPE	Quasi-public enterprise
R&D	Research and development
SME	Small and medium-sized enterprise
SSB	Presidency of the Republic of Turkey, Presidency of Defence Industry (T.C.Cumhurbaşkanlığı Savunma Sanayii Başkanlığı)
TSKGV	Turkish Armed Forces Foundation (Türk Silahlı Kuvvetlerini Güçlendirme Vakfı)
UN	United Nations
U.S.	United States

WMD	Weapons of mass destruction
WWII	World War II

CHAPTER 1

INTRODUCTION

Preserving peace is one of the most serious and compelling issues for nations and the world as a whole. There is a global and a historical consensus that the peace is only to be sustained by proper and deterrent forces. Therefore, having a well-organized and developed national defence is an indispensable instrument for states to secure their citizens and to defend their interests. Not only armed and security forces, but defence industry is also a main constituent of national defence. Nations have been putting great efforts in developing their defence industry and it is usually located in the centre of their internal and international policies.

Defence industry is an ever-evolving community combined with a wide range of stakeholders including several public and private organizations, such as government agencies, armed forces, defence companies, universities, R&D facilities, SMEs, etc. These stakeholders correlate with each other through commercial activities, investments, knowledge transfer, government funding, and so forth.

Turkey is one of those states that is striving for a stronger, "national and indigenous" defence industry and it has been a "hot topic" in its political agenda in recent years. As a result of excessive government support, the sector has passed substantial milestones recently, but now it is facing with more serious challenges. For instance, Turkey has been encountering arms embargo imposed by advance manufacturers (they mostly have monopoly on specific defence systems) and restrictions applied by various Western countries. These challenges forced Turkey to improve its domestic defence infrastructure and to stimulate its defence budget.

Defence industry contributes to the development of absorptive capacity of a nation by promoting the high-end and unique discoveries and facilitating the process of learning. It is generally acceptable that defence industry uses the cutting-edge technologies in order to ensure a superiority to possessor nation. It has been the leading sector for decades and civil industries has benefitted from the outcomes of technological developments. Today the current technological diffusion between defence and civil industries is not unilateral and civil industries are increasing their share in knowledge generation. Therefore, dual-use applications are crucial for commercialization and utilization of these technologies for both sides and to achieve mutual growth. In order to ensure sustainable growth, defence industry should improve and strengthen its relations with domestic civil industries. In addition, increase in military expenditures and defence budgets necessitate to create rational, durable and sustainable connections between defence and civil industries.

1.1 Principles and Purpose of the Thesis

1.1.1 Statement of Topic

Although defence industry has unique characteristics it is strongly related with civil industries, such as machinery, manufacturing, primary metals (and steel), chemical (and metallurgy), automotive, robotics, aviation, shipbuilding, ICT, etc. For this reason, connections between defence industry and other industries have to be investigated in terms of intersecting areas, the level of interaction and positive/negative effects of former to latter for a better understanding. In addition to this, any unilateral or mutual dependence between industries should be specified and good practices of interaction between them shall be revealed in order to make realistic recommendations regarding industries.

There is no doubt on the necessity of defence industry for a free country and no one is questioning it. Since self-defence is considered as a necessity to survive for states, significant amount of resources is allocated from national budget for defence related expenditures. The way of using this amount effectively and higher recontribution to

economy of this (allocated) budget is more likely with the domestic development of defence industry. In this direction, to build an effective, solid and sustainable defence industrial base[1] for a country is more than crucial. Analysing the inter-industry relationships will pave the way of conclusions and policy recommendations of this thesis as a better point of view to the industrialization of a nation. In addition, structural divergence between perspectives and business manners of industries will be defined as it seems crucial for proposing pinpoint interaction analysis and improving the cooperation.

1.1.2 Aim of the Study

This study, that covers global and national data both from the literature and from interviews, aims to fill an important gap in STS literature of inter-industrial policymaking for an industry of increasing recognition and importance in Turkey.

Main objective of this study is to shed some light on three points: determination of the current level of relations between defence and civil industries, the evaluation of effects of defence industry on other industries and bringing out best practices for a beneficial inter-industry collaboration. Conclusions of this research will hopefully enable us to suggest reasonable relation mechanisms for the industry and recommendations for defence industrial and technological base of Turkey.

1.1.3 Significance of the Study

There are quite a number of articles, theses, books and other sorts of publication on the subject of defence industry. These works have mentioned about financial, organizational, developmental and many more aspects of defence industry as well as several related/intersecting issues like military expenditure, technological innovation

[1] Defence industrial base (also called *defence industrial and technological base*) is a term used to express the total capacity o11f the industrial and technological infrastructure of a country that is available to produce arms and defence equipment.

and technology transfer, industrial development etc. What absent in the literature is the identification of types of relations between industries, especially to the perspective of defence industry and a tidy study offering unique policies for enhancing the relationship between defence and civil industries.

In addition to form a new study on relations of defence industry with other industries, this thesis will contribute to the STS literature and Turkish policymakers in along three novel ways:

- First, to bring a new perspective in the literature, four relation types are developed to describe relations between industries. Descriptions of *interaction, intersection, integration and interdependence* will serve this purpose.
- Second, this thesis includes most up to date policy recommendations about strengthening relationship of defence and civil industries based on solid analyses and best practice examinations for policymakers in Turkey.
- Third, influence of boosting defence industry on civil industries are examined orderly through both literature and interview data.

1.2 Features of Research

1.2.1 Research Questions

To mark the objectives of this thesis, three research questions have been determined at the beginning of the study, which are:

- To what extent of connection have been achieved between defence industry with other (civil) industries?
- What are the positive/negative effects of boosting defence industry on other (civil) industries?
- What are the good practices for coherent and beneficial inter-industry collaboration between defence and other (civil) industries?

1.2.2 Research Methodology

Methodology of this study is based on the qualitative approach. An extensive literature review has been made at the beginning to make a significant contribution on the existing knowledge ground without falling into repetition. One of preliminary questions designated for early stages of this research could not find satisfactory answers from the literature and it has changed the direction of the study and added an unexpected novelty into this thesis. This process provoked four new descriptions to be coined to construct theoretical frame of this study and to define inter-industry relation types. These new descriptions are then subjected to a qualitative test through interviews to prove themselves utilisable.

The research data is collected via qualitative semi-structured interviews, which are conducted with total of twenty one participants from three target groups (experienced professionals in management positions from both public and private sectors of defence and civil industries as well as academics from Turkey), all selected by quota sampling method. All data gathered from interviews are analysed through the data-driven coding process in three stages. Through this process, sources of error that are identified in the literature have been avoided. Reasoning and the selection processes of data collection, sampling and data analysis methods in addition to types of communications, recordings and ethical issues of interviews are mentioned in detail in the methodology chapter.

1.3 Organization of the Thesis

The primary objective of this thesis is to analyse current structure and relations of defence industry and its effects on other industries. Hence, following chapter is starting with the identification of defence industry, its boundaries and characteristics. This chapter also distinguishes relevant industries to the defence industry. Chapter 3 starts with the areas of inter-industry relations and describing the relation types between them. Novel definitions are made collaterally with the objective of this thesis and the

current level of relationship between industries are explained for global scale and for Turkey. Dual-use technologies and current flows of technology are also mentioned in this chapter. Next in the fourth chapter, effects of boosting defence industry on other industries are discussed with examples from the literature. Fifth chapter expresses the backbone of this research, including the methodology for research design, sampling, data collection and analysis processes. Followingly in Chapter 6, data sources and detailed analysis of interviews are processed in detail. In the last chapter policy focus and recommendations developed on all the collected data on this subject and additional remarks related to this study and future research are delivered at the end.

1.4 Summary of Findings and Conclusions

Today's interwoven environment of economics and politics enable us to mitigate contrast between defence and civil industries through novel mechanisms. Industries serving to one side or another (or both) can realize numerous opportunities to increase inter-industrial relations.

This study includes two main sections as part of conclusions: the comparison of findings and policy recommendations. It is important to make country-specific policy recommendations and to take advantage of previous experiences of other countries.

Analysis made on the existing literature and interviews shows us that the following distinctive characteristics of defence industry are overlapped:

- Governments as restricted and sole customers
- Strong government support alongside its higher intervention and enforcement
- Tough military standards/requirements and well-accepted global regulations
- Unique market structure with hard processes for entrants and leavers
- Compelling confidentiality issues and its effect on cooperation and marketing

Findings of this study are summarized under three groups: First group of findings include that are correlated with the literature, second group of findings that are absent in the literature and the last group concludes in contrast to the literature.

Policy recommendations are made specific to Turkey under two headlines: building valuable relation mechanisms and improving defence industrial base. Former headline includes five recommendations to enhance the relations of defence and civil industries via several mechanisms to be set up and latter makes seven recommendations with intent to improve the infrastructure and domestic capacity of learning.

CHAPTER 2

DEFENCE AND CIVIL INDUSTRIES: IDENTIFICATION, BOUNDARIES AND CHARACTERISTICS

Firstly, what defence industry means and which subcategories of industries are included in defence industry will be defined in this chapter. Additionally, the scope and the boundaries of defence industry will be drawn in Section 2.1 to clearly outline what this subject covers. The position of defence industry in internationally recognized industry classification systems is also stated in the same section. Particularly in Section 2.2, characteristics of defence industry will be discussed and aligned into subcategories, because most debates around this subject involve the features of defence industry. Following in Section 2.3, civil industries that are related with defence industry at most are described, based on the literature review and today's examples. Lastly, Section 2.4 will summarize and conclude the whole chapter in the writer's perspective.

The reason why this research segregates its subject as defence and others, by others meaning "civil industries", is basically from the same reason why defence industry cannot be defined on its own. As a matter of fact, there are a lot of definitions made by many researchers and official sources for defence industry with minor differences. All industries other than defence industry are categorized as civil industries in scope of this study and much the same for many other studies.

2.1 Identifying Defence and Civil Industries

Existing literature is pretty fertile with regard to defence industry, which has been defined many times in a number of studies and even by many public and private institutions. So many explanations and different perspectives are reflected on innumerable definitions of what defence industry is.

In a formal definition made by Regulation for the Security of Defence Industry (in Turkish: *Savunma Sanayii Güvenliği Yönetmeliği*) in Turkey, defence industry is defined as the whole of industrial plants that work for the production of information, materials and systems as well as related R&D activities with defensive aim of use.

Beyoğlu (2006) defines defence industry as the whole of abilities and resources of a country for the production, technology and R&D in order to satisfy its national defence needs. Çil argues that defence industry has a special position as a "locomotive for other industries" from the viewpoint of governments (as cited in Demirel, 2012, p. 10).

Aerospace and Defence Industries Association of Europe (ASD) (n.d.-a) argues that defence industry is a highly-regulated industry that produces durable systems based on cutting-edge, high-end technologies with the objective of providing military advantage over potential adversaries. ASD adds that the unique role of governments on this monopsonic market has specific rules and funding schemes.

United States Defense Contract Management Agency (DCMA), an agency equivalent to SSB, defines defence industrial base as "*the industrial complex that enables R&D as well as design, production, delivery and maintenance of military weapons systems/software systems, subsystems and components or parts, as well as purchased services to meet military requirements*" (as cited in Lopez, 2020, para. 7).

To make another definition original to this thesis, defence industry can be defined as "the cumulative of public and private organizations taking place in any operations (designing, developing, manufacturing, etc.) aiming to meet the security and defence needs of a country".

Next question is, examining what the boundaries of defence industry are. Defence industry can be bounded by several frames through which some articles related to

products/systems (to draw these frames), such as field of use, whether its production and specifications under military and confidential restrictions or not, whether it subjects to military standards and regulations, whether it can be put on free market or can be sold only to restricted customers, etc.

There are theoretical arguments about identifying defence industry through inductive and deductive perspective: Is it emerging from collective technologies or rather is the source of various technologies emerged? Dunne (2015) argues that the determination of the scope of defence industry is not quite easy as it differs from country to country and dual-use technologies also blur this distinction. He agrees with the suggestion of the Department of Trade and Industry (DTI) of the UK and claims that even foreign suppliers can be included into the defence industrial base of a country.

There are contradictory views on the distinction (or combination) between defence and aerospace industries. Certain part of researchers and organizations categorize aerospace industry as a subsector of defence industry and makes a definition for defence industry together, whereas others do not add the aerospace industry into the definition and the scope of defence industry, due to its different specificities. For example, many global credit ratings agencies (Moody's, Standard&Poor's, etc.) and worldwide consulting firms (Deloitte, Boston Consulting Group, McKinsey&Company, Accenture, Ernest&Young, etc.) have a combined headline for defence and aerospace industries. The categorization of these organisations regarding aerospace and defence industry include all companies that are developing, producing and marketing global civil and military aircrafts, satellites and related parts of it as well as supplying defence and civil products and equipment to governments across the world. Similarly, aerospace industry is counted among key components of defence industry in a Report of the Commission of Experts published by the Republic of Turkey Ministry of Development (Ministry of Development [KB], 2018a, p. 1)

Why countries need defence industry or where the necessity of enhancing it is coming from? Gökpınar (2013) mentioned two main reasons for that: First, defence industry serves for the required deterrence and the need of self-defence for a country by equipping its security forces with high technology systems (that may also have confidential specifications). Second, it also aims to increase technological and

industrial capabilities of a country as well as gaining ultimate economic and social benefits by satisfying its needs requiring large resources and infrastructure domestically (p. 4).

Considering all industries, defence industry is only a little part of a whole as indicated in the next section in detail through international classifications. All other industries except defence industry are referred to as "civil industries" to separate them from each other within this thesis. At this point, other terms like "civilian industries" or "commercial industries" could be preferred to provide this distinction but the term "civil industries" is dominating the relevant literature, so that the predominant terminology is chosen for a proper usage in scope of this study.

For a better insight and to give additional information about activities related to the defence industry, its position in international classifications should be defined. Actions of defence industry is varying through internationally recognized industry classification systems, such as Nomenclature Statistique des Activités Économiques dans la Communauté Européenne (NACE), Standard Industrial Classification (SIC), North American Industry Classification System (NAICS), Global Industry Classification Standard (GICS), Australia and New Zealand Standard Industrial Classification (ANZSIC), United Kingdom Standard Classification of Economic Activities (UKSIC), Merchant category code (MCC), Industry Classification Benchmark (ICB), etc. Including manufacturing or building defence products and supplies as well as research and development operations are categorized in these classification systems, though they do not embody all of defence industry activities we face today. Association of defence industry exercises is examined in this section for three most common systems: NACE, ISIC and NAICS.

At first, in terms of "statistical classification of economic activities in the European Community", abbreviated as NACE, defence industry is associated with many NACE classes, including those in Table 1 below:

Table 1: Defence Activities in NACE Rev. 2 Codes

NACE Rev. 2 Class	*Related Section*	*Class Description*	*Activities including*
20.51	Manufacture of other chemical products	Manufacture of explosives	Manufacture of propellant powders, explosives, pyrotechnic products including percussion caps, detonators, signalling flares, etc.
25.40	Manufacture of basic metals and fabricated metal products, except machinery and equipment	Manufacture of weapons and ammunition	Manufacture of heavy weapons, small arms, guns and pistols, air or gas guns and pistols, war ammunition, explosive devices (such as bombs, mines and torpedoes), etc.
26.51	Manufacture of instruments and appliances for measuring, testing and navigation; watches and clocks	Manufacture of instruments and appliances for measuring, testing and navigation	Manufacture of aircrafts engine instruments, radiation detection and monitoring instruments, flame and burner control, spectrometers, mine detectors, pulse (signal) generators, metal detectors, search, detection, navigation, aeronautical and nautical equipment including sonobuoys, GPS devices, radar equipment, etc.
26.70	Manufacture of optical instruments and photographic equipment	Manufacture of optical instruments and photographic equipment	Manufacture of optical mirrors, optical gun sighting equipment, optical positioning equipment, optical magnifying instruments, optical comparators, optical measuring and checking devices and instruments (e.g. fire control equipment, range finders), etc.
30.11	Manufacture of transport equipment	Building of ships and boats	Building of warships and submarines, etc.
30.30	Manufacture of transport equipment	Manufacture of air and spacecraft and related machinery	Building helicopters, airplanes for use by the defence forces, etc.

Table 1: Defence Activities in NACE Rev. 2 Codes (continued)

30.40	Manufacture of transport equipment	Manufacture of military fighting vehicles	Manufacture of tanks, armoured amphibious military vehicles and other military fighting vehicles, etc.
84.22	Public administration and defence: compulsory social security	Defence activities	Administration of defence-related research and development policies and related funds

(Source: European Commission [EC], 2006)

Dunne (2015) argues that the NACE Code 84.22 does not cover all activities related to the defence industrial base such as the "provision of military aid to foreign countries" or "supplies for domestic emergency use for peacetime disasters" (like COVID-19 global disease).

Secondly, The International Standard Industrial Classification of All Economic Activities (ISIC) created by UN in 1948 to principally offer a taxonomy of economic activities with the aim of gathering and rendering standardized statistics related to these activities. Classification system of UN has a great influence on national classification systems, as many countries implemented its categorization from ISIC. For instance, NACE Rev. 2 document is revised to implement to the ISIC Rev. 4, which is approved by UN in 2006, similar activities are categorized within similar classes (UN, 2008, p.iii-37). Abovementioned NACE 84.22 "Defence Activities" is corresponding to ISIC 8422, and NACE 25.40 "Manufacture of weapons and ammunition" is corresponding to ISIC 2520. Likewise, NACE 30.10, 30.30 and 30.40 classes under Division 30 "Manufacture of other transport equipment" are defined as pretty equal activities within ISIC 3010, 3030 and 3040 classes with same descriptions.

Lastly, categorization of defence industry activities is defined by the North American Industry Classification System (NAICS). NAICS is submitted in 1997 as a replacement for Standard Industrial Classification (SIC) system (that was in use between 1937-1997) and has been using by United States, Canada, and Mexico since

then (EO, 2017, p.13). At this point, industry categorization of NAICS via "digits" should be mentioned to clarify the logic behind it. In a sample case, it labels "manufacturing" as a "sector" with two digits, "transportation equipment manufacturing" as a "subsector" with three digits, "motor vehicles manufacturing" as an "industry group" with four digits, "automobile and light duty motor vehicle manufacturing" as an "industry" with five digits, and "light truck and utility vehicle manufacturing" with the sixth digit, indicating the most specific "industry area". In terms of NAICS, activities related to defence industry are associated with following codes, as listed in Table 2.

Table 2: Defence Activities in NAICS Codes

NAICS Code	***Industry Group***	***Industry Area***	***Primarily engaged with***
325920	Other Chemical Product and Preparation Manufacturing (3259)	Explosives Manufacturing	Manufacturing blasting accessories (e.g. detonators, safety fuses, ignitors, etc.) and blasting powders as well as explosive materials like TNT (trinitrotoluene), dynamite, gunpowder, etc.
332992	Other Fabricated Metal Product Manufacturing (3329)	Small Arms Ammunition Manufacturing	Manufacturing ammunition for small arms (having barrels of 30 mm or less), cartridges, bullet jackets, etc.
332993	Other Fabricated Metal Product Manufacturing (3329)	Ammunitions (except Small Arms) Manufacturing	Manufacturing ammunition above 30 mm, like artillery, mortar shells, bombs, missile warheads, rockets, grenades, mines and torpedoes, etc.
332994	Other Fabricated Metal Product Manufacturing (3329)	Small Arms, Ordnance, and Ordnance Accessories Manufacturing	Manufacturing small arms like antitank rocket launchers, aircraft and antiaircraft artillery, antisubmarine projectors, cannons, gun turrets, guns, etc.
336120	Motor Vehicle Manufacturing (3361)	Heavy Duty Truck Manufacturing	Manufacturing (buses, heavy duty trucks or other special purpose heavy duty motor vehicles) is defensive use

Table 2: Defence Activities in NAICS Codes (continued)

3364	Aerospace Product and Parts Manufacturing	-	Manufacturing and developing/making prototypes of aircrafts, guided missiles and space vehicles and its related parts like engine and auxiliary equipment
336611	Ship and Boat Building (3366)	Ship Building and Repairing	Building and repairing ships and submarines
336992	Other Transportation Equipment Manufacturing	Military Armored Vehicle, Tank and Tank Component Manufacturing	Vehicles and components primarily manufactured for military use

(**Source:** Executive Office of the President Office of Management and Budget, 2017)

Defining all related activities are almost impossible since many subsidiary industries like information, finance and insurance, transportation and warehousing, metalworking, professional, scientific, and technical services and manufacturing of machinery, fabricated metal or rubber products are involved with defence industry processes, but it may help other researchers to see a summary of framework for defence industry activities explained above. National industrial classifications are not included in this research since there are many of them and those are mostly derived from international classifications.

2.2 Differences Between Characteristics

In this section, characteristics of defence industry are listed and differences between defence industry and civil industries are addressed in each section below. Headlines for specific characteristics of defence industry can be counted as standards and regulations, confidentiality, contracts and enforcements, marketing dynamics, and government support. Additionally, structure of defence companies, requirement for qualified labour force and large-scale investments, specific requirements for the products/production, primary objective of production are also relevant and may be

added to the list of differences. Since many additional differences are mentioned by interviewees, other headlines are added to Data and Findings chapter.

2.2.1 Standards and Regulations

Defence industry has a playbook full of rules, namely military standards and regulations. Military standards describe many aspects like how to build and secure a defence industry facility, produce a defence equipment, test or inspect a product under which circumstances, protect its related data, do maintenance at which intervals, use this equipment properly in the field. In short, these standards are the rules that you have to obey in defence industry whilst providing a defence-related service.

Governments control operations of arms producers (or sellers) by inspecting costs of suppliers and joining development phase of defence products as a potential recipient (Six, Goodwin, Peck, & Freeman, 2006).

Besides, there are national regulations as well as international arrangements/regimes introduced to control production, import-export and liabilities of goods related to defence industry in many countries. These regimes are also crucial to make sure that handover of these products would not present a threat or a potential harm to the national security and interests for an exporter country. Some national regulations include:

- Law No. 5201, Control of Industrial Enterprises Producing Arms, Defence Equipment, Munition, and Explosives for Turkey,
- International Traffic in Arms Regulations (ITAR) and other several regulations pointing at ITAR for United States,
- The Foreign Trade and Payments Act (1961) is being applied by The Federal Office for Economic Affairs and Export Control (Bundesamt für Wirtschaft und Ausfuhrkontrolle, BAFA) for Germany,
- Since there is not a common authority for processing exports out of European Union (EU), member states are able to take necessary precautions to preserve their

own security and interests under EU laws whilst they should avoid arms transfers that may threatens security of another EU member state (Kuznetsova, 2017) For transfers of defence industry products between EU member states, simplified terms and conditions of Directive 2009/43/EC are effective (EC, n.d.).

International community have mostly reached a common ground and a mutual determination for establishing and applying international arrangements, conventions and regimes on the control of production and transfer of weapons and various arms as well as disarmament on heavy. The list of related international treaties/conventions and export control regimes, that also form framework for national regulations to comply with, including but not limited to those in Table 3, Table 4, Table 5, and Figure 1 below:

Table 3: International agreements and groups regarding export control

Export Control Regimes	***Subject***	***Signing Year***	***Participating Countries***
The Wassenaar Agreement	Transfers of conventional arms and dual-use goods and technologies	1996	42 participants
Missile Technology Control Regime (MTCR)	Limit the proliferation of weapons of mass destruction (WMD)	1987	35 members
Australia Group	Control of export of the chemical and biological weapons	1985	43 members
Nuclear Suppliers Group (NSG)	Non-proliferation of nuclear weapons, controlling transfer of nuclear energy	1974	48 members
Zangger Committee	Control the export of nuclear-related materials, equipment and technology	1971	UN Member States

(Source: Ministry of Foreign Affairs, n.d.)

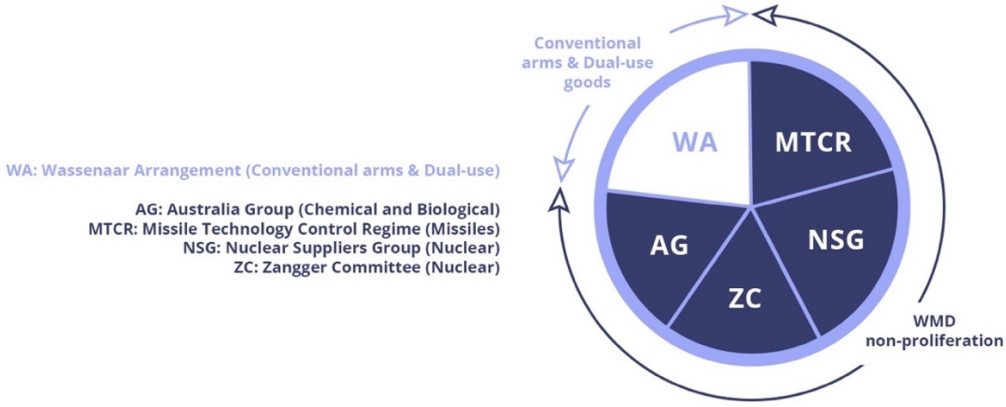

Figure 1: Overview of export controls for arms and dual-use items

(**Source:** The Wassenaar Arrangement, n.d.)

Table 4: International conventions and treaties regarding arms control and disarmament

Conventions / Treaties	***Subject***	***Signing Year***	***Participating Countries***
Arms Trade Treaty (ATT)	Regulation of the international trade of conventional weapons	2014	107 parties, 130 signatories
Central African Convention for the Control of Small Arms and Light Weapons, their Ammunition, Parts and Components that can be used for their Manufacture, Repair or Assembly (Kinshasa Convention)	Regulation for transfer of small arms and light weapons (SALW)	2010	7 parties, 11 signatories
International Code of Conduct against Ballistic Missile Proliferation (Hague Code of Conduct, HCOC)	Non-proliferation of ballistic missile systems (capable of delivering WMD)	2002	143 subscribers
Convention on the Prohibition of the Use, Stockpiling, Production and Transfer of Anti-Personnel Mines and on their Destruction (Ottawa Treaty)	Eliminating anti-personnel (AP) landmines	1997	164 parties, 133 signatories

Table 4: International conventions and treaties regarding arms control and disarmament (continued)

Comprehensive Nuclear-Test-Ban Treaty (CTBT)	Banning all nuclear explosions with civil and military purpose	1996 (not effective)	184 signatories
Convention on the Prohibition of the Development, Production, Stockpiling and Use of Chemical Weapons and on their Destruction (CWC)	Banning the chemical weapons	1993	193 parties, 165 signatories
Convention on Prohibitions or Restrictions on the Use of Certain Conventional Weapons (CCW)	Prohibit or limit the use of certain weapons	1993	125 parties
Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on their Destruction (BWC)	Banning the biological weapons	1972	183 parties, 169 signatories
Treaty on Non-Proliferation of Nuclear Weapons (NPT)	Non-proliferation, disarmament and peaceful use of nuclear energy	1970	190 parties

(Source: Ministry of Foreign Affairs, n.d.)

In addition to the international conventions and treaties as well as export control regimes, several programmes and resolutions have been carried out by UN as showed in Table 5.

Table 5: UN-related areas of arms control and disarmament

Programme and Resolutions of UN	*Subject*	*Signing Year*	*Participating Countries*
UN Security Council Resolution 1540	Non-proliferation of WMD weapons (chemical, biological, radiological, and nuclear [CBRN])	2004	UN Member States
UN Programme of Action to Prevent, Combat and Eradicate the Illicit Trade in Small Arms and Light Weapons in All Its Aspects	Regulation for improving national laws on tracing transfer of small arms and light weapons (SALW)	2001	UN Member States

(Source: Ministry of Foreign Affairs, n.d.)

2.2.2 Confidentiality

In defence industry, documents, military projects and even some technologies are categorized under various classification levels of secrecy. Moreover, some military standards are not published publicly but are shared only with the government bodies and authorized defence companies that have valid classifications. This exceptional phenomenon is constructed over significant experiences over centuries related to security and defence of countries/societies. If defence capabilities of a nation, like equipment specifications or tactical/strategical plans, are known to its enemies, nation's layers of what called as "survivability onion" shown in Figure 2 (in Turkish: *beka soğanı*), a term used in defence literature to visualize survivability of military forces in the battlefield, may be already penetrated. Any piece of sensitive information or material may be useful to opponents in war time. So that, defence industry goes down hard from beginning and takes measures to limit any potential risk of sensitive information leaking. Since the secrecy is one of the prominent issues in the defence industry, it is common making NDAs to state information to be kept confidential

between firms or agencies before go further in their relations. As part of these legal agreements, serious sanctions will be placed if any information disclosed by those parties.

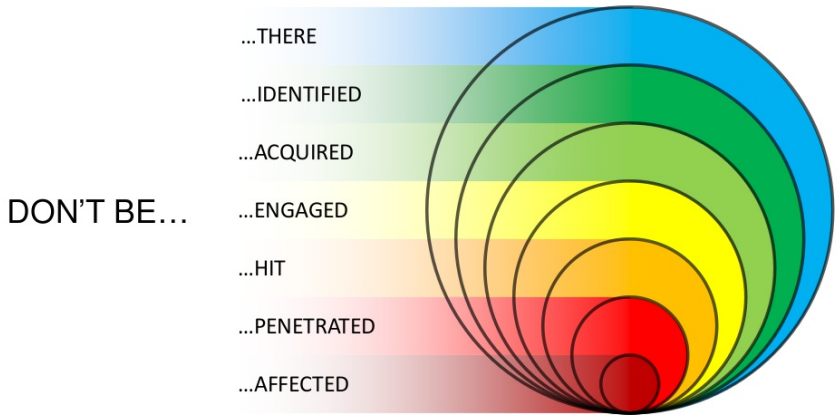

Figure 2: Survivability Onion

(**Source:** UK Ministry of Defence, 2015, p. 17)

In addition to these privacy tools, defence industry also has other systematics of what are already used in commercial side, like trade secrets (in Turkish: *ticari gizli*) and other IPR tools.

Defence industry prefers narrow and focused networking due to the sensitivity of confidentiality for defence technologies (Pittaway, Robertson, Munir, Denyer, & Neely, 2004). This also affects the volume of its relations with other industries and proves the unwillingness to establish more as it does not see relationship as an opportunity.

Oppositely to commercial strategies, declassifying specifications of a defence product neither contribute to purpose of using this product nor a part of marketing strategy in this sector. Even it is better for these specifications, abilities and limits of a product to be known only by its seller and user is a vital necessity and has an operational value (Liman, 2020, p. 58).

2.2.3 Contracts and Enforcements

Another specific headline from differences is the different structure and specifications of defence contracts. Hall (2007) asserts that a typical United States defence procurement contract has seven times more articles or conditions and six-fold technical requirements and standards than a typical commercial contract.

Customers (armed forces in general) are in tendency to reject any commercial off-the-shelf (COTS) systems offered by contractors because the common process of procurement is based upon defining specific requirements for a system to be procured (due to its great effect on their institutional culture) on its own (Gökpınar, 2013). In fact, not only the contracts of the projects or the related enforcement on projects, but also the size, the structure and the trade of defence industry are all determined and regulated by the government in its nature (Dunne & Sköns, 2010).

In a standard contract that a defence procurement agency signed with a prime defence contractor includes articles like (with a high probability): The agency may extinguish/terminate this contract without stating any reason necessarily and have this right of peremptory termination in any phase of a project. Requirements and acceptability criteria of any defence item to be procured are also decided by the government authorities and it may subject to change over the contract periods. The government authorities also have the right of peremptory ban on production (or development) on a specific subfield of defence industry, or cancel the certification of security clearances for personnel or a facility regardless of time manner.

There are also significant penalty clauses that are stated in defence contracts regarding both regular documentation and timely procurement of items from the beginning and are hanging over contractors like the sword of Damocles. Besides, follow-up mechanisms exist for long-list of requirements that are inspected regularly at both development and acceptance phases via several methods.

Dunne (2015) argues that reasons for concluding elaborate contracts in defence industry are to reflect accountability to the public and to atone the deficiency of competitive market conditions.

2.2.4 Market Dynamics

Another article in the list of differences is market dynamics of defence industry, in addition to the diplomatic effects due to conjuncture of international relations. There are significant amount of studies regarding the market structure of defence industry in the literature (W. Adams & W.J. Adams, 1972; García-Alonso & Levine, 2008; Chao, 2005).

The structure of defence market is defined in various market structures by researchers. Hartley and Belin (2019) argue that market structure of defence industry can be categorized under three structures: competitive, oligopolistic or national monopoly.

Some called it a monopsony, a market structure of multiple suppliers and one customer that is dominating the market (Dunne & Sköns, 2010; Dunne, 2015; Day, 2012). On the other hand, there are others who claimed that it is much more a monopoly, a market structure characterized by a sole seller of a unique product and no existing competition (Hall and James, 2009; Sapolsky & Gholz, 1999) or rather an oligopoly with the domination and a limited competition of few contractors in various countries (Wiśniewski, 2012). Intrinsically, defence industry reflects those market structures in partial, varying by countries. Monopsonic structure is because governments are singular clients of defence goods via their procurement bodies. Similarly, monopolistic or oligopolistic structure is caused by some defence companies' position of being the only or among few sellers of specific defence products/systems in some particular fields. All of these cases give industry the cause to diverge from perfect market conditions.

In this regard, an important factor that shapes market dynamics is the existence of restricted customers. There is only one dominant and regulatory customer in defence market, which is the state (i.e. armed forces). Government cannot determine the price of defence goods to be procured, as it may be in a fully monopsonic market, but it controls all the transactions (purchase or sale) in the market to ensure all defence products are going to proper buyers. Because most of these products possess strategical value for its users and may pose a threat to the seller itself.

A comprehensible and explanative comparison is published by Republic of Turkey State Planning Organization (DPT) for comparison of defence market with an ideal free market in sixteen articles, as indicated by Table 6:

Table 6: Comparison of defence and ideal free markets

#	***Defence Market***	***Ideal Free Market***
1	A couple of small-sized firms but mostly large-sized companies	Many small sized-firms
2	Obstacles for entry or exit to market	Free entry and exit to market
3	Costs are determined proportional to total costs	Marginal costs
4	Cost is determined upon predetermined performance criteria	Cost is determined upon marginal utility
5	Decreasing demand increases prices	Decreasing demand reduces prices
6	There may be huge unutilized capacity	Supply is proportioned to demand
7	Lower degree of mobility for labour force	Higher degree of mobility for labour force
8	Increasing returns to scale	Decreasing or constant returns to scale
9	No market equilibrium, changes from year to year	Market equilibrium exists properly
10	Costs are increasing steadily, higher difference between subsectors or even between companies from same subsector	Price equilibrium exists in normal conditions
11	Heavy loans contracted and hard to find loans	Excellent capital flows in market
12	Older and bigger capital assets binding for companies	Capital assets change due to demand
13	State is determinant, regulatory, banker and decision-maker	No direct intervention of state

Table 6: Comparison of defence and ideal free markets (continued)

14	Volume of market is defined by annual budgets made by related government bodies.	Volume of market is defined by buyers and sellers
	Number of producers are predetermined and smaller size of production takes place.	Buyer has a freedom of choice from a long list of products
15	Restrictions for product development after starting of serial production, buyer defines its needs in advance	Sellers develop their new products through potential market analysis
16	Buyer is in contact with seller all the time	Buyer and seller move independent

(Source: DPT, 2000, pp. 97-98)

Gansler (1988) argues that in addition to market dynamics, settled procurement applications has also significant effect of increasing costs of defence products. For instance, defence industry has not been exposed primarily to a pressure for applying commercial standards of productivity or cost-effectiveness in its designing and manufacturing processes.

Van Nostrand (2013) argues that economic, political, psychological and marketing problems are interconnected at the production of defence technologies.

Not only the entry to the defence market, but also to exit from it is compelling for companies, due to permissions and binding terms of defence contracts. At this point, Dunne and Sköns (2010) claim that this situation causes an exceptional persistence for the list of main defence contractors. They also assert that another reason for narrow list of bigger companies in this sector is the necessity of higher R&D investments for new systems.

2.2.5 Government Sponsorship

Governments are voluntary sponsors of their defence industries through various support and funding mechanisms. As a permanent supporter, governments would not allow national defence firms to be harmed one way or another since there are mutual interest and vital confidentiality issues. In addition, this field of industry is backed by

governments due to its role on satisfying countries' strategic needs and its acceleratory effect on wider technological development.

Lorell, Lowell, Kennedy and Levaux claim that defence industry has a higher risk than commercial markets due to its market dynamics and dangerous technological applications. Because of this reason, defence market becomes appealing only with a powerful government support (2000, p. 14). Level of government support changes even for different fields of defence industry in such a way that some prime contractors having pleasure of more private connections with government agencies upon their dependency (Gummett & Reppy, 1988, p. 7).

Since the nationality is a substantial issue for defence industry, acquisition from domestic sources is preferred by states. Even domestic defence market is under the protection of government and defence firms may make use of the government support within defence industry. It is because defence is a public service, works for public benefit and every sovereign state is responsible for execution of this service as Adam Smith argues (Louth &Taylor, 2018).

Some countries have taken formal precautions for protecting their industries from international competition and more domestic procurement, as stated below (Gökpınar, 2013, p. 77-78):

- Both the general public procurement law in United States (i.e. "Buy American Act") and specific regulations for DoD procurements (under "Berry Amendment") prioritize domestic sources for defence acquisitions with some exceptions.
- An agreement of EU excludes its member states from competition conditions in common EU Market with the implementation of Article 296 of the TEC (Treaty Establishing the European Community) in the field of defence procurement with some exceptions.
- In Turkey, defence procurement is excluded from the general regulations of public procurement law (Law No. 4734) and regulated with particular articles under laws, laws and presidential decrees (Article 3.b under Law No. 4734, Article 44 under

Law No. 2886, Law No. 3238, Law No. 3212, Law No. 6136, Presidential Decree No. 7) along with exceptional permissions in scope of defence industry.

In addition to protecting precautions, EU provides significant amount of budget for European Defence Fund (EDF), effective since 2017, to increase collaboration between companies, research agencies and government bodies of member states in addition to international institutions in both research and development phases of defence products and technologies (EC, 2017).

Dunne and Sköns (2010) stated that the unique position of government for defence industry -as both buyer and investor in the sector- let related policymaking process is carried out separately and sensitively in government bodies.

The dependency of governments is potentially open to companies' abuse as Dunne (2015) argues that "they (defence contractors) become experts of winning government contracts rather than being successful in commercial markets" because defence contracts potentially make way for subsequent contracts of same or developed defence products.

2.3 Civil Industries in Relation with Defence Industry

Defence industry cannot be disclosed as alone and discrete industry since it has intimate relationships with many civil industries like machinery manufacturing, primary metals (and steel), chemical (and metallurgy), automotive, robotics, aviation, shipbuilding, ICT, etc. As stated before, civil industries that have intimate relations with defence industry are not only playing an important role of supporting defence industry, but also being affected seriously by it.

Foremost defence companies in the world (from the list of Defense News Top 100 for 2020, shown in Table 7) may set an example on this issue. Taking the top 10 companies to investigate the civil involvement of these companies, four of them are making more revenues from their civil businesses than defence businesses. From these companies, three of them, Boeing, United Technologies Corp. (later merged with Raytheon in April 2020) and Aviation Industry Corp. of China, have primary business operations

in aerospace industry, proving that the civil aviation is among the most related industries with defence industry.

Table 7: Top 10 Defence Companies in the World, 2020

Rank	Company	Country	2019 Defense Revenue (in millions)	2019 Total Revenue (in millions)	Revenue From Defense
1	Lockheed Martin	U.S.	$56,606	$59,812	95%
2	Boeing	U.S.	$34,300	$76,559	45%
3	General Dynamics	U.S.	$29,512	$39,350	75%
4	Northrop Grumman	U.S.	$28,600	$33,841	85%
5	Raytheon Company	U.S.	$27,448	$29,200	94%
6	Aviation Industry Corp. of China	China	$25,075	$66,858	38%
7	BAE Systems	U.K.	$21,033	$23,370	90%
8	China North Industries Group Corp. Ltd.	China	$14,771	$68,074	22%
9	L3Harris Technologies	U.S.	$13,916	$18,074	77%
10	United Technologies Corp.	U.S.	$13,090	$77,000	17%

(Source: Defense News, 2020, pp. 97-98)

President Vladimir Putin of Russia once stated that the defence industry is the propulsive power for the progress of innovative technology and counted energy, engineering and communications industries as the primarily affected industries in a speech he made in 2015 (Kremlin, para. 1).

Machinery industry is among the biggest industries under manufacturing sector and counted among relevant industries to defence industry in 11th Development Plan of Turkey as both sides affect each other via infrastructure investments and final products (KB, 2018b, p. 2, 58). In another specialized commission report under same development plan, it is aimed that relations between automotive industry and defence industry to be increased to intensify the cooperation via technological development and to sustain competitiveness of both industries (KB, 2018c, p. 96, 121).

Dunne (2015) asserts that innovations coming from civil side is using increasingly in defence applications and it connects industries with each other more. He gave electronics and IT sectors (including software) as examples for which involves more with defence industry compared to the past. Additionally, he argues that the socio-economic environment which a defence facility located is dependent upon it in general.

For a better insight with a kind of backflowing method, the proportion of number and the financial amount of projects regarding subsectors of defence industry can enable us to deduce the density (or volume) of inter-industry relations, since much of them are related to specific counterparts in civil side of industry.

States may step forth at different fields of defence industry based upon their primary needs or industrial capabilities. Applying this method for United States for example, following two figures (Figure 3 and Figure 4), taken from a study made to determine acquisition trends in United States and published by CSIS in September 2018, may give us an idea about the weights of defence contract obligations (2000-2017) and total vendor counts (2005-2017) by platform portfolio of DoD.

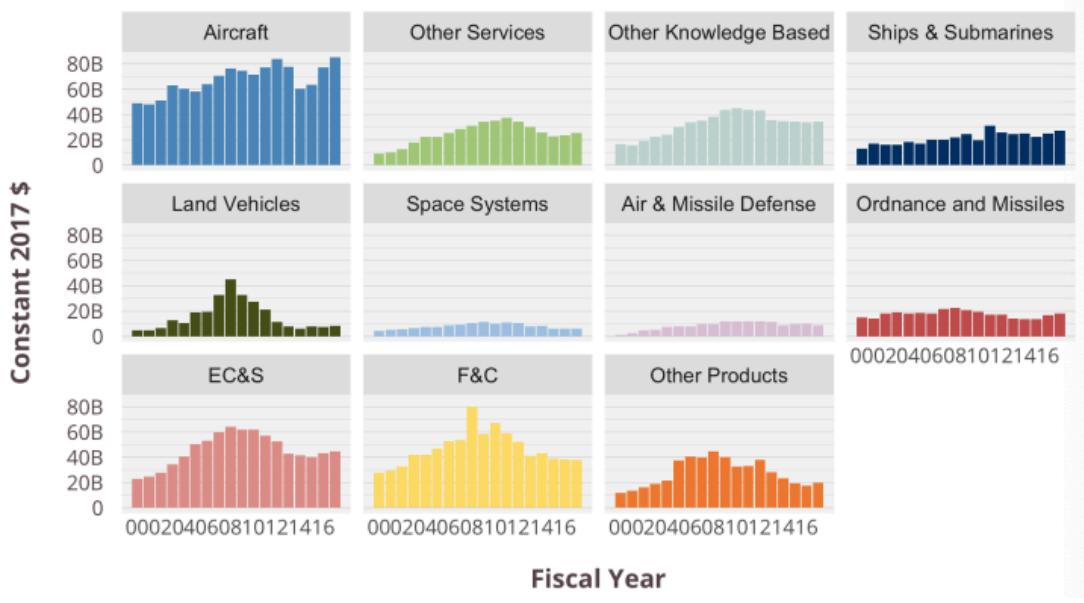

Figure 3: Defence Contract Obligations of DoD by Platform Types (2000-2017)

(**Source:** McCormick, Hunter, Cohen,& Sanders, p. 4)

Figure 3 shows us that the largest subsectors are facilities and construction, electronics & communications and sensors, and aircrafts for the United States. A similar picture can be seen in Figure 4 regarding vendor counts. We can make a prediction on that the potential relationships of defence industry in this country should be established mostly with civil aviation, construction, electronics and IT sectors of civil industries.

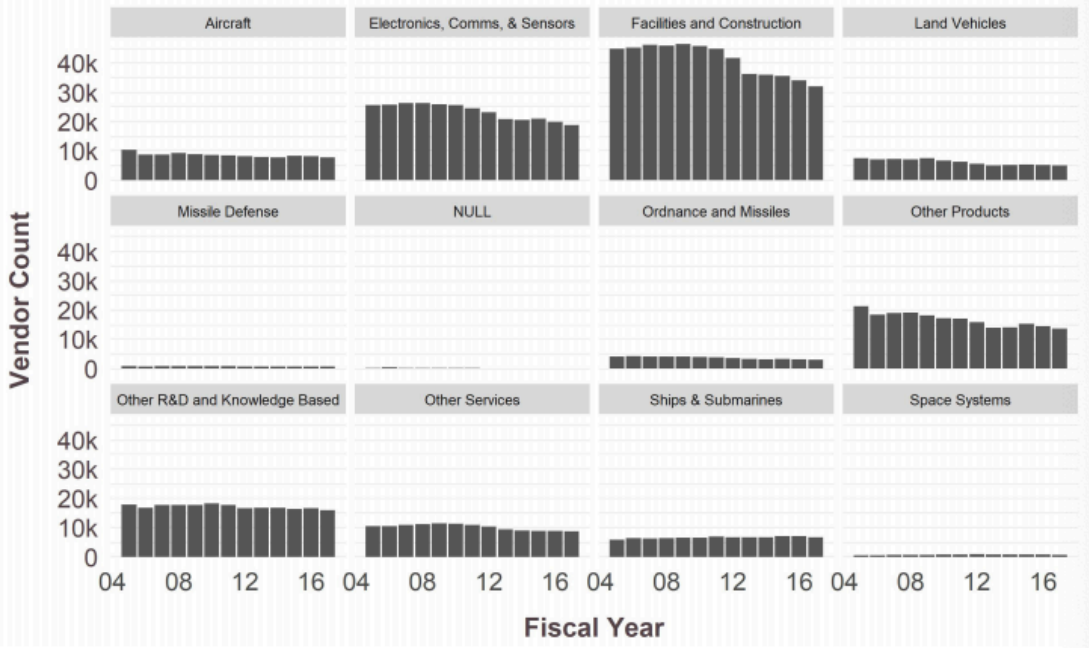

Figure 4: DoD Vendor Count by Platform Portfolio (2005-2017)

(**Source:** McCormick, Hunter, Cohen, & Sanders, 2019, p. 10)

For Europe, turnover and employment rates are a little bit different from United States regarding the subsectors of defence industry. Aerospace and Defence Industries Association of Europe (ASD) investigates the European aerospace and defence industry every year and their latest document suggests that the aerospace sector has continued to be ahead of other subsectors of defence industry by far. Land platforms is the follower of aviation industry of Europe in terms of total turnover and total employment as shown in Figure 5:

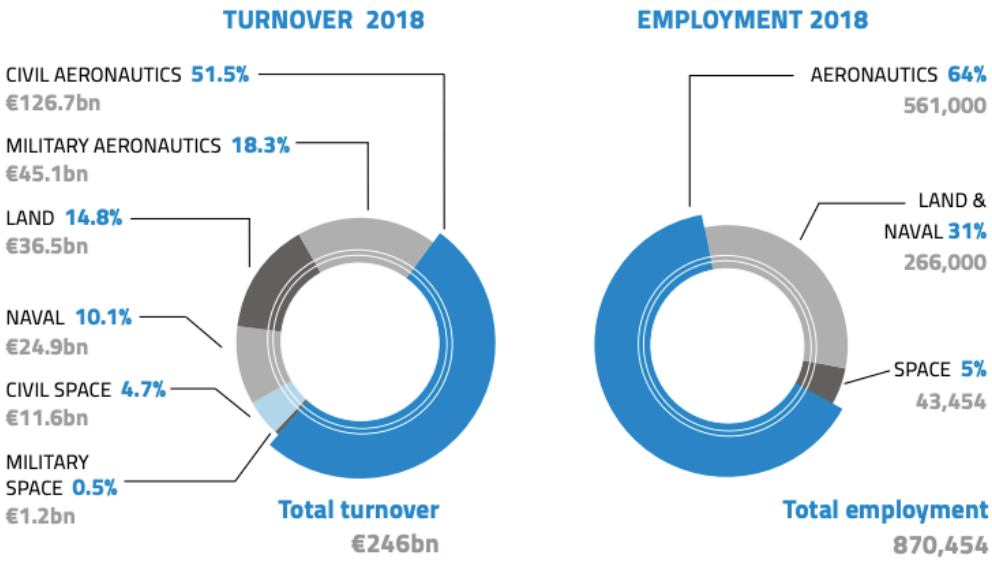

Figure 5: Turnover and employment rates of EU

(**Source:** ASD, n.d.-b, 2019 Facts and Figures)

Similarly for Turkey, SaSaD publishes a performance report for Turkish aerospace and defence industry annually, which also includes shares of subsectors. In the latest report that is published by SaSaD for 2019, Figure 6 shows the turnover amounts of prominent subsectors of Turkish defence industry. Land platforms seems to be at the first place with the biggest share in the defence market (for domestic and foreign markets), invariably for years. Aviation industries of both civil and military have followed it, ahead of the subsector of weapons, munitions and missiles. Figure 6 also signifies that the domestic automotive industry and relevant infrastructure is relatively developed in Turkey and the level of connections between land platforms of defence industry and (civil) automotive industry is potentially higher, as well as the established level of interrelation between civil and military aviation industries.

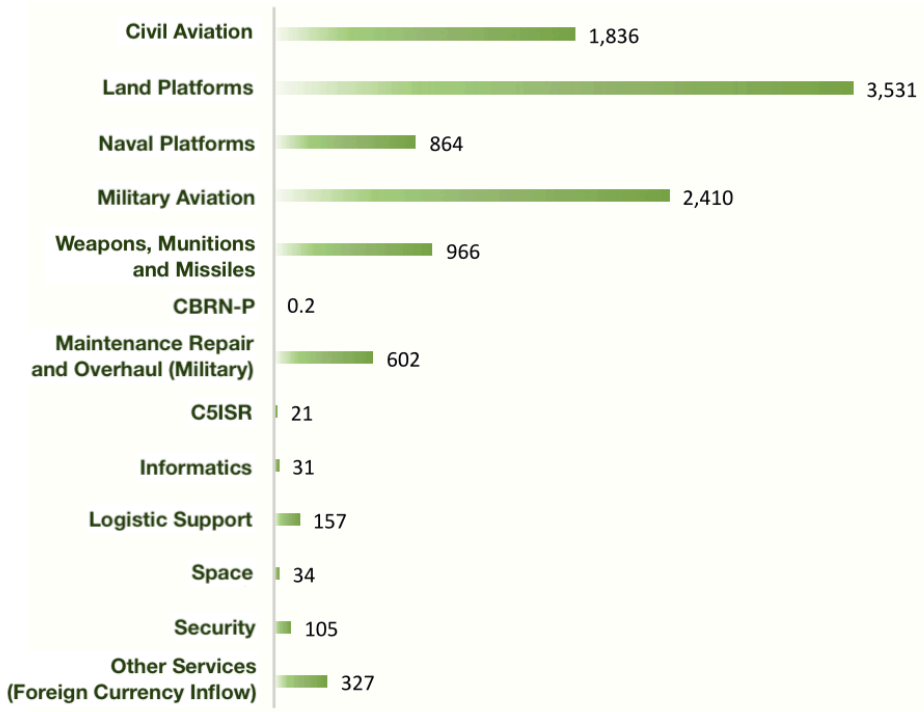

Figure 6: Turnover rate of Turkish defence industry

(**Source:** SaSaD, 2020, p. 12)

2.4 Summary of the Chapter

This chapter describes the defence industry and its activities, position in international recognized industry classification systems, boundaries with civil industries, specific characteristics in addition to specification of civil industries most related with defence industry.

The literature gives us a lot of definitions for defence industry. Some of these definitions are prioritizing defence industrial base while others are describing it based on its activities. A new definition made for defence industry in this study, which is: "the cumulative of public and private organizations taking place in any operations (designing, developing, manufacturing, etc.) aiming to meet the security and defence needs of a country." All industries other than defence industry are categorized as civil industries in scope of this study, similar to many other studies.

Activities of defence industry can be distinguished by international industry classification systems like NACE, NAICS and ISIC, which is mentioned in this chapter in detail. Note that aerospace industry is considered as a part of defence industry in many resources.

Differences between characteristics of industries are also discussed in this chapter and prominent topics regarding characteristics of defence industry are counted as: standards and regulations, confidentiality, contracts and enforcements, marketing dynamics, and government support. Regulations and standards that this industry have to follow include rules for both defence and dual-use products. Market structure section include a comparison of defence and ideal free markets. Defence industry is backed by governments due to its role on satisfying countries' strategic needs and its acceleratory effect on wider technological development.

Civil industries that are in relation with defence industry most are changing from country to country, but the literature highlights automotive, aeronautics, electronics & communications industries in general. Next chapter will involve with the analysis of inter-industry relations for defence industry, the specification of current levels for Turkey and the world and the importance of dual-use products/technologies on these relations.

CHAPTER 3

ANALYSIS OF INTER-INDUSTRY RELATIONS FOR DEFENCE INDUSTRY

This chapter presents a crucial part of this study due to its involvement with one of the objectives and the main subject of this thesis. The relevant objective of this study was expressed as the determination of the current level of relations between defence and civil industries, that is investigated through various aspects in following sections of this chapter.

Today, industries are interconnected than ever before. The financial and the strategical value of an industry in an economy may be assessed through its relations with other industries. Establishing permanent relations between industries possess a great importance due to its potential effect on business volume and economic activities.

We should mention to Bain (1967) in this chapter with his pioneering studies regarding industrial economics including oligopolies, barriers to entry (to market), industrial organization, new competition, concentration, etc. He argued that "*not only individual profit but also collective performance must be considered in the analysis of market competition*" (pp. 11-12). Thus, firms are key players in a cumulative success of industries.

Industrial relations of defence industry are bounded not only to its direct connection with the technological development but also to the flow of human and capital resources. Therefore, macroeconomic indicators may deteriorate if its defence and civil industries become segregated rather than intertwined. To ensure cumulative benefits and to strengthen its economic harmony, a government should remove the obstacles in front of collaboration of firms, and industries.

Coordination of civil and defence industrial capabilities would be a significant leverage for economies. Gummett and Reppy (1988) argue that when someone looking for benefits with regards to both sides (p. 141):

- Defence industry may benefit from the lower cost, higher volume, greater factory automation, higher quality, increased competition and greater emergence production capability based on civil industries, while
- Civil industries can take advantage of the greater availability of higher R&D funds and government procurements, most sophisticated engineering talent in a country, and most up-to-date manufacturing technologies.

In this chapter, analysis of how industries relate with each other and areas of inter-industry relations to be defined at first in Section 3.1. In addition, due to the lack in the literature, four relation types will be defined in Section 3.2 under several subsections. Particularly in Section 3.3 and Section 3.4, the current level of relationship with respect to global and national scales are specified respectively. In Section 3.5, one of the main subjects in scope of this thesis, dual-use technologies and products, is stated with subsections of country perspectives and regulations towards it. Lastly in Chapter 3.6, current direction of flow for emerging technologies (either from defence to civil or vice versa) is described based on literature review and today's examples.

3.1 How Industries Relate With Each Other? Areas of Inter-Industry Relations

"How industries relate with each other?" is the first question to ask in this chapter as it was the starting point for this thesis. It took significant amount of time to make in-depth research on this question, but could not find a satisfactory response to base on in the literature for this section. The relevant studies in the industrial economic literature are mostly analysing the inter-industrial relations through inputs and outputs regarding materials- or product-based general market equilibriums, rather than discussing collateral influences of one on another in a wider concept.

There are several results indicated below for what industrial relations are referring in the literature:

- **Intra-industry relations:** Mostly referring to intra-industry trade and relations of labour/employment, i.e. the relationship between employers and employees in a general extent,
- **University-industry partnership:** There are many studies that analyse the relations and the cooperation between industry and academia, even for the partnership of university, industry, and government triangle. Universities offer industries to perform research collaborations or to do industry-funded academic research within their research centres or to give consultancy that industry needs, etc. (University of Cambridge, n.d.)
- **Economics of inter-related industries:** Several country-specific and inter-regional studies made for economic aspects of inter-related industries in a country, such as for general market equilibrium. A relevant study made by Midmore, Munday and Roberts is assessing industry linkages using regional input–output tables (2006). Another research made by Aydın investigates the key growth industries in Turkey via analysis of backward and forward linkages (2007).
- **Industry relations with service sectors:** There are also few studies on industries' relations with service sectors in specific.
- **Industry relations with research centres:** There are several research related to interactions between industries and public research organizations or engineering research centres.
- **Industrial cooperation:** Some companies describe it as a key element for their business strategy and use this definition to express their position in international or external partnerships, rather than describing an inter-industry collaboration.

It was decided that finding insufficient materials in the literature is also a result and may give us the opportunity of identifying a new theoretical approach on this subject. So that, regardless of defence industry, four new relation types are described for inter-industry relations in the following section to provide theoretical basis for this thesis.

Relations between industries are open to economical, technological and institutional influences. Its structure and durability are also affected by other elements in the nature of connections. In a business environment, firms usually design their corporate relations through financial interests in the first place. Another vital element in relations is technological aspect, which forces industries into a specific playground (market) with virtual limits, as much as it offers. As integral parts of this aspect; technology spin-offs, develop and exchange of knowledge (spillovers), learning capacity and innovation potential are among these influences. Last but not least factor is the effect of institutional drivers on establishing relations between industries.

3.2 Describing Relation Types: Interaction, Intersection, Integration and Interdependence

Gummett and Reppy (1988) argue that it is not merely technology that flows between two industries and there is a need for a more detailed classification to understand relational flows. As they suggest, a new classification has been made for describing relation types between any two industries.

In this section, new definitions are made to express the types of inter-industry relations. Rather than a categorization based upon the transfer of technology, information or capital, simpler and more generalised forms of relations are chosen. In other words, definitions like policy-based, technology- or project-based relations are not preferred. All of these elements have their place under categories of the following coined descriptions.

In this context, several alternative naming have been evaluated and these four descriptions are decided to be made, which are believed to represent the interrelations of industries best: interaction, intersection, integration and interdependence. The density of relations is increasing with the same order from interaction to interdependence as expressed in detail below.

3.2.1 Types of Interaction

Interaction is the first description coined to define the basic level of relations between two industries as it contains mostly first stage of relations like networking activities, inspiration by applications from other industries and the connections before and at early periods of the cooperation between industries. Interaction also refers to communicational activities to burgeon new business connections.

There are many types of interaction between industries, such as benchmarking and feasibility studies, pursuing and transferring management applications and other types of industrial best practices into another industry (learning-among-practices), inter-industrial networking activities to benefit from each other, joint meetings under the guidance of governments or led by NGOs to evaluate mutual business opportunities, etc.

Cause and effect relationship, is also a form of interaction between each other. For instance, the case of strong competition in civil industries is pushing defence industry for better.

3.2.2 The Role of Intersection

Intersection is the second relation type defined to clarify second level of relations between industries. It contains temporary project- and product-based operations of two or more industries, business-based junctions or usual intersections between industries. The main objective for an intersection is not to establish strategical or sustainable cooperation between industries, rather it is an applied solution for several business cases. Intersecting cooperation is based upon mutual benefit of sides whether in a voluntarily or a compulsory situation.

Wider use of COTS components is being observed in the applications of defence industry recently (Dunne, 2015). These ready-to-sell products may not contribute to the long-term relationship between industries but are cost-effective and eases business activities temporarily. As an example for intersecting relations, usage of COTS products (including software, communications and electronics equipment) in defence

industry give major defence contractors to understand the importance of dual-use applications and to increase their interests in commercial markets primarily with the financial and sustainability reasons (Dunne & Sköns, 2010).

It may be added under this headline that there are companies serving multiple industries. The activity and the task of these companies seem more appropriate to be intersection among new descriptions as they are at the intersected points of multiple industries, even if the companies are not literally the subject of inter-industry relations.

Main contractors of defence industry have a business that stand upon many subcontractors and small-sized enterprises, so that their costs are. In a research made for United States, it is determined that 60% to 70% of total costs of a main contractor are originated from its subcontractors. Total number of suppliers for a project, is found to be about 3,000 SMEs, shows a significant network of production (Six, Goodwin, Pack, & Freeman, 2004, p. 183).

3.2.3 Integration: A Necessity?

Integration is the third relation type defined to clarify inter-industrial relations in the scope of this thesis. It describes the further step of relations between industries after intersection, as it represents a denser relation upon integrating parts (regarding specific products or projects) between two or more industries. In addition, it concludes the case of integration when an output of an industry becomes an input for another industry.

What different with the previous coined description, intersection, is the starting point and the objective of the cooperation. Integration refers a purposeful relationship -rather than an adventitious connection- that is planned and established between industries on a product, a project or a business area. Integration requires a product- or project-based collaboration between industries and it contributes both sides by submitting a sustainable workstream upon integration and giving potential opportunities of new business areas for both sides. Integration does not include a dependency between sides, and, so may be terminated by them at their will.

It may not be a necessity for industries to integrate each other but it would probably provide cost-effective solutions and widen business fields of these industries. An apparent example of integration between industries is software, which applies in many sectors. For instance, a software prepared to serve as a statistics program in a specific industry may be integrated to another industry with a similar utilization.

It may also be included under this relation type that there are companies in some industries serving as an "integrator". Locating of what these companies are doing under these descriptions may be suitable to be integration as they are at practically integrators of an industry, even if they are not the subject of inter-industry relations as a company.

An alternative opinion concerns with the possible negative outcome of integration for two sides; defence industry's habit of raising performance of a product irrespective of its potential cost is a contradiction to and may deform the existing philosophy of commercial side of the industry. There are cases of defence contractors that tried to go into commercial side but could not succeed. Such examples cannot be generalized to reach a precise conclusion for now, but similar cases can be evaluated in global scale within a specific study. There are also examples for failed integration of defence companies with civil industries. One of the most-known instances is the bus manufacturing fiasco and big financial damage of Grumman Aerospace Corporation (merged with Northrop later in 1994) via its subcompany Grumman Flxible, that is sold to another company and declared bankruptcy due to the chassis problems of the busses (Roess & Sansone, 2012, p. 347-348).

Gansler (1988) offers larger integration of defence and civil industries "at the engineering and production levels" as a solution for intensifying relations. He adds that procurement agencies should not be persistent about the use of unique equipment built for defence needs, rather than choosing commercial parts (which are relatively cheaper) that results in better urgent producibility and lower unused capacity (p. 68).

3.2.4 Is There a Unilateral or Dual Dependence?

The fourth and the last relation type is *interdependence*. This relation type describes mandatory relations between industries due to a technology or a product as well as dependency to a single source. It may be resulted from advancement of relations if the previous types of relationship have been passed through by industries. In addition, this kind of relation is more sustainable in general since it requires a long-term continuity for both sides and is hard for industries (or companies) to terminate this interdependence when they want.

The dependency may be formed one- or two-ways, i.e. unilateral or dual. As an example for unilateral dependence, developments in most of emerging technologies such as 5G, cloud systems or artificial intelligence may affect industries up to a point that these industries have developed a dependency on these technological developments within their fields, or an industry may be in need to do business involuntarily with a single vendor for a specific field in a (probably monopolistic) market. As an instance for dual dependence, imagine a case of two industries that are dependent to each other and would not able to withdraw from these relationships, like the relation of civil aviation and tourism industries or metals manufacturing and metallurgy industries. Absence or distortion in such an industry will inevitably affect its dependent industry and vice versa, so that they have to maintain their business through their dependency until a disruptive innovation breaks this chain.

Academia is another element to be mentioned in this category since they possessed the power of research and several dependent industries upon their R&D activities, especially for the relations with industries that are passed beyond previous relation types.

3.3 Specifying the Level of Relationship for Countries

In this section, level of industrial relations between defence and civil industries are specified in a global scale. Since there is not a single constant level for all countries, it may differ from one country to another significantly. So that, examples from some

prominent countries are mentioned rather than trying to identify a static level for all countries (which can be a subject of a book on its own).

Krause (1995) classified the countries into four categories in terms of maturity level of defence industry: first category includes the producers of new technology via investing in defence R&D while the countries in the second category are the "producers and adaptors" that undertake an effort for developing domestic products with existing technologies. Countries categorized under the third category are the copiers/reproducers of current defence systems, and the countries procuring only foreign defence systems fall into the last category. In the light of Krause's philosophy, it can be concluded that rank of the countries depends on interrelationship between defence and civil industries. Being ranked in later categories indicates a weak relationship between defence and civil industries due to lack of industrial capability of the country.

Several examples can be given from the United States. For instance, U.S. Defense Advanced Research Project Agency (DARPA) is an obvious intersection point for the relationship between defence industry and civil ecosystem for more than fifty years. DARPA has summarized its mission in one clear sentence: "to make pivotal investments in breakthrough technologies for national security" (DARPA, n.d., para. 1-3). Internet, automated voice recognition, language translation, miniaturized global positioning system (GPS) receivers, first computer mouse are amongst the cutting-edge technological developments triggered by this institution for civilian use, as well as numerous defence products and technologies in history. They express the proud of working, rather having strong connections with a large ecosystem of public and private sectors in addition to academic environment to overcome revolutionary challenges they face. Gansler (1988) stated that defence industry puts about one third of all scientists and engineers in the United States to work and involves with a same amount of R&D in the country in the year of 1988.

Durmaz examined the role of DARPA and the necessity of a similar organization for countries. In his article, he designated the transformative R&D capability of the institution as a significant activator of technological development for both defence and

civilian industries as well as a beneficial tool for national economy. He concluded that eagerness of a country to construct and support useful institutions like DARPA affects directly the development level of defence industry capabilities (2016).

Another example is put by Dunne (2015), what he calls "privatization of defence services and support". A newer defence-civil field opened for private companies as they have been preferred to safeguard people or construct new buildings in conflict zones since the Iraq War.

There are two related instances from United States on this issue. First one is known as the "Packard Commission" (with its formal name: President's Blue Ribbon Commission on Defense Management), that created by President Reagan in 1987. The established federal commission worked for "management functionality within DoD" as well as the defence procurement system. Among the suggestions made by this commission, one point is related to this research: defensive use of commercial products and processes should be maintained via "design-to-cost approach" of business to decrease production and equipment costs whilst increasing performance of systems, rather than making improvement regardless of its incremental costs (Gansler, 1988, p. 69).

Second instance is another Executive Order (EO 13806, 2017) issued by current President of the U.S. on July 21, 2017, with the aim of analysing deficiencies in the collaboration and industrial base of defence industry with the headline of "Assessing and Strengthening the Manufacturing and Defense Industrial Base and Supply Chain Resiliency of the United States" and orders a formal report to be provided to him by top national bureaucrats about "an interagency assessment of the manufacturing and defence industrial base and their supply chains with considerations of the following nature: single source of supply, workforce skill gaps and access to goods and raw materials critical to national security" within 270 days (AIA, 2018, par.1). In fulfilment of this very formal instruction, an unclassified report submitted to the President by the Interagency Task Force in September 2018. This study has a sophisticated methodology and significant amount of work that involves more with United States, as well as some critical outcomes related to our subject in this thesis,

which are: the problems of level of foreign dependency on critical production capability of many sectors.

By the way, defence industrial base is defined in several ways. Dunne (2015) touched upon this issue as he asserted that one can define it as the whole companies that are able to ensure defence related needs to the government authorities. Though it can also include some civil companies related to the production of commercial parts used in defence industry and (upon the suggestion of the UK's Department of Trade and Industry) some foreign defence suppliers, all are doubtfully counted as a part of defence industrial base for a nation.

In Russia as another example, there exists a tradition of civilian production under defence infrastructure since Soviet era, which may be useful for "military to civilian spin-off both in terms of direct technology transfers and second-order spill-over effects" (Bukkvoll, Malmlöf, & Makienko, 2017, p. 244). Yet it is not possible to define a clear distinction between defence and civil industries for the Soviet era since the infrastructure and the capabilities of both industries are intentionally meshed throughout the country in order to make possible the conversion of production lines in case of a troublesome (Hartley, & Belin, 2019).

Germany separates from others for connections among industries since the current flow of technological relationship is clearly originated from civil to defence side. Most of its R&D activities have its sources in civil activities. Large civilian R&D expenditure and the well-known quality of its engineering applications in several civil industries push Germany to exploit its experience in the civil industries into defence activities and to generate the further advantage of relationship between industries.

Brazil may present another example of relationship in aerospace industry with its well-known company, Embraer (Empresa Brasileira de Aeronautica), that established in 1969 as a public company upon the long-term dream of Brazil having its indigenous aircraft manufacturer. Having divisions of defence & security, commercial aviation and executive jets under the privatized umbrella company today, Embraer continues to produce military and civilian aircrafts side by side with technological development

it has achieved. Both sides of their indigenous industries have mutual benefits from this fifty years old story (KB, 2018a, p. 13).

China's economic development and powerful financial condition ease its direct procurements of foreign defence systems and provoke higher integration between defence and civil industries (which China can take incredible amount of foreign direct investments and has significant joint-ventures), which lead China to improve its defence capabilities along with the commercial side (Dunne & Sköns, 2010).

There have been examples of organizations for integrating defence and civil technologies and to find possible solutions to convert military products into civil products in some countries. For instance, the UK once had an institution in 1980s for technology transfer, Defence Technology Enterprise (DTE), to identify, fund and transfer defence technologies into commercial applications.

In this section, export licenses should be mentioned as a mutual hurdle point for both defence and civil industries. Kuznetsova (2017) asserts that the period of obtaining export licenses is a mutual challenge for industries and it poses a bigger problem for some countries with longer time periods. Table 8 presents examples from several countries:

Table 8: Average time period for granting export license for several countries

Country	Average Time Period for Granting
Australia	15 working days (in certain cases – up to 30 working days)
Germany	30 days
Canada	10 working days (in certain cases – up to 40 working days)
Singapore	5 working days
Russia	45+ working days

(Source: Kuznetsova, 2017, Disagreements over the volume of exported product when licensing by the FSTEC of Russia)

At this point, an old-fashioned term, "conversion studies", can be mentioned. Defence conversion is defined in many ways by academics but can be summarized as the

process of transforming (or transferring) of defence industry abilities into the civilian abilities such as infrastructure or human and economic resources. Different perspectives exist for different types, subjects, scales and sources of this conversion and Boemcken characterized these typology of defence conversion in several labels as stated in Table 9 below:

Table 9: Typology of defence conversion

Indirect Conversion	Conversion of Military Personnel (Reintegration)	
	Conversion of Military Bases (Base Conversion)	
	Conversion of Defence Expenditure	
Direct Conversion	**Internal Conversion**	Factory-based / Firm level
		Company-based
	External Conversion	Community-based

(Source: Boemcken, 2017, p.7)

3.4 Specifying the Current Status in Turkey

In Turkey, SSB oversees the nature of relations with respect to defence industry since its establishment. Especially in the last decades, its intervention has been increased to cultivate SMEs from civil industries more into the defence ecosystem via several programmes, such as EYDEP (Industrial Competence Evaluation and Supporting Program) and YETEN (Inventory of Talent). Besides, there is an objective in the 2019-2023 Strategic Plan of creating working groups on the subject of promoting multiple use technologies and transferring them to other industries whether developed for defence or civil purposes (SSB, 2019c).

EYDEP Programme aims to take inventory of industrial competence of applicant companies in industrial ecosystem within the country and develop their competence for defence industry via sustainable improvement on quality, balance on procurement

pyramid, strategic targets of indigenousness and technological focus (SSB, 2017, p. 3).

YETEN Project has been conducting to identify and take inventory of existing abilities of system, subsystem and component levels of national defence industry. After the identification, several specific roadmaps and nationalization roadmap will be prepared to decrease foreign dependency of those levels and to develop domestic versions of those defence items (SSB, 2019a).

Aircraft and helicopter development programmes like Hürkuş (new generation basic trainer), T129 ATAK (multi-role combat helicopter) and T625 (multi-role helicopter) that are carried out by national defence companies have been contributed to the civil aviation industry on the subject of certification activities as well as design and indigenous production capabilities of national firms and their subsidisers.

Several indigenous engine and powerpack development projects have been carried out for different defence platforms from aerospace, missile and land, and partial assistance from civil industries and academia have been evaluated throughout some of these processes.

It should be mentioned that investment and production processes for defence products is an issue to be handled by policymakers, not only for Turkey but also for other countries. A new investor in this field should get several legal permissions for his/her enterprise including certification of incorporation (in Turkish: *firma kuruluş izni*), investment authorization (in Turkish: *yatırım izni*) if the investor is a foreigner, certifications on security clearance for personnel and facility (in Turkish: *kişi güvenlik belgesi*, *tesis güvenlik belgesi*) and permission for production (in Turkish: *üretim izni*) for a specific defence industry field, etc.

3.5 Intersection of Sets: Dual-Use Technologies and Products

Main specification of a product is its intended use, which also affects its industrial positioning as a product. Some defence items may be produced specifically for defence

industry but there are many items that found itself a place in defence industry but have other field of civil applications.

In order to illustrate this, drone represents an example. It may become a civil or a defence product through its intention of use, whether for daily life activities or for defensive purpose. Similarly, many transportation vehicles, optical and electrical solutions or even metal or chemical products can be used in both fields of civil and defence industries, so it comes through the point where we encounter *dual-use* term.

There is no contradiction on the global definition of *dual-use*, as many formal and informal sources define it as the products and the technologies that can be used for both military and civil purposes.

Approach of dual-use technologies is a way to create offshoots from defence technology to civil industries and to compensate R&D costs by entering into civil markets (Lansford, 2019, p. 185). In the same study, Lansford cited that estimated half a million-employment created in defence industry due to the progress in dual-use technologies.

Yazan (2004) stated that there are four type of dual-use relationships among actors, that are spin-off, spin-on, venture capital model and military support/pull model.

Significant part of production and R&D activities of defence industry includes various technologies related to potential civil use (Six, Goodwin, Peck, & Freeman, 2006, p. 176). However, some argues that if there is not predetermined objective to reveal a dual-use concept within defence industry, technological innovations emerged applicable for civilian use can be seen as “lucky side effects” of the standard processes (Bukkvoll et al., 2017, p. 244).

Demirel (2012) concluded that increasing of dual-use applications in industries is found to be the most important issue for a sustainable development of defence industrial base and its main reason seems to be the lower restrictions applied on foreign sales and higher market shares of civil products.

Van Nostrand (2013) believes that commercialization of technologies which are produced in defence side and transferred into civil use is also a cycle and a process of information production.

Gummett and Reppy (1988) argue that dual-use technologies represent a wide class of technologies which are developed by a joint effort of civil and defence industries. As an additional naming used in some studies, they also assert that it may be called as "multiple use technologies" too, due to the usage in various fields/markets of different civil industries. They claim that this type of technology is so important not only upon the effect of defence expenditure on civil economies but also with the availability of civil technologies for defence applications (p. 3-5).

Brandt (1994) summarizes the objective of policymakers' efforts in her well-constructed expression for defence conversion and dual-use technologies:

> *... to accomplish two extremely difficult and seemingly opposing objectives: reducing the defense budget, while at the same time saving industrial jobs, technology, and infrastructure in the defense industrial base by converting them into a flexible, commercial infrastructure capable of supporting both defense and non-defense needs. The outcome of this attempted balancing act will have far-reaching defense and economic consequences for the nation.*

A military official from the United States stated that if the civilian use of a defence industry product becomes widespread, civil market dampens the monopsonist effect of the state and its influence on products' price and makes sure that it remains in competitive and reasonable limits (Day, 2012).

In short, the more defence technologies converge to cost-effective, the more we see examples of dual-use technologies in civil use.

3.5.1 Countries' Perspectives on Dual-Use Technologies

The concept of "dual-use" is neither a new term nor a sole saviour for all problems in defence industry. Its increasing use in the literature and the popularity in recent times is because of escalating discussions about the volume of military expenditures and the

efficiency of defence industry for governments. In this direction, its help on cost-effectiveness as an alternative tool for defence industry has an increasing importance and awareness for governments and the industry.

Dual-use may have not been so popular some decades ago but have great examples of applications for both technology and product levels in recent history. Supporters of dual-use concept are growing day by day and its function in solving some disadvantages of defence industry is admired by many people today.

Governments are keen to promote dual-use technologies and the potential benefit from their large investments on defence industries. In order to obtain such a fringe benefit, some governments supply funds under the condition that the output of R&D should be practicable for both defence and civil fields. Lansford (2019) gives an example for United States: with Technology Reinvestment Program (TRP), $1.3 billion spent to give support to facilitate dual-use technologies in 1990s as part of a greater reinforcement efforts of Clinton Administration to defence industry (p. 189).

Hartley and Belin (2019) mentioned that China has put emphasis on taking advantage by integrating its high-tech available in civil industries like AI, robotics, unmanned systems into defence related applications via dual-use approach, because capabilities of civil infrastructure of China is seen ahead of its military counterparts. They also asserts that government policies are implemented starting from mid-1990s until today with this objective and gives a recent example: China set this subject as one of the prominent objectives for its 13th Five-Year Plan (2016-2020) to underline integration of defence and civil industries. Furthermore, to supervise this objective through R&D activities, about 10,000 researchers/engineers and 1,500 projects are affiliated under "836 Programme".

In a study made for European defence sector Dunne and Sköns (2010) argue that widening the competition through defence industry is possible with the step-up of dual-use applications and the more inclusion of civil companies to the industry will likely integrate policies for defence and general industry more in near future.

Turkey has a positive perspective on increasing usage and awareness of dual-use technologies and products. In Defence Industry Sectoral Strategy Document (2018-

2022) published by SSB, it is stated that SSB expects marketing survey to be made for dual-use opportunities and skills should be improved through this focus from defence companies (SSB, 2019b, p. 7). They also found out from PESTLE analysis that the potential of dual-use opportunities is high for Turkey and it should be utilized by converting into solid projects (SSB, 2019c, p. 37). In the same document they published, an institutional SWOT analysis made on SSB shows that it is also among external threats if Turkey would not reach dual-use opportunities in the following years (SSB, 2019c, p. 39).

3.5.2 Regulations for Dual-Use Items

Dual-use items are both industrial goods belonging to a certain market with economic significance and a tool for foreign policy, that is why these items need specific regulations (Koutrakos, 2001, p. 93).

Not surprisingly, dual-use items are subject to various national and international regulations in terms of handover traffic, as well as other defence industry items. National regulations for export are differentiated between two group of countries: *first group* (Canada, Singapore, Australia, etc.) controls the export of both defence and dual-use products in a single list while the *second group* (United States, UK, Russia, Turkey, etc.) prefers to use a double list for defence and dual-use items (Kuznetsova, 2017, para. 11).

A well-known example of international agreement for dual-use items is the Wassenaar Arrangement on Export Controls for Conventional Arms and Dual-Use Goods and Technologies (or Wassenaar Agreement in short), that is a regime applied by the joining 42 states. Arrangement has two lists of control, that are the “Munitions List” and the “List of Dual-Use Goods and Technologies”. Latter is related to this section and includes ten headlines to monitor: Special Material and Related Equipment, Materials Processing, Electronics, Computers, Telecommunications, Information Security, Sensors and Lasers, Navigation and Avionics, Marine, and Aerospace and Propulsion headlines in addition to sensitive and very sensitive lists.

Examples from several countries belonging the aforementioned second group that have separate lists for dual-use items are stated below:

In Turkey, Law No. 5201 regulates controlling of production and import-export of defence equipment, arms, munitions, explosives, and spare parts and technologies related to them under the responsibility of Ministry of Defence. Current legislation in Turkey (Communiqué No. 31114 published by the Ministry of Defence on April 30, 2020) defines dual-use materials as which are capable of utilization for both military and civilian purposes; and appoints Ministry of Trade to control import-export of those materials, as of export based on the declaration of its potential use by exporter regarding the "Communiqué concerning the Control of the Export of Dual-Use and Sensitive Goods" and of import under the related articles of "Import Communiqué" for those which is listed by the Wassenaar Arrangement and the Australia Group (Ministry of Defence, 2020, article i), (Ministry of Trade, 2018). Additionally, if a nuclear dual-use item defined in the Nuclear Suppliers Group (NSG) control list, then its export is subject to the permission of Turkish Atomic Energy Authority (2007). In summary, exports of all dual-use materials from Turkey is subject to related permissions from these government institutions and any dual-use item transferred to a free-trade zone in Turkey is subject to an entrance certificate and related export control procedures (U.S. Department of Commerce, n.d.).

It is asserted that the export of dual-use items out of EU is subject to control upon a common list under European law, rather than an EU member country's law and each country appoints its officials to the related control mechanisms (BAFA, n.d.). EU member states are obliged to apply formal procedures of EU while exporting, transferring, brokering or transiting of these items upon EU Dual-Use List (Annex 1 to Council Regulation No. 428/2009) (EU Council, 2009).

Export regulation of dual-use items in the UK is being controlled upon the UK Dual-Use List [Schedule 2 to the Export Control Order 2008] under the UK Strategic Export Control Lists in addition to the EU Dual-Use List for EU member states (UK Department for International Trade, 2019).

Similarly for Russia, Federal Service for Technical and Export Control (FSTEC) is a federal authority under the Ministry of Defence which involved with the export regulation of dual-use items (n.d.). In summary, governments have specific control lists for dual-use items to oversee trade and traffic of these items.

3.6 Current Status of Relational Flows of Technology

Technological developments are among main drivers of societies. Pushers of R&D (basic or applied research and technological development) activities can be categorized either by its funders or its performers. R&D activities may be funded by academia, governments, non-profit organizations and business enterprises from both domestic and foreigners/overseas. Funding actors of R&D may have several objectives such as widening basic or applied research, increasing employment, generating social benefit, making business profit or expecting technological advancement in specific fields, etc.

Researchers agree on that there was technological diffusion from military side to civilian side for the period starting with world wars until the end of Cold War, as breakthrough technological products like computer, internet, communication satellites and GPS emerged for military restricted use and spread to common use in this way. However, many researchers studying this subject believes that the directional flow of technology transfer has become reversed after the end of Cold War and civil industries has a leading role of technological development in our digital age. As Cowan and Foray (1995) stated years before today that there is a unanimity on that defence R&D has no longer great effect on civil industries as in the past. Gansler (1988) also agrees that defence technology is no longer far ahead of its commercial counterpart and better products with lower costs are available in the more competitive civil market. Dunne (2015) agrees with Gansler's position as he suggests that defence technology was ahead of its civil counterpart between WWII to the 1980s but lagged behind the civilian sector since 1990s, especially in the electronics sector, due to the longer period of delivery. He adds that the altered environment of defence industry has included increasing civil companies, that are mostly from IT and service sectors. For this reason,

defence industry will probably be using adopted technologies more in its applications in the following years, rather than the opposite case.

To give a dramatic example about the levels of defence and civil R&D to compare; R&D performance and funding sources in the UK for 2018 are showed in Figure 7.

£ million, 2018, UK

	Sector performing R&D						
	Government	UK Research & Innovation	Higher Education	Business Enterprise	Private Non-Profit	**Total**	Overseas
Sector funding R&D							
Government	1,296	150	380	1,190	113	**3,129**	649
Research Councils	51	626	2,600	530	189	**3,996**	84
HE Funding Councils	-	-	2,492	-	-	**2,492**	0
Higher Education	4	18	-	179	10	**211**	0
Business Enterprise	16	54	389	19,832	25	**20,315**	5,955
Private Non-Profit	34	38	1,318	67	402	**1,860**	0
Overseas	97	75	1,562	3,250	84	**5,069**	0
Total	**1,498**	**962**	**8,740**	**25,048**	**823**	**37,072**	-
of which:							
Civil	1,331	962	8,693	23,363	810	**35,159**	-
Defence	168	-	47	1,685	14	**1,913**	-

Source: ONS, Gross expenditure on R&D, 2020, Data table 1

Figure 7: Total expenditure on R&D by sectors in the UK

(**Source:** Rhodes, Hutton, & Ward, 2020, p. 9)

Figure 7 shows us the civil R&D activities were almost eighteen times more than the defence R&D activities in the UK with regard to the figures of 2018 and the share of universities among the performers of this R&D was quite low. It can be concluded that the technological development on defence side is not accelerating and the flow of technology will continue to be braced up by the civil side.

Similarly, 2019 EU Industrial R&D Investment Scoreboard, published by EC (with a sample companies of 77%) approves the aforementioned argument with its numerical figures for EU, the United States, Japan, China and the rest of the world as it proves that the defence R&D has been far behind of its competitors for years (Zoltan, Hernández, Tübke, Sara, & Petros, 2019, p. 9).

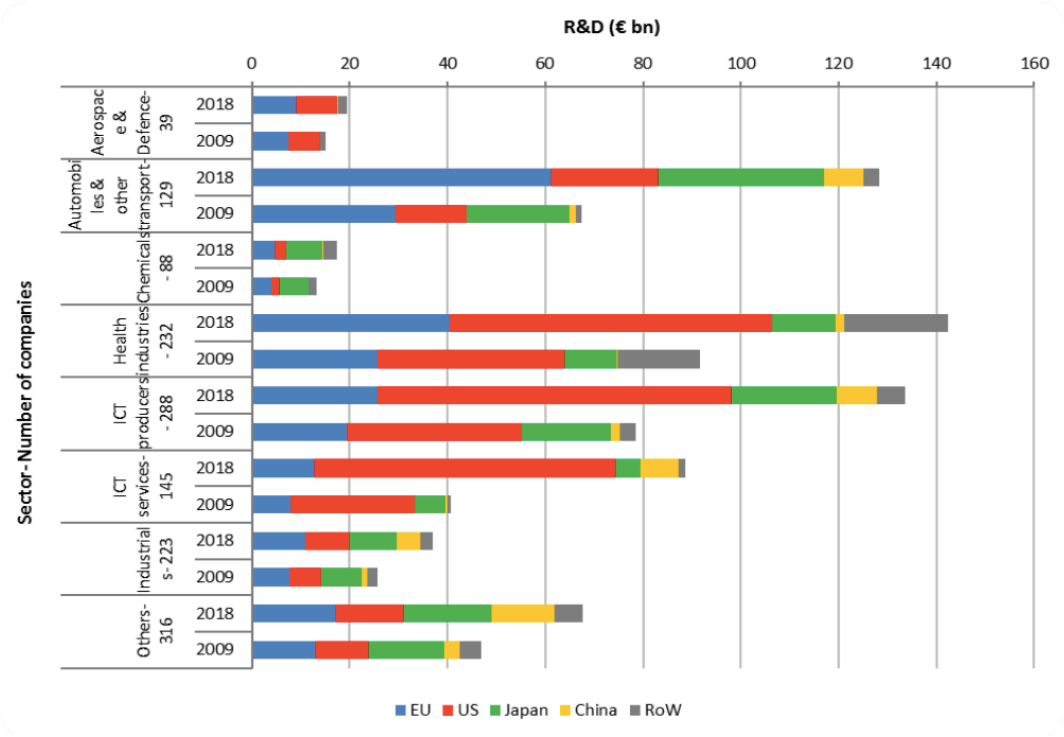

Figure 8: Classification of R&D (sector spending and number of companies)

(**Source:** Zoltan et al., 2019, p. 9)

Figure 8 shows that global aerospace and defence industry has relatively smaller number of companies carrying out R&D activities and its total level of R&D expenditure in 2018 was about USD 20 billion while only global health industries has more than seven times of R&D activities in money equivalent.

However, Bukkvoll et al. (2017) argue that successful technological spin-offs from defence industry to civil industries are likely under these six conditions (p. 233):

- If the defence R&D has a higher degree of funding on basic research comparing to the civil R&D,
- If civil users involved with the military technology at the experimental phase rather than to see final phase of a product,
- If IPR restrictions of defence product does not pose a problem for commercial use,
- If there is a technology intermediary institution committed to increase relationship between defence industry and civil industries

- If more establishments that can produce goods for both sides exist,
- If higher amount of defence procurement is needed and so defence companies apply civil industries more (via subcontracting) to tackle challenges they face.

Technological innovation and diffusion have been another trend topic in the scope of defence and civil industries/technologies and there are many studies in this knowledge area.

Bellais and Guichard (2006) asserts that transferring outcomes between defence and civil industries is upon stable adherence of both sides and compelling to apply but these hardship may be solved via effective using of IPR as an incentive.

Gummett and Reppy (1988) argue that defence companies will probably maintain their position in defence industry unless an exit or a transition (from defence market) seems necessary to them, so that a technological flow is hard to actualize without a necessity for consultation from other industries. In summary, whether the technological lead of defence and civil industries change by the field of technology and over time, coming through a conclusion is not easy as specific research is needed to determine by respective subject.

3.7 Summary of the Chapter

Although defence industry has unique characteristics, it is strongly related with civil industries. For this reason, connections between defence and civil industries are investigated in terms of intersecting areas and the level of interaction. Identifying the current level of relations between defence and civil industries, the evaluation of effects of defence industry on other industries and bringing out best practices for a beneficial inter-industry collaboration. Analysing the inter-industry relationships will pave the way of conclusions and policy recommendations of this thesis.

Segell concludes in his book published in 1997 that no one disaffirms that procurement and development activities of defence products are at the point that “civil-military, military-industrial and civil-industrial relations are all inter-related” (p. 17).

These four descriptions are made to represent the interrelations of industries: interaction, intersection, integration and interdependence. The density of relations is increasing with the same order from interaction to interdependence, all described in detail.

In Turkey, SSB oversees the nature of relations with respect to defence industry since its establishment. Especially in the last decades, its intervention has been increased to cultivate SMEs from civil industries more into the defence ecosystem via several programmes, such as EYDEP (Industrial Competence Evaluation and Supporting Program) and YETEN (Inventory of Talent).

Dual-use may have not been so popular some decades ago but have great examples of applications for both technology and product levels in recent history. Supporters of dual-use concept are growing day by day and its function of damping some disadvantages of defence industry is admired by many people today. In short, the more defence technologies converge to cost-effective, the more we see examples of dual-use technologies in civil use.

Today the current technological diffusion between defence and civil industries is not unilateral and civil industries are increasing their share in knowledge generation. Therefore, dual-use applications are crucial for commercialization and utilization of these technologies for both sides and to achieve mutual growth.

CHAPTER 4

EFFECTS OF BOOSTING DEFENCE INDUSTRY ON OTHER INDUSTRIES

Motivation for change is a provoker of industrial, technological and economic development and adapting to change is a vital pillar of survivability for nations. From economic perspective, Foster and Kaplan (2001) argue that markets always win and any business that is not able to keep step with the change in the market will inevitably fail at the end. Similarly from defence perspective, Yazan (2004) claims that military forces that fail to transform for an altered warfare environment will not prevail, and, thus, an innovative change in military is unavoidable, and the development of defence industry is crucial. Armed and security forces are obliged to maintain their existence via various activities including procurement of new systems and modernization of current systems to increase (or sustain) their readiness level for any potential threat they may face. For this reason, effects of industrial, technological and economic development of defence industry on other industries are worth to be investigated and should be managed by the authorities through deliberate mechanisms.

Historical events show us that wartime economies are great examples for boosting defence industry for a period of time and its effects on other industries, apart from other instances of a peacetime. Even today, two arch-rivals of Cold War era has taken advantage of then developed systems and defence capabilities.

The structure and the vision of defence industries differ from country to country upon their level of development. Developed countries may serve as models with their long-term planning capabilities including economic side, although developing countries mostly have determinants of threat levels and security needs along with insufficient evaluations for economic activities (Canbay, 2010, p. 178).

The power factor of defence industry seems correlated with the achieved technological competence and the economic power of a country as well as the unique production capability of its industry.

While mentioning about boosting defence industry, 2019 presented the highest level of global military expenditure in a year in last three decades (since 1988) and the increasing trend has been continuing for last five years (Tian, Kuimova, da Silva, P.D. Wezeman, & S.T. Wezeman, 2020), but it would be affected due to the recent global pandemic and perspectives of governments on defence expenditure may be changed for a limited period of time (This issue will be handled shortly in Section 7.3).

There are two main opinions about the effects of defence industry on industrialization and the macroeconomy (Demirel, 2012, p. 11):

- Defence industry is a booster for developments in other industries (Frederiksen, & Looney, 1983)
- Defence industry constitutes an impediment against the positive developments of other industries and its alternative costs are higher (Topçu, 2010).

Except these two opposite opinions, many researchers agree on the historical importance of defence industry on technological development until a time and the importance of integrating defence and civil economies for mutual interest. Even defence budgets of countries (except few) are proportionally low in their gross domestic products (GDPs), sphere of influence of the defence related activities is relatively higher in both political position and strategical power of countries.

Gummett and Reppy (1988) argue that the question of opportunity cost of the dedicated expenditure of defence industry to the civil industries by spin-off methodology is not quite applicable and verifiable on this subject, because if there is no money dedicated for arms procurement, then no money on hand to transfer to other R&D activities.

With the categorization of relations between industries in the previous chapter, leverage impact of defence industry on civil industries, especially regarding resources, is investigated in this chapter. In this chapter, literature outputs about the influence of

defence industry on other industries with the historical background to be mentioned at the beginning, in Section 4.1. Subsequently in Section 4.2, same research subject for Turkey is investigated with the chronicles of defence industry in this country for a better understanding. Identifiable positive and negative effects of public policy concentrating on defence industry are assessed particularly in Section 4.3 with major subsections identified. Section 4.4 brings several examples of good practice from the literature review and known instances forth. The effects of global pandemic on defence industry are addressed in next section (4.5) as a supporting part. Last section (4.5) summarizes what have been discussed in Chapter 4.

4.1 Literature Outputs from History of Industries: What We Experienced Until Now

There are two opposite approaches dominating the literature. Former approach claims that defence industry and related efforts are not optional and does not cause other economic activities to be damaged, rather it is a necessity for nations. Besides, it feeds national economy through several mechanisms and triggers industrial development, thus has positive effects on macro development. On the contrary, latter approach asserts that increasing of global defence expenditure and defence industry size are not natural processes and not useful for nations' own good as it exploits countries' resources like qualified man power and funds for high-tech R&D activities. Both approaches have significant amount of supporters from academy, public and private sectors.

As a support to first approach, following points are collected as outputs from common literature:

- According to Şenol (2007), defence industry is a reflection of scientific infrastructure and an indicator for the capability of technological absorption of industrial infrastructure for a country.
- As a well-known example, competition capacity of the United States in high-tech technologies are mostly originated from post WWII efforts of defence industry as

referred by many researchers with several examples in aviation (Gholz, 2011, p. 46) .

- "Military Subsidy Theory" should be mentioned as a term for expressing spin-off effect of defence industry into commercial sector as it argues that technologies developed through Cold War era led by defence industry and its great size of procurements have presented significant contributions to civil aviation companies. Gholz (2011) argues that these progress was conducted purposefully by the government.

- For instance, President Vladimir Putin of Russia claimed that defence industry should "set the bar for many technological and production parameters and remain the driving force for the development of innovative technology, including dual-purpose and civilian technology" and its effectiveness is the most crucial resource for a total economic boost, underlining its importance in a statement he made (Kremlin, 2015, para. 1).

To give a dramatic example as a supporter of adverse opinion (for second approach):

- Dwight D. Eisenhower, who served as Chief of Staff of the Army and then 34th President of the U.S. (White House, n.d.), in other words a man who reached top at civil and military careers combined in a country of having most advanced defence industrial base (acknowledged by majority) and allocating highest budget for military expenditure by far (38% of global military spending in 2019 on its own) (Tian et al., 2020), had severe criticisms of former approach. In his second and most famous presidential address, made in 1953, with the headline "The Chance for Peace" (also known as "Cross of Iron" speech), he expressed arms race is a gigantic burden on nations' shoulders and spilled out his desire for disarmament with this famous quote:

  > *"Every gun that is made, every warship launched, every rocket fired signifies, in the final sense, a theft from those who hunger and are not fed, those who are cold and are not clothed. This world in arms is not spending money alone. It is spending the sweat of its laborers, the genius of its scientists, the hopes of its children."*

These strong sentences were recognized by many people, who promotes disarmament like him. In his last presidential speech made in 1961, he advised *"No matter how much we spend for arms, there is no safety in arms alone."* and described national security as *"...the total product of our economic, intellectual, moral and military strengths."* (Nester, 1997). At the time this address presented, he confessed that annual defence spending is greater than the net income of all corporations of his country combined. His warning about a structure he called "military-industrial complex" is still be argued today and it is well attached to the subject and the research questions of this thesis (Eisenhover, 1961; Walker, Bella, & Sprecher, 1992; Bandeira, 2019).

The phrase "military-industrial complex", coined by Eisenhower in 1961, refers an informal structure (or lobby) based upon intimate relationship between government bodies and defence industry companies for mutual benefit, such as promoting bigger arms production and defence expenditure (Roland, 2007, p. 335).

Eisenhower's aim of explaining this phrase at the end of his presidency period can be seen as giving an alarm in advance, intuitively before this structure (that evolved widely in his era) gains significant strength. He warned his fellow citizens with solid expressions about protecting democratic structure and liberty from potential harm and influence of this complex at that time, and suggested a more convenient engaging of defence industrial base with civil industries to generate a mutual prosperity for security and liberty (Eisenhover, 1961, para. 17-18). To him, the danger is not only about potential constraint to free and democratic processes of a state, it also risks peace whilst feeding structures in need of "war for profit". The philosophy behind this phrase put an explanation for an unrestrained relationship between military and defence industry (mostly bigger contractors), which may mislead and even dictate domestic and international actions or dominate scientific research of a country although it should serve for industrial development, national economy and peace keeping ("What is Military-Industrial Complex", n.d., para. 4).

Several arguments made about the causation of this military-industrial complex. For instance, Dunn (1995) stated that this chain involved with rationalization of defence

employment, increase of defence budget, and a military threat to justify these activities and allocations. Related to this network of interests, Boemcken (2017) claims that the militarization (i.e. increasing presence of defence industry) is not only involved with the political aspirations but also with the economic interests of some groups.

Current status of defence industry of United States is somewhat different from its old days. Large mergers occurred between many defence companies with the push of government after Cold War period due to the serious downfall of defence expenditure (proportional to the GDP) and prominent defence companies have involved with increasing their civil market share more.

Another study on underdeveloped countries of Sub-Saharan Africa shows that defence expenditure gives a nonsignificant rise to economic development of those countries and it may contribute to countries' socioeconomic level more if such amount of money would spend for other industries. (Koçoğlu, 2014)

The results of a study made by Cappelen, Gleditsch, & Bjerkholt (1984) for 17 OECD countries between 1960-1980 show that defence industry has an overall negative effect on economic development of other than Mediterranean countries.

Another research investigating the effects of military expenditure by Kentor & Kick (2008) suggests that these spending decelerate the growth of GDP and the employment while decreasing the amount of capital investment for more productive industries.

To sum up, there is no consensus for economic effects of defence industry as there are supporting research for opposite conclusions in the existing literature. Additional and a third argument on this issue argues that both of former opinions are inadequate since the effect of one to another should be discussed case by case and it is not possible to have certain conclusions supporting one side (Gummett & Reppy, 1988, p. 4).

4.2 Specific Experience of Turkey on Defence Industry

In this part of the thesis, short history of defence industry and the recent effects of boosting this industry are examined specifically to Turkey. Since the collected data

from interviews and the recommendations made at the end are related to Turkey in a large extent, it may worth to mention it to provide necessary background for this research.

The well-known time course of the defence industry in Turkey can be summarized as below:

- After the establishment of Republic, several efforts in various fields can be seen to create indigenous defence industry in Turkey but they failed to develop a self-sufficient industrial environment for this period.
- After WWII, Turkey had close relations with Western countries as it benefitted millions of dollars of military aid from United States and has become a NATO member eventually in 1952.
- Military needs are met via procurements based mostly on import during Cold War Era, which created a comfort zone by eliminating efforts for technological and infrastructural developments and decreased the quality of domestic industrial capabilities.
- Arms embargo that placed by Western countries after Turkey's Cyprus Peace Operation (1974) created an extensive awareness for national defence industrial base. In 1976, first version of Enactment for Defence Industry Strategy (in Turkish: *Savunma Sanayii Stratejisi Dokümanı*) is published. This document is the first document that mentioned about the balance of development and defence as well as the necessity of systematic contact between defence and civil industries.
- At the next stage, that may be called as "indigenization of defence industry", first sparks for serial production of defence systems have seen in Turkey. Primary aim of related policies were to create necessary lines of products inside the country with technology transfer or licenced-production methods. This process inevitably involved with import of critical materials, technologies and components during this period. In this period (mostly 1980s) there were also joint ventures established between Turkish and mostly American partners, such as Turkish Aerospace Industries (TAI), TUSAŞ Engine Industries (TEI) and FNSS. These new-born

companies have been given the task of assembling defence products under foreign licence. Pinto (2017) argues that American assistance on Turkish defence industrial base at that time was closely associated with America's self-interest due to their strategical position regarding Cold War and aftermath.

- All activities of defence industry and defence-related procurement are considered as a whole and being managed/directed by one authority in Turkey since 1985, namely Presidency of Defence Industry (SSB).
- In 1998, Defence Industry Strategy is updated and new procurement methods for national/critical technologies and price advantage for domestic companies are added to this enactment. As an example for a better understanding the market situation at this stage, Turkey was the biggest customer among NATO members upon defence equipment procurements from external sources and its import to export rate was 1/94 in 2003 (Gökpınar, 2003, p. 186).
- Next (and current) stage for Turkey can be described as "nationalization of defence industry", that aims critical technologies, materials, components and systems to be nationalized with the highest effort of companies and a serious support by the government. This stage is also called as "Turkification of the defence industry" by Pinto (2017) who claims that this process stands as the centre of justification for the current government as they see defence project as the most crucial part of a greater "Turkification of the Turkish economy" (p. 3).

Lewis (2010), a well-known historian, argues that the Turks evaluated learning from other nations after the failed Siege of Vienna, which started with the modernization of its military and developing its defence industry. Since then, it has been trend topic for this nation to succeed at having a nationalized defence industry.

Through this story, foreign investments or partnerships in defence industry in Turkey seems to have negative effects on development of national technology capability as they often sabotaged the efforts and the possible success that domestic companies may get with a proper development schedule. Demirel (2012) argues that three procurement methods, even practiced widely in Turkey in the past, are not advised to apply for the sake of industrialization of defence industry in Turkey: procurement under license,

procurement via technology transfer and off-the-shelf procurement (p. 115). Similar conclusion is made by Canbay (2010) as he claims the effect of defence industry on economic development of Turkey between 1950-1974 was negative due to the off-the-shelf procurement, since it has diverted to positive after 1974 when Turkey has started to decrease foreign dependency thereafter.

Turkey has understood the seriousness of foreign dependency on defence industry as early as 1974 by facing an arms embargo when its national interests are conflicting with its allies and how much unreliable it is to procure main defence systems from foreign sources. Military aids received from other countries also brought critical damage onto Turkish defence industry starting from 1947. It causes production plants under MKEK (Mechanical and Chemical Industry Company, in Turkish: *Makine ve Kimya Endüstrisi Kurumu*) and other companies either to be weakened or closed as well as increasing foreign dependence via procurement of insufficient or economically-expired defence products from those countries. Some articles of negotiations while entering NATO also directed Turkey to get military aids and to choose foreign procurements from allied countries (Özlü, 2006, p. 290).

Turkey is obliged to increase defence expenditure due to its challenging environmental conditions and receiving no more military aids and it causes the government to understand the importance of effective management of defence expenditure with a greatest surplus possible for national economy and industries.

According to a research made by Candar (2003) (via cointegration analysis) on Turkish defence expenditure between 1950-2001, defence expenditures went in parallel with economic growth both in short- and long-terms, but in another similar research made by Kasalak (2006) for the period of 1980-2004 with another methodological approach (four-equation econometric model) did not find a serious evidence related to defence expenditure. On the other hand, research made on Turkey investigating the period of 1980-2000 (with the help of computable general equilibrium method) shows us that increasing defence expenditures have a negative effect on economy (Aya, 2005, p. 30). Hence, all three arguments (positive, negative, irrelevant) have academic support in the literature, but the position of this study on this issue will be processed at the conclusion chapter.

Turkey's archetypal development in defence industry does not feature a significant boosting in total defence expenditure except last five years, as it can be seen through the Figure 9 below (for years between 1960-2018). Because of decreasing military spending on several large-sized foreign procurements and prioritization of domestic development projects and indigenous acquisitions, the direction of the graph has turned upwards recently. It should be noted that the current environment of defence industry seems to industrialists as an exclusive "sign of prestige" and the identification of "nationalism and advanced technology" being a part of defence industry in Turkey (Pinto, 2017, p.13).

Figure 9: Military expenditure of Turkey (% of GDP)

(**Source:** World Bank, n.d.)

4.3 Identifiable Positive/Negative Effects

Defence industry is mostly concerned with high technology products and bigger and unique infrastructure investments. Thus, it is not only related to economic power but also technological and strategical power of a country. Most countries aim maximum

rate of indigenousness for their defence industrial base. So that, domestic procurement is at utmost importance for macroeconomic policies (like employment and balance of payments) and sustaining native production capability (for domestic inputs and security of supply) in addition to the technological development.

Dumas claims that it (defence industry) unlocks new opportunities for employment and supplies alternative source of demand for increasing business activity as well as leading the technological developments and their civil implementation. (1898, p. 1)

As another example, Erdil et al. claim that the dense, combined and developed structure of defence industrial base in Ankara is found to be a strength for IT sector (via SWOT analysis) and gives this sector an opportunity and a higher potential of doing business, being a part of joint learning process, and even integrating with the defence industry settled in this city. (Erdil, Pamukçu, & Akçomak, n.d.) It may be interpreted that the defence industrial base has positive effect on other high-tech industries as it provides a trusted environment for developing technology together.

The method of defence procurement has an undeniable effect on the industrialization and the domestic development of both civil and defence industries. Government agencies are assigned not only with the mission of defence procurement but also with the task of developing national capacity of defence industrial base. Procurement methods of domestic development and R&D are known as the most beneficial types among them as they include and enable all potential of local companies from both defence and civil industries in a country.

Demirel (2012) analyses the factors affecting the industrialization on defence industry in Turkey within his study and concludes that the government, internal dynamics and international conjuncture, and the procurement methods are the major factors regarding the development of defence industry (p. iii). His study suggests that these methods of defence procurement listed below should not be applied because of their limited benefit to economy, industrialization and defence industrial base as well as other issues like confidentiality and establishing a dependence to foreign states:

- Production under licence: It has several benefits to suppliers, problems on supply chain and restrictions on production and export.

- Procurement via technology transfer: It indicates underdevelopment and old technologies to be transferred in general.
- Foreign direct procurements: It should be the last option if and only if the related defence need is urgent.
- Foreign military assistance: Even not necessarily to mention as a procurement method.

To sum up, carrying out indigenous development projects for defence products/platforms is considered as the best option for enhancing domestic industrialization and inter-industry relations between defence and others, even though they are costlier solutions for procurement.

4.3.1 Human and Capital Resources

Human resource is among the most important elements of a national defence industry. So that most countries have their most qualified professionals including engineers and technicians as well as managers and executives are employed in the defence industry. Employment in defence industry is not only important in terms of its size but also the number of professionals and researchers with higher skills and experiences than other industries (Dunne, 2015) .

Being a centre of attention among industries may cause a drawback for the rest of the industries, as there are increasing critics from civil industries in cities that have significant size of defence industrial base, arguing that the salaries of defence industry affects other industries negatively and they have difficulties to find qualified/experienced engineers by offering reasonable wages in the market. In some developing countries like Turkey, there is limited skilled workforce and if the distribution of this labour is not balanced, there would be some problems uttered by the nonconcentrated industries, even some industrial zones. Moreover, the introversion of defence industry, a defence professional goes to another defence company rather than other industries, forms another factor for others to be worried. Critics on this issue are also originating from the preferences of new graduates and of other professionals

who then decide to cross the street for defence industry. Due to the reason of being a critical industry, it provides its personnel the privilege of a strong feeling: “serving the country” under better financial conditions.

There are conflicting arguments about the interrelation of defence expenditure (as an indicator of boosting defence industry) with the employment rates in a country but it is hard and may not meaningful to correlate two variables because of the volume of defence industry in many countries except the United States. For example in Turkey, only 73.771 people are working for defence industry where about 3.1 million people are working in civil industries and total employment is over 27 millions (latest numbers from open sources). In United States, 2.5 millions of people work for defence and aerospace industry where 120 millions of people are employed in total.

Bellais (2009) claims that an influential technology policy including implementation and financial aspects is required to sustain technological superiority and adds that a country should find out the ways to prevent the uncontrolled increase of its defence expenditure and increase the effectiveness of R&D activities to procure newest technologies with reasonable prices.

Brunskill (1992) suggests that a part of defence budget can be dedicated to civil projects which may provide support to defence technologies, so that the know-how and the cumulative knowledge of defence side may be transferred better to civil side when a necessity (like a financial shrinkage in defence industry) occurs.

Estimated amount of 70% of Turkish exports in defence and aviation industry was offsets in 2013 (Pinto, 2017, p. 22).

Since most of the defence spending relies upon public funds, Gökpınar (2016) suggests that following conditions should be maintained by the proper government enforcement while procuring defence products (p. 504):

- Supporting competitiveness of the country in medium- and long-terms via promoting domestic innovation culture,
- Disseminating economic benefits of defence innovations via transmitting these innovations into the civil fields of use.

Bellais (2009) claims that there is not a linear ratio between R&D expenditures and potential technological outcomes and a threshold exists for R&D expenditures that any amount spent under this level would not give rise to efficient results. He made a significant suggestion to those countries who are not able to invest enough to a specific technology are better not to put their money on this field of technology because the success rate would be diminished, and saying that even NATO is choosing which technologies worth to be funded. His arguments approve that it is important for countries that focusing on specific fields should be preferred in both defence and civil industries via solid mechanisms for strategical policymaking.

4.3.2 Technology Push

The only way for technology push is R&D on emerging technologies. It may be originated from internal or external sources and from domestic capabilities or via technology transfers. Gökpınar (2013) investigated the sources of innovation for defence industry and found that the primary source is overseas companies/competitors, which is an external factor.

Dual-use applications of defence items are main transferrable elements in scope of the technology push. These applications have been significant effects on societies throughout history with numerous examples. World wars and the Cold War have been the major reason of higher defence expenditures and defence R&Ds and those countries who joined to arms race have taken advantage of this periods, not only in defence industry but also in civil industries. Commercial outputs of the technological development mostly originating from these eras are still visible, even the historical background of dual-use technologies and products are not ancient.

As a common example, to determine frequently used technologies are whether originated from defence or civil industries, Mazzucato gave the example of iPhone with its cutting-edge technologies in her book published in 2013 and shown in Figure 10. This scheme proves that most of the-then emerging technologies used on an advanced phone of that time are mostly originating from defence technologies such as GPS, signal compression, cellular technology and internet, microprocessor and micro

hard drive, Siri, multi touch screen, etc. and funded by defence institutions like DoD, DARPA, Army Research Office, etc.

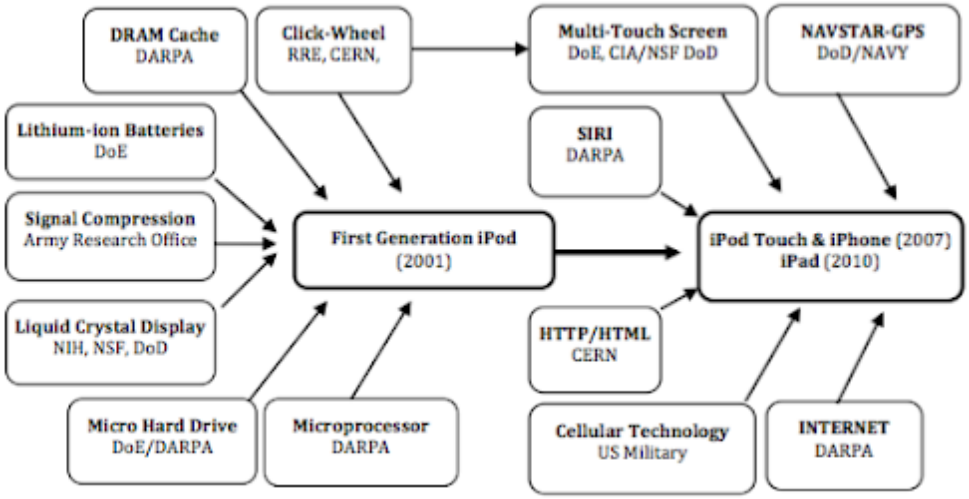

Figure 10: Ingredient technologies of an iPhone

(**Source:** Mazzucato, 2013, p.109)

Much the same mentioned in the previous chapter, relational flow has been changed and the role of defence industry as a technology pusher has reversed recently. Though, both Gökpınar (2016) and Geels (2002) claim that defence industry remains as a niche market among industries with its mission as an incubator for radical innovations.

Lundvall (2016) states that the innovation is not an isolated playground for academics, and public and private professionals in a learning economy; and without the society that gives feedback, the innovation system becomes distanced from a sustainable increase on cumulative knowledge as well as technological and economic development (p. 709). Within this perspective, the restricted society of defence industry provides a relatively informed environment with both its customers and suppliers in which the incremental knowledge is based on the close cooperation of these actors in the industry. Therefore, defence industry serves as a model for a learning economy within a limited area.

Lastly in this section, *public procurement for innovation* can be mentioned as another model applied by states for domestic technology push and economic development. It

has a wide practice in several industries and categorized as “public technology procurement” (Edquist, Hommen, L. Tsipouri, & L. J. Tsipouri, 2000) and “innovation-oriented procurement” (Rothwell, 1984). Erdil, Pamukçu and Çifçti (2016) argue that defence acquisitions may present the only systematic examples in Turkey for the innovation-oriented procurement policy (in addition to ICT sector in partial), noting that the innovation part is relatively slower because the competitiveness is not a primary focus of defence industry (p. 48-49).

4.4 Examples of Best Practice for Common Interest of Industries

Technological influence and spread of innovation through one side to another are in common interest of defence and civil industries. Connections between industries have given way to best practices to be formed and some of them are selected to mention in this section.

There are many collaboration practices and commercial expansion of sectors like spin-off effects including dual-use applications and some companies serving both civil and defence industries. Related examples of companies include those stated below:

- The development of technology and production capability of military jet aircraft and civilian aircraft side by side in United States, Brazil and Europe under famous brands: Boeing, Embraer, AIRBUS, etc.
- Helicopter manufacturers are also serving for both defence and civil industries: Bell, Sikorsky, Leonardo, TAI, etc.
- There are some key players of automotive industry also serves to defence industry in various land platforms: MAN, Mercedes-Benz, BMC, Otokar, Tatra, ISUZU, IVECO, Land Rover, Renault, etc.

Similar examples may be listed from many other sectors, but more relevant are selected from projects or products that are fruits of a joint work of both sides in scope of this section below:

- An SME from civil industry in Turkey, *BioSys*, has succeeded to produce a mid-level intensive care mechanical ventilator device to be used for healthcare purposes, with the domestic capabilities of *Aselsan*, *Baykar* and *Arçelik*. The project was developed between 2012-2017 but could not be produced until the global disease make defence and civil giants to help to this project on completing development phase and succeeding mass production within a month. The final product, *biyovent*, has taken orders of several millions of dollars from overseas and has exported to several countries already (Ergocun, 2020). Similar productions have been made by using defence industry facilities in the UK and in the United States since April 2020.

- Turkey Wagon Industry Corporation (TÜVASAŞ) has worked together with Turkish defence company Aselsan's Sector for Transportation, Security, Energy, Automation & Healthcare Systems (in Turkish: *Aselsan UGES*) on the project of first electric train of Turkey. Aselsan has produced traction system and train control management system (TR-CMS), which are said to be the essential parts of a train, which indicates another significant example of cooperation (NTV, 2020).

- Vision projects for either defence or civil platforms like TOGG (Turkey's Automotive Initiative Group) or ALTAY (Turkey's Main Battle Tank) have an impact on all industries as it involves with them in a wider extent, from a component to a system.

- Two examples come forward as fine and successful examples of harmonic cooperation of industries: Oruç Reis and A400M projects. The former is an advanced geophysical exploration vessel owned by the General Directorate of Mineral Research and Exploration of Turkey (MTA) and has come into service in 2015. (Istanbul Shipyard, n.d.) What makes her an example here its building project is conducted by SSB as a defence project although it is a vessel in civil use and built by civil shipyard. Latter A400M Atlas project is a multinational project for medium-range turboprop military transport aircraft which has come into service since 2013 and used by six armies including Turkey. The difference in this project is the management type of the procurement, as this tactical and strategic

airlifter programme is overseen by OCCAR and managed by prime contractor with a “commercial approach” proposed by AIRBUS with its experience coming from civil side. (OCCAR, n.d.)

4.5 Additional Remarks Regarding COVID-19 Case

Coronavirus-related crisis underlined again the importance of that countries should construct, plan and improve their defence industrial base with the consideration of emergency situations for similar cases. Defence expenditures may be reduced or waived by governments under such difficult times. An emergency scenario should be studied for each industry separately. Recent instances show us the deficiency of collaboration for such a case as industrial infrastructure in many countries wavered in the first months of global pandemic. Converting existing capabilities of industry into a needed version has taken months for industries even in developed countries. For instance, in the United States, Defence Production Act (DPA), an American law passed to support national security in wartime and emergency conditions, has been invoked by the President and domestic facilities of civil industry are used to produce healthcare products such as mask and ventilators (White House, 2020).

Sommer (2020) argues that defence industry or “military-industrial complex” is still well subsidised during COVID-19 as before and has not experienced hardness like other sectors. There is evidence proving this argument for the United States as the Director of DCMA stated that they have ensured defence companies being not affected by business closures and running through COVID-19 days and they have pushed the market with improving cash flow for the industry (Lopez, 2020). On the contrary, Kurç (2020) claims that many countries would probably cut back on defence budgets to decrease economic influence of global disease which eventually cause defence expenditures to be lowered considerably as in the beginning of 1990s and adds that he expects domestic markets to be narrowed, industrial targets and some projects to be postponed, another era of consolidation to be experienced and international cooperation to be improved.

4.6 Summary of the Chapter

In Summary, changing of the defence and industrial environment is inevitable and adaptation to the change is crucial for nations. The influence of industrial, technological and economic development that defence industry has on civil industries should be investigated and managed by the authorities through accurate mechanisms.

Statistics show us that most of the developed countries that have well planning capabilities, significant level of technological and economic competence and industrial production capability are also ahead of other countries regarding their defence industry accomplishments. Even defence expenditures are proportionally low in GDP, its impact is relatively higher in both political position and strategical power of countries.

There are two opposite approaches (regarding the effects of defence industry on other industries) dominating the literature. First approach claims that defence industry feeds national economy, triggers industrial development and has positive effect on civil industries, whereas the second approach argues that defence industry does not contribute to civil industries as it exploits resources like qualified man power and funds for high-tech R&D activities.

Defence industry contributes to the development of absorptive capacity of a nation by promoting the high-end and unique discoveries and facilitating the process of learning. Defence industry is mostly concerned with high-tech products and bigger and unique infrastructure investments. Thus, it is not only related to economic power but also technological and strategical power of a country.

Most countries aim maximum rate of indigenousness for their defence industrial base. So that, domestic procurement is at utmost importance for macroeconomic policies (like employment and balance of payments) and sustaining native production capability (for domestic inputs and security of supply) in addition to the technological development. Selected procurement method has a significant effect on the industrialization and the domestic development of both civil and defence industries. Government agencies are assigned not only with the mission of defence procurement but also with the task of developing national capacity of defence industrial base. Procurement methods of domestic development and R&D projects are known as the

most beneficial types among them as they include and enable all potential of local companies from both defence and civil industries in a country.

In this chapter, technological outcomes, and human and capital resources are investigated as the foremost impact areas of defence industry. Besides, historical background of the defence industry of Turkey is summarized. Turkey is obliged to increase defence expenditure due to its challenging geopolitical conditions and receiving no more military aids. It expands government's awareness of the effective management of defence expenditures along with the extraction of potential gain for national economy and industries.

Technological influence and spread of innovation through one side to another are in common interest of defence and civil industries. There are many collaboration practices and commercial expansion of sectors like spin-off effects including dual-use applications and some companies serving both civil and defence industries. Selected examples for connections between industries are also mentioned in this section.

CHAPTER 5

METHODOLOGY

Social research can be described as an academic study on issues regarding the differences and the progress in society via using concepts and theoretical structures of social sciences. The approach of social sciences mainly stands on enhancing our understanding of alternation in our societies. Questions arise from our curiosity while trying to understand changes or deepen our knowledge about the society. In this respect, methodology has an undeniable importance for an academic research. Social sciences give us a broad range of choices between research methods while gathering and analysing the data. This kind of abundance also puts writers in a danger of choosing improper methods for their research. Every new research can be identified as a unique academic effort, and, thus, every of it needs specific choices regarding research method.

In this chapter, it is described that the methodology used for seeking answers of the research questions of this thesis (i.e. relation mechanisms and reciprocal influence between defence and civil industries along with best practices in this field).

Engaging on a subject for a researcher has two ways. First, researcher expresses his/her views at the beginning of academic writing and formulates his/her hypothesis before proving it through his/her research. Second, researcher choose to play it safe, as his/her theories are constituted on results of the research. The difference between two approaches directly affects the research process, because former makes his/her view to lead the data process whereas latter let data reveals new ideas (Bryman, 2012, p.6). In the following sections, readers can see that the second approach is chosen to construct new arguments and followingly policy recommendations are made by prioritizing the deliveries of the research data.

Selected research methods for this thesis are reported in this chapter, starting with the details of the literature review in Section 5.1. Subsequently in Section 5.2, the role of qualitative methodology in research design is discussed and research questions are listed. Followingly, in Section 5.3, selection of data collection method and reasoning of semi-structured interviews made with twenty-one participants under three groups, are explained. This section includes the sampling method and the supplementary information about interviewees and interviews. In Section 5.4, data analysis method and its selection process are expressed in detail. Last section (Section 5.5) contains a short summary of what have been included in this methodology chapter.

5.1 Literature Review

Investigation on existing knowledge area forms a critical proportion of a research, what we called "literature review". It is hard to scan all accumulated knowledge within the scope of a topic, which makes it important for a researcher to filter foremost transcripts in addition to newest studies. What next after filtering those studies is determining their materiality and utilizing them in the current study. Bryman (2012) asserts that literature review should not comprise of a summary of what has been read by the researcher, rather be a significant part of the research by being reflected in related chapters with a critical perspective.

Academic writers are advised to be acquainted with the literature on the topic to make a significant contribution on the existing knowledge ground without falling into repetition. Going through previous studies about the research subject took a serious proportion of this study. Literature review may be considered as a continuous process till the end of the study as latest developments have being followed regularly.

Apart from this, preliminary literature review affected the direction of the study, as it added an unpredictable dimension and a novelty into this thesis. One of foundational questions designated for the early stage of this study did not get satisfactory answers from the literature. Since it was critical for the theoretical frame of this study, there emerged a necessity for contributing to the literature with making new descriptions in this field. As such, four new descriptions have been coined within this study to define

inter-industry relation types. Then, these descriptions are subjected to a qualitative test through interviews to prove them as acceptable.

5.2 Research Design: Qualitative Approach

In respect of research design, selected approach on research process including data gathering and data analysis will be explained. It is essential for a research to undergo an "explicit, disciplined and systematic" process to get most proper outcomes (Mohajan, 2018, p. 1).

There are reasonable grounds why qualitative approach is selected for this study and also used widely in social sciences. To Domholdt (1993), "deep understanding of the particular" can be described as the aim of the qualitative tradition. This thesis does not pursue the numbers or statistics, rather it focuses on an extensive analysis of current status of relations between defence industry and civil industries, and revealing the valuable examples (i.e. best practices) in this field. This phenomenon about qualitative research is explained by Walia (2015) as "it focuses on words rather than numbers" (p. 3). It embarks on to human endeavours and social facts with an interpretive approach (Atkinson, Coffey, & Delamont, 2001). Therefore, the aim of qualitative approach can be described as creating new themes by examining regular or irregular cases with our intellectual viewpoint. Creswell (2009) described qualitative analysis as an effective model that allows the researcher to involve with genuine experiences closer and to originate a level of detail from them.

Naturally, qualitative research method has its advantages and disadvantages. As the interest in this method is growing since a few decades, many analysis made in social sciences literature on its strengths and weaknesses (Choy, 2014). Data characteristics may give us a clear distinction between qualitative and quantitative research. More clearly, measurable or "quantifiable" data may be more appropriate reserve for quantitative research (Dey, 1993, p. 11). On the other hand, data that is interpretable by its meaning, is potential subject of qualitative research (Denzin & Lincoln, 2005, p. 10). In this manner, most fitted description for "qualitative data" comes from Miles

and Huberman (1994): “data in the form of words” that requires to be processed by the researcher (p. 9).

Connecting research method with research questions is another important issue in an academic research. Research questions may simulate pillars of a study. As the importance of research questions underlined by many scholars; the stronger research questions are, the more successful a research is. This is because it pushes researcher to undergo a significant process of focusing and reasoning of his/her research subject and research objective. It guides a research starting from literature review to conclusion and affects researcher’s choices regarding methodology, data collection, data analysis etc. It is widely accepted that if research questions are not specified studiously at the beginning (or early stages) of the research, study may become unfocused without clear purpose(s).

Frequently, a research contains multiple research questions, each selected to draw the main frame of the research. For this study, research questions are selected before getting into literature and not revised during or after literature review and consecutive process. To mark the objectives of this thesis, three research questions emerged as follow:

- To what extent of connection have been achieved between defence industry with other (civil) industries?
- What are the positive/negative effects of boosting defence industry on other (civil) industries?
- What are the good practices for coherent and beneficial inter-industry collaboration between defence industry and other (civil) industries?

5.3 Data Collection: Semi-Structured Interviews

One of the most essential part of the study will be described in this section: data collection method. Even if a research is qualitative, quantitative or both, interviews are counted among featured methods for collecting data.

In part of this thesis work, "semi-structured interviewing" is selected as the main tool for data collection. Note that, although different alternatives like elite interviewing, focused interviewing, ethnographic interviewing, depth interviewing or qualitative interviewing were used for naming, "*semi-structured interviewing*" is preferred in this research, since this name seems attracted more supporters than others in the scientific community, as Adams (2015) declared it "simple and descriptive" (p. 493). This type of interviews include both open and close-ended questions and interviewer can change the sequence of questions or ask further questions for probing into a subject whilst respondents also have the privilege of canalizing their answers. It also helps researcher to be open minded for new ideas from respondents and make it easier to construct new theories from the data collected. In this manner, semi-structured interview is more convenient for inductive research method (Bryman, 2012, p. 12). Because it frames a full and semi-structured conversation on an individual basis which allows researcher to combine predetermined questions with wonder questions (like how and why) and pop-up (undetermined) questions.

If advantages and disadvantages of this research method should be mentioned, it has numerous pros and cons stated in the literature. To start with, following disadvantages can be discussed:

- It needs greater times and effort to prepare, conduct and analyse,
- Higher effect of interviewing skills on research,
- Lack of representing larger number of people statistically.

First of these disadvantages can be eliminated with the experience obtained with this study. Complete structure of the interview has been designed with open and closed-ended questions and escape hatches. After getting the permission of execution from ethics committee, it took months to conduct all interviews (slowed down to a degree with the emergence of COVID-19) and to finalize data analysis. So, the interviewing process was more time-consuming comparing to other methods like surveys or focus groups. Second disadvantage is eliminated by studying on the literature about points to consider while interviewing. To overcome third disadvantage, sampling method, target groups and interviewees are selected from a wide range of people to increase

power of representation. Related selection process is explained comprehensively in following sections.

On the contrary of counted disadvantages, semi-structured interviewing has several advantages including:

- It reflects skills of a researcher more,
- It is easier to get in-depth details and nonstandard insights in a subject by the liberty it offers, making it a more convenient method to the nature of qualitative approach. We should rephrase that the importance of being conscious about how to conduct a semi-structured interview and what to avoid are academic skills of a writer.

Considering both advantages and disadvantages of semi-structured interviewing, the main reason why it is selected as the data collection method is to get in-depth commentary regarding the relations of defence industry. Since confidentiality is counted among the main characteristics of defence industry, survey/questionnaire or other quantitative data collection methods might not be purposeful for getting better answers for this study. It is believed that experienced professionals will act more explanatory under the conditions of certain anonymity and a warm environment of one-to-one speaking. It seems succeeded as you can see the results of the collected data in following chapters.

Some suggestions to consider for interviewers while conducting interviews are listed in the literature about the duration of interviews, plurality of interviewees, communication types (in-person, by phone or online) and substantial points related to it, knowing the schedule, introducing the research, asking questions and recording answers (Bryman, 2012, pp. 213-220). Upon these suggestions, following points are considered and measures are applied:

- Comparing face to face interviews, telephone interviews are said to be easier to manage and cheaper to conduct. However, it is uneasy to have longer conversations above 20-25 mins (Frey, 2004) and harder to observe respondents' reactions, which may lower quality of answers. Based on these factors, face to face interviews are preferred at the beginning of this research and eight of first nine

interviews were made in person. To the initial planning, most of the interviews (especially with those who are reachable and nearby) are planned to be conducted in this way, however emerging factor of COVID-19 affects the course of events and further interviews are conducted via voice or video calls.

- At the beginning of interviews, the aim of research and the scope of questions are introduced to participants, in order to give them a macro view of the study.
- Knowing the schedule is also important for both sides. For interviewer, it is easier to control the time and to set the tone of discussion whilst keeping schedule in his or her mind. Similarly, not all interviewees have hours to participate a research or to maintain his or her focus for a long time without knowing where questions are going. To overcome this problem, estimated length and the schedule of interview are also told to participants and their attention is kept alive by increasing the pace of questions when necessary.
- It is not suggested to exceed one hour of interview length in general, due to the risk of tiredness and losing focus for both sides (Adams, 2015, p. 493). In this study, length of recordings varied from 22 to 80 mins and the average of interviews were 44 mins while only three out of twenty-one interview have overstepped this suggestion. Interestingly, all of these three respondents that exceeded one hour of interview time and two respondents of conversation under half an hour were all academics. At this point, it should be stated that the interview length is calculated from the starting point of interviewer's reading of introductory text before asking the first question to the ending point of thanking speech for participation after last questions about demographics.
- Interviewee plurality was another factor for successful interviews. If multiple interviewees are not preferred or a necessity for a research (like couples or project teams etc.), it is suggested to conduct interview with only one person at a time. Because, if a respondent is not alone during interview, he or she may consult others or others may interfere his or her answers time by time. Thus, confusion and alteration may occur in the data collected. Due to these reasons; nineteen interviews (of twenty-one) are conducted one by one, while two interviewees were

accompanied by others. In these two cases, comments of others have not been considered for this research and have not added into collected data.

- To maintain the structure of an interview to an extent, i.e. asking similar set of questions to all respondents is also important since it ripens the collected data (Guest, Bunce, & Johnson, 2006).

5.3.1 Target Group for Interviews (Sampling)

It is not possible to reach all people in the selected universe (i.e. target groups formed under determined criteria) to conduct interviews with. Resources like time, cost and manpower limit the amount of interviews or any other type of method in a research, which causes sampling to play a vital role in most of scientific research. To the perspective of in-depth interview, it is not necessary to generalize a theory with a larger population, rather it is more important to acquire detailed and genuine answers for research questions (Dworkin, 2012).

In this direction, interviews are intended to be made with three target groups within the context of this thesis, which are described in detail below. After identification of these three groups, method of *quota sampling*, one of *non-probability sampling* methods, is selected and applied to determine potential interviewees. To explain in short, non-probability sampling methods are used when samples (i.e. respondents) are not selected randomly. Quota sampling among them is related to the personal selection of interviewer once the decision made upon categories of target group of interviews and the amount of people within these categories (i.e. quotas). The main objective of this method is the self-determination for reflective samples of population.

There are pros and cons stated in the literature for this method as well as other methods. Disadvantages of this sampling method include the impossibility at measuring error rates of non-random methods and the possibility of fallacy if the samples are not selected in a representative and typical way. On the contrary, following advantages makes quota sampling preferable: it is a manageable, inexpensive and a faster method, and the sampling error is relatively negligible compared to surveys (Bryman, 2012,

pp. 203-204). Considering both advantages and disadvantages, using this method allowed this study to move faster at processes of selection of interviewees and examination of interviews.

Sampling biases mentioned in the literature and above like *inadequate sampling, selective (subjective) sampling, problem of non-response* were taken care of through the sampling process.

Sampling size is chosen upon the suggestion of advisors as they pointed out minimum of twenty interviews should be made for such a study. According to the relevant literature, Bertaux (1981) points that smallest acceptable size for sampling in a qualitative research is fifteen. Likewise, Creswell (1998) suggests five to twenty interviews for a phenomenological research and twenty to thirty interviews for a grounded theory research. In addition, there is an article insisting on minimum five people for a target category and up to fifty people for a well-planned qualitative research (Dworkin, 2012). Since there are three categories defined as target groups; minimum five interviews for each category and minimum twenty of total interviews are needed. Therefore, conducting seven interviews for three categories (total of twenty-one interviews) would have met both requirements, ipso facto it favoured to be so.

The reason why three target groups are determined is to primarily investigate the different perspectives of defence-, civil-, and academy-based professionals on this subject and getting a saturated data from interviewees.

First target group, named *TG1*, can be defined as "Turkish defence industry professionals in management positions that are related to civil industries" and the sampling universe is categorized under these criteria:

- Experienced professionals from defence industry,
- Public servants who have experience of coworking with civil industries,
- Professionals from top defence industry companies of Turkey (to the national and global rankings) (ISO, 2020; Defense News, 2020; SaSaD, 2020b).

Second target group, named *TG2*, can be described as "Turkish civil industry professionals in management positions that are related to defence industry", and the sampling universe is categorized under these criteria:

- Experienced professionals from civil industry,
- Public servants who either have defence industry experience or coworking with defence industry, or
- Professionals from large-sized enterprises which main field of operation is civil industries but also have defence-related production.

Third target group, named *TG3*, can be identified as "experienced academics that are familiar with the defence industry in Turkey" and the sampling universe is categorized under these criteria:

- Academics who have managed Master's/PhD dissertation(s) in the field of defence industry,
- Academics who have conducted project(s) or academic work(s) in the field of defence industry in recent years,
- Academics with a prior background about industry relations or defence industry.

Selection criteria for defining the universe of sampling became easier following the determination of three target groups, since the intersecting points of these target groups with the research subject are limited with those criteria defined above. In this way, for example, more than forty people were determined from the sampling universe of TG3 in a reachable distance and their experiences are sorted for invitations of interviews.

Morse (1994) argues that "saturation is the key to excellent qualitative work" but she noted that requiring sample size for reaching a decent saturation is not determined in the literature yet (p. 147). To differentiate outputs of interviews and to preclude bias on subjective selection of sampling, participants are chosen from different institutions and companies or from different universities and departments as far as possible. Only two of twenty-one interviewees were from the same department of the same institution (two academics from same place) but their primary working fields were different and

the divergence of their point of views showed up in interviews. Hence, this selection did not obviate the criteria for target groups.

Non-response samples have been experienced mostly in invitations for the last target group (TG3, academics). But it did not push the study in a position of occurring excessive non-sampling errors, because all standby invitations have met predetermined criteria for the target group.

Some interviewees suggested a few people in related sectors, who they believe have great experiences and may contribute to this study, but it was not preferred to widen sampling universe through their suggestions. Following another method in the literature, what called as "*snowball sampling"*, might harm to the predetermined sampling methodology. It would be an improper strategy for this study, as it generally decreases the representation rate of the selected universe.

For a better understanding and an impartiality of interviewees' contribution, interview numbers are selected equally as seven interviews per each group. Limited time can be arranged for semi-structured interviews since this thesis should have completed in a definite period of time and have subsequent processes with regard to the selected methodology. Thus, total of twenty-one interviews in three determined groups is decided to be enough for a solid qualitative analysis.

5.3.2 Demographics of Interviewees

In this section, demographic information of participants including their age groups, job experiences and job-related specifications are expressed. It makes readers to understand better the background of evaluations of interviewees via different perspectives. As stated above, interviews are decided to be made with twenty-one participants. Data is collected through face to face meetings along with voice and video calls with interviewees.

Average age of participants, 47,6, shows that the interviews are conducted with a group of highly experienced people in general. Looking into age ranges, two of them are tricenarian and twelve of them are at their forties (this age range includes the

dominant part of interviewees). Three of them are between 50-59 ages and remaining four people are above sixty ages, whom are believed to be most experienced ones with their longer years of working.

Job-related experiences were another crucial point taken into consideration while choosing interviewees. Three types of job-related experience of participants are noted, which are defence industry experience, management experience and total job experience.

- First, defence industry experiences as showed in Table 10 by five-year ranges. One participant has defence industry experience under 5 years and another one has more than 30 years of experience. Average defence industry experience of participants is 17,35 years.
- Second, management experience of participants is taken into consideration for a better analysis on demographics. In this manner, only one interviewee has management experience under 5 years and the most experienced participant has taken management responsibilities on for 28 years. The mean of management experience of interviewees is calculated as 13,2 years. All of the respondents have managerial roles, which reinforces this study by getting actual remarks about industrial relations from a higher point of view.
- Thirdly, total job experience can be perceived as one of most meaningful part of the data set on demographics. In this context, total job experience of interviewees, having an average of 22,3 years, is varying between 16-20 years to 40+ years.

Looking into current job titles of respondents; nine managers, three directors, one head of department and one vice president joined to this research from TG1 and TG2. Among participants from TG3, there are three assistant professors, two associated professors and two professors. Some academics in this group has and had taken managerial and entrepreneurial roles within defence industry and other industries, but they are selected for this research because of their academic roles/titles primarily.

Institution types, which become meaningful with other demographic information of respondents are also noted. There are four types of institutions: five respondents are working in public institutions and six of them are working in private sector. There are

also three respondents working in quasi-public enterprises[2] (QPEs) in addition to seven people who work for the academy. Names of institutions are kept confidential to maintain anonymity of respondents.

Distribution of respondents' experiences in the defence industry, in their whole career and for their management roles are shown separately in Table 10.

Table 10: Distribution of interviewees' experiences

Interview ID	Age Group	Defence Industry Experience	Total Job Experience	Management Experience	Current Job Title	Institution Type	Target Group
1	60-69	30+	30+	21-25	Manager	Public	TG1
2	40-49	21-25	21-25	1-5	Manager	Public	TG1
3	40-49	6-10	21-25	6-10	Manager	QPE	TG1
4	40-49	16-20	21-25	6-10	Head of Dept.	Public	TG2
5	40-49	11-15	16-20	6-10	Manager	Private	TG1
6	40-49	6-10	16-20	11-15	Manager	Private	TG2
7	40-49	21-25	26-30	11-15	Director	Private	TG1
8	30-39	6-10	16-20	6-10	Manager	Private	TG2
9	40-49	6-10	21-25	11-15	Vice President	Public	TG2
10	30-39	1-5	16-20	6-10	Asst. Prof.	Academy	TG3
11	40-49	6-10	21-25	6-10	Manager	QPE	TG2
12	60-69	21-25	30+	11-15	Assoc. Prof.	Academy	TG3
13	40-49	6-10	21-25	21-25	Asst. Prof.	Academy	TG3
14	40-49	16-20	16-20	6-10	Director	Public	TG1
15	50-59	26-30	26-30	11-15	Manager	Private	TG2
16	40-49	11-15	21-25	11-15	Director	Private	TG2
17	50-59	26-30	26-30	11-15	Manager	QPE	TG1
18	60-69	21-25	30+	21-25	Prof.	Academy	TG3
19	50-59	21-25	30+	21-25	Asst. Prof.	Academy	TG3
20	60-69	16-20	30+	26-30	Prof.	Academy	TG3
21	40-49	21-25	21-25	11-15	Assoc. Prof.	Academy	TG3

[2] TSKGV companies are public-private companies that are owned predominantly by public institutions. Hence, these companies are listed as quasi-public enterprises (QPEs) in this research.

5.3.3 Length of Interviews

Length of interviews are differentiated regarding communication methods (face to face, voice and video calls) and target groups (TG1, TG2, TG3). With regard to duration, defence industry oriented TG1 has an average of 41,7 mins and 292 mins in total, while civil industry oriented TG2 has a mean of 39,1 mins and 274 mins summed. This two group have relatively similar smaller ranges between maximum and minimum interview duration and therefore smaller standard deviations. On the other hand, regarding academics of TG3, there is a different picture: 49,9 mins of average interview time, 58 mins of difference between shortest and longest interview (leads to a higher standard deviation of course) and 349 mins of total conversation time.

To give another perspective on same issue, effect of communication methods on length of interviews is also analysed. Face to face meetings (held with eight people) has an average of 39,1 mins, similar to the 41,6 mins average of interviews conducted via phone calls (with eleven people). At this point, length of two interviews, that are conducted via video conferencing, breaks up with other communication methods, as they long 64 mins and 80 mins each. This may not be caused by communication method only, since the sampling is not enough and these two interviewees have similar demographics: both were professors from the same age group having lengthy experiences and from TG3.

As a summary, numeral calculations made to submit a better picture about statistical analysis on interviews, that is presented in Table 11.

Table 11: Statistical Data on Interview Length (1)

	Interview Length Statistics				
	Category	**Mean**	**Range**	**Std. Dev.**	**Sum**
Target groups	**TG1**	41,7	25	8,5	292
	TG2	39,1	19	6,9	274
	TG3	49,9	58	21,3	349
Communication methods	**Face to face**	39,1	19	8,9	313
	Voice Call	41,6	41	11,7	458
	Video Call	72	16	11,3	144
	Total	**43,6**	**58**	**13,9**	**915**

There are studies about the effect of age group and educational background of respondents on interview length, saying that age group has a positive effect on this (Looseveldt & Beullens, 2013, p. 71). Not interestingly, there seems a correlation between the job experience and the duration of interview (with a few exceptions), as all of three interviews that long over an hour made with people over thirty years of working experience and the shortest interview made with the least experienced participant as shown in Table 12 below.

Table 12: Statistical Data on Interview Length (2)

Age Group (years)	60-69	50-59	60-69	60-69	40-49	40-49	50-59	40-49	40-49	50-59	40-49	30-39	40-49	40-49	40-49	40-49	40-49	40-49	40-49	60-69	30-39
Total Job Experience (years)	30+	30+	30+	30+	26-30	16-20	26-30	21-25	21-25	26-30	16-20	16-20	16-20	21-25	21-25	21-25	21-25	21-25	21-25	30+	16-20
Duration of Interview (mins)	80	65	64	55	49	49	47	47	45	44	41	41	38	37	35	35	35	30	30	26	22
Time Interval	60+ mins			46-60 mins					31-45 mins									30 mins and under			

5.3.4 Recording of Interviews

One of the crucial points about conducting interviews are recording issue. Recording of an interview liberates a researcher from conducting interviews under the pressure of noting every statement of respondents. Such a pressure may cause a researcher to miss critical points or holistic perspective in an interview. Misunderstanding of the respondent's perspective is another possible mistake that can be faced with, which may be recovered by listening or watching the interviews again. Recordings give the researcher freedom of listening or referring his/her interviews repeatedly as much as needed and the chance to confirm or to revise expressions of respondents in his/her transcripts or notes. At this point, it is important to receive interviewees' approval for audio or video recording and to start it with their consent. Also, if there are any off the record statements, it should be taken out from transcripts and better to pause recording during their explaining for getting critical insights by establishing an environment of mutual trust. In an academic study, a breach of faith in such a case may be irrecoverable.

In this direction, a pre-informing form on voluntary participation -that is prepared upon template of ethical document of METU (provided in Appendices A) and includes asking for their consent on recording- shared with interviewees while inviting them or just before starting the interview (if it was face-to-face). In this form, the aim of recordings was clearly stated for easing transcription of interviews for data analysis and for shortening interview durations. It is also stated that audio and video recordings will only be used for transcription process, which will be made by researcher himself.

Twenty out of twenty-one interviewees accepted their interviews to be recorded by me, while only one respondent, who was in an administrative position in a public institution, did not give consent on recording. Some of the respondents preferred to talk off the record on several issues and recordings were paused during these periods. Only two of twenty recordings were video recorded, as others (eighteen interviews) were audio/voice recorded. Respondents were notified during interviews about when recording started.

5.3.5 Ethical Issues on Interviews

Ethical matters are another point taken into consideration about methodology as part of this thesis as any other scientific research. Christians (2005) collected codes of ethics in social sciences under four simple headlines: getting informed consent from research participants, referring not to any kind of deception, assuring privacy/confidentiality and anonymity of the participants and verifying the data accuracy (pp. 144-145). Three of these four points were issued with different words by Diener and Crandall (1978). The only difference between two was "harm to participants" instead of "data accuracy".

For any research that contains contact with humans, an application to METU is obliged, made with relevant documents -including semi-structured interview questions- for ethical issues about interviews. METU Human Research Ethics Committee granted permission for conducting interviews within a period of four months, on February 20, 2020 with the protocol number 087-ODTU-2020 (provided in Appendices B).

Additional permissions for interviews did not required because all communications with interviewees are arranged by direct contact with those person without involving their companies or institutions. As mentioned in the previous section, participants were informed about the scope, objective and essence of the research as well as the research method with the voluntary participation form. In addition to this clarification, statements of respondents in written, auditory or visual environments are promised to be kept confidential and analysed solely by researcher. All collected data will be analysed collectively and used only in this thesis and prospective scientific publications related to this study in the future. Notification made to respondents about that an interview can stop any time if he/she feels uncomfortable even if there exist no such questions. Neither patentable information nor restricted/classified material have been used for this thesis, thus, no additional permission is needed from any institution/company for classification matters.

5.4 Data Analysis: Coding Process

Data analysis is another valuable part of the study as it helps researcher to find meaningful bases for his/her conclusions, which many of them arises from this part of research. It helps a research to be settled perfectly on its research questions with the assistance of implementing statistical techniques. Raw data of research may be meaningless to many readers without a proper analysis process by researcher. In other words, data analysis process is summarizing the gathered data in the most substantive way.

Qualitative approach, that is adopted for this research, gives researcher a partial freedom on data analysis methods. *Qualitative coding* is one of the most popular methods among academic studies on social sciences. In this method, researcher tries to find out patterns or filter ideas into categories or groups. Gibbs (2007) defines coding as "how you define what the data you are analysing are about" (p. 38). By doing this analysis, a researcher gives his/her interpretation to the data with his/her point of view and intellectual understanding. In the same direction, Saldaña (2015) claims that coding is not a precise science and calls it "primarily an interpretive act" (p. 4). Every researcher maintains a different approach, and, thus, results may differ from one to another, unsurprisingly. At the end, coding cannot be identified as a labelling process, rather it can be said that this method is organizing the data in a structured and genuinely way. Strauss (1987) alleged that perfection of the research stands upon the researcher's proficiency of coding skills.

There appear two types of coding stepping forth in the literature: concept-driven coding and data-driven coding (or open coding) (Gibbs, 2010). Former type of coding pushes researcher to scan the data by sticking to specific concepts while latter type of coding allows data to drive the coding and generate categories or labels.

Data-driven coding is selected as the method for analysing the data deducted from semi-structured interviews, for looking the raw data without conceptual viewpoint. Within the qualitative approach to data analysis, data in text format is broken into meaningful pieces at the first place. Thereafter the coded pieces are examined if there exists any repetitiveness or connection between. At this point, Bryman (2012), who

was among foremost social sciences methodologist, clears up how researchers perform the data analysis and coding operations in his clean and short explanation: data should turn into more manageable transcripts rather than recordings, then should turn into meaningful interpretations corresponding to research questions, literature and theoretical ideas (p. 13). At this point, there were some cautions in the literature for coders. One of them is the difficulty and the misguidance derived from line by line coding (i.e. micro coding) for researchers. It is advised by Glaser (1992) to solve this problem by coding only significant parts of the transcripts.

Fragmentation of data is said to damage narrative flow of respondent's story (Bryman, 2012), but it provided this research an opportunity of getting explicit answers from participants on each subject. Relatively independent sections of interview questions not allowed interviewee to tell a story on the subject, this is why narrative analysis is not preferred as a data analysis method.

Only primary data is used in this thesis, so that data collection and the primary data analysis made by the same person. Secondary analysis (i.e. secondary/external coder) is not preferred because of the clear interpretation of respondents and the limited time for the data analysis. Coding manual for a secondary coder is not necessarily constructed from this reason, rather a progressive and detailed coding process is applied for data analysis. In this research, coding method is applied through three stages: *preliminary coding, grouped coding, final coding*. Variables are determined from the related coding questions at first. Then, all the answers of interviewees are sorted under preliminary codes. Those codes are then grouped under several headlines (if applicable) and turned into grouped codes. At the last stage, grouped codes are summarized in sentences with the minimum words to represent the whole data of a variable and are transformed to final codes in this way.

Research outputs (interview data) were quite reliable as they showed weighted means from respondents' answers mostly. Data analysis process is not executed using software because it was not necessary as the size of the data seemed proportionally convenient to overcome manually.

5.5 Summary of the Chapter

This chapter describes the methodology used whilst seeking answers for the research questions of this thesis. Methodology of this study is constituted with a qualitative approach. One of preliminary questions designated for beginning of this research did not get satisfactory answers in the literature and changed the direction of the study and added novelty into this thesis. Four new descriptions have been made within this study for constructing theoretical frame of this study to define inter-industry relation types. Then these descriptions are subjected to a qualitative test through interviews to prove them as acceptable.

The research data is collected via qualitative semi-structured interviews, which are conducted with total of twenty one participants from three target groups. Reasoning and the selection process of semi-structured interview method are expressed in this chapter. Sampling method (quota sampling) and the selection of target groups for interviews (who are experienced stakeholders from public community, industry and academy in Turkey), type of communications, recording and ethical issues on interviews are also mentioned. Next, coding process (data-driven coding) for analysing collected data is described. All data that is gathered and analysed through the methodology explained in this chapter will be presented in the next chapter.

CHAPTER 6

DATA AND FINDINGS

This chapter includes the analysed data and the related findings of interviews. In the first section of this chapter, 6.1, demographics and length of interviews are stated in detail. In Section 6.2, analysis of interviews and the summary of findings are reported for each three part and total of twenty-seven variables as part of interviews. Section 6.3, the discussion part, includes the comparison of interview data with the literature and the last section summarizes this chapter.

Elaborative analysis of interviews provides this research to compare its generated outcomes with the literature data for global industrial relations and the interview data generated for Turkey. In order to conclude wider recommendations at the end, both local and global perspectives of interviewees are obtained via consecutive questions. The writer prefers to remain neutral through the interview and data analysis processes. Hence, predictive results and subjective recommendations are not mentioned until the conclusion chapter.

6.1 Analysis of Interviews

Citing from Bryman (2012) in this section again, regardless of the degree of high-quality data collected from respondents, what important about the result is the reflection, interpretation and theorizing this data for a researcher. On this part of research, the literature warns researchers about miscarrying a significant analysis by relying on the excessive importance given to collected data, which called "analytic interrupts" by Lofland (1971, p. 18). Bryman (2012) listed possible traps for coding operations as *"discrete dimensions, mutually exclusive categories, exhaustive*

categories, non-clear instructions, clarity about the unit of analysis" and added inter-coder reliability and intra-coder reliability as additional points of considerations for a coherent and high-grade analysis process (p. 303).

In this thesis, data processing is started with the transcription of interviews. Most of transcripts had already been generated through note-taking whilst interviewing. Still, most of interview recordings are listened again and necessary parts of transcripts are revised. After then, coding process is examined in this way: interview questions are turned into variables at first. There were 31 variables/questions at the first stage but four of them are cancelled due to their similarity and combinability and total of 27 variables left for coding process. Then all transcripts are analysed and coded under the category of preliminary codes. In this part, some answers reflecting approaches of interviewees are labelled like yes, no or not specified and their proportions are revealed to make easier interpretations. These preliminary codes are then grouped through their relationships and relevancies of each other under the category of grouped codes.

Both preliminary codes and grouped codes are in words or phrases. Grouped codes presented a clear and a meaningful picture and cleared the path for generating final codes, where all codes are expressed briefly in sentences. Each variable and final code on these variables are analysed below.

6.2 Summary of Findings

If interview questions are divided into three standardized categories, that are: opening, body and closing parts. First part of introduction questions includes six variables, mostly related to describing basic elements of this research. Second part of body questions includes 17 questions/variables which are mostly related to industry relations, effects of defence industry on other industries and dual-use issues. Closing part, having four variables, summarize final opinions and suggestions collected from interviewees through interviewing process. Total of 27 variables with a broad extent of answers are analysed via coding method as explained in methodology chapter and finalized versions of analysis are mentioned in following sections.

6.2.1 Summary of Part A: Introduction

Opening part of interview includes six questions/variables which are explained in detail and put into a summary table (Table 13) with final codes in this section below.

Variable A.1 (Defining industries): At the beginning of interviews, first question that participants are asked is to define defence industries and civil industries in their perspective. There are a lot of definition already made for defence industry and other industries in the literature but this question is asked if any novel/new approach to be brought out. Most of participants define industries in many ways but grouping their answers led to four main points shined out. To make a clear definition; Intended use (as a weapon, aim of protect or destroy), customized needs (not for ordinary people, specialized requirements of security forces), limited consumer (only for governments and armed forces) and source of many technologies (being an origin for technological development) we use in daily life. To interviewees, a more realistic definition for defence industry should include these points.

Variable A.2 (Are characteristics distinguishable?): After then, they are asked if they believe characteristics of defence industry are distinguishable or not. Two third of them (14 of 21) certainly believes that characteristics are distinguishable and another six of them also believes in this way but with some additions, like distinctiveness exists only for certain aspects or it will disappear with time. Only one participant objects to this common argument.

Variable A.3 (Distinctive characteristics of defence industry): Additionally, for whom believes characteristics are distinguishable, they are encouraged to share their ideas about what these characteristics are. In this manner, distinctive characteristics through their answers are grouped under twelve major headlines, as listed below:

- **Confidentiality:** security obligations, documentation, IPR

- **Different field of use/aim:** endurance for environmental conditions, self-defence or offensive approach
- **Requirements and standards:** tactical/strategical needs, essential abilities, long-standing durable products, military standards, lower margin of error, robustness
- **Process of customer approval:** tough testing procedures, intensive quality process
- **After sales service:** logistic support management/mechanisms, long-term liability, no way to evade responsibility
- **Project management approach:** different organizational structures for product design, risk management, customer management
- **Marketing strategies:** contract-based, niche market, primarily not commercial indeed, different process for placing on the market, impressed more by politics and foreign relations
- **Limited consumers:** government-only sales, close relations to bureaucracy and government
- **Manufacturing process:** longer period for product renewal/innovation, serious/detailed documentation process, slower production
- **Not cost-effective:** cost has secondary importance, urgent necessities, no feasibility study, smaller sales volume, mandatory investments
- **Profitability and capital structure of companies**
- **Serious enforcement:** in-time procurement, heavy sanctions

Variable A.4 (Any barriers due to characteristics?): Regarding to these answers, participants are asked if they think there are barriers due to characteristics of defence industry or not. This question sits in a crucial position in research as it may set light to identify the crux of problems regarding relations between industries, and, thus, recommendations at the end. Similarly, to previous question, two third of interviewees said they certainly think the characteristics of defence industry pose a problem for its

relations with other industries, while another five of them partially believe so. Paradigmatic differentiation as well as hardness due to profitability, remote working and using non-defence products are seem to be prominent reasons for this opinion. Two interviewees on the other hand, opposed to this argument, claiming easier usability/adaptability of defence product/technology in civil industries and higher standards of defence industry is disciplining civil industries.

Variable A.5 (Characteristics that harden relations): Pursuing what complicate relations of defence industry with civil industries, barriers (mostly arising from characteristics of defence industry) claimed by interviewees are grouped under eight major headlines, as sorted following:

- **Confidentiality**: more serious than civil industries, no permission for common production lines, limited interaction due to security concerns, secure facilities)
- **Higher standards**: for manufacturing and verification, non-flexible military standards, quality awareness, tough feedback
- **Higher rate of customization:** unlikely adaptable to civil industries, slower process improvement
- **Project management**: longer project duration and commitments, different organizational structure
- **Restricted sales:** country/international restrictions on sales, only to government sales, etc.
- **Cost effectivity:** not important as in civil industries, lower level of competition
- **Sectoral culture:** troublesome entry to defence industry, unwilling cooperation, defence companies show overbalance to civil companies, lumpish and selfish nature of big players, over self-confidence about self-sufficiency, pressure to SMEs, civil industries run after COTS sales rather than joint development
- **Government influence**: flattered big defence companies, authoritative pressure on contractors, habits of being single vendor

Variable A.6 (Civil industries most related with defence industry): Lastly, the perception of which civil industries seems most related with defence industry is investigated. Gathered opinions of respondents include mostly industries belong to the manufacturing sector. In this group, top three mentioned industries are automotive (land platforms) industry (nine times), electronics industry (nine times) and followingly aerospace industry (seven times). Other mentioned industries are machinery manufacturing (five times), chemical and pharmaceutical (four times), shipbuilding (thrice), basic materials (twice), energy (twice) and optics (once). In addition to manufacturing related industries, some service industries are mentioned as subsidiary industries, such as software (six times), information and communication technology (ICT) (5 times), logistics, healthcare and consulting.

Table 13: Variables and Final Codes of Part A

#	*Variables*	*Final Codes*
A.1	Defining industries	Defence industry can be defined with its intended use, customized needs, limited costumer and as a source of many technologies we use in daily life.
A.2	Are characteristics distinguishable?	Defence industry has distinguishable characteristics to interviewees as two third of them (66,6%) said certainly yes while almost one third (28,6%) said partially yes. Only one interviewee believes characteristics are not distinguishable (4,8%).
A.3	Distinctive characteristics of defence industry	Distinctive characteristics of defence industry can be listed in these major headlines: confidentiality, different field of use, special requirements and higher standards, process of customer approval, after sales service, project management approach, manufacturing process, marketing strategies, limited consumers, being not cost-effective, capital structure of companies and serious enforcements.

Table 13: Variables and Final Codes of Part A (continued)

A.4	Are there any barriers due to characteristics?	Characteristics of defence industry complicate its relations with civil industries to interviewees, as two third of them (66,7%) said certainly yes and five of them (23,8%) said partially yes. Only two interviewees believe the exact opposite (9,5%).
A.5	Characteristics that harden relations	Defence industry characteristics that harden its relations with civil industries can be described as follow: confidentiality, higher standards, higher rate of customization, difference in project management, restricted sales, cost effectivity, sectoral culture and government influence.
A.6	Most related industries	Defence industry seems related mostly with manufacturing industries as automotive, electronics and aerospace are top three mentioned industries. Service industries like software, ICT and healthcare industries are also mentioned.

6.2.2 Summary of Part B: Body

Second part of interview includes seventeen variables/questions which are mostly related to industry relations, effects of defence industry on other industries and dual-use issues, all explained in detail below. Variables in Part B and opinions of interviewees (in terms of final codes) are put into Table 14 for macro view at the end.

Variable B.1 (Relations between two industries): As a starting point, one of key questions in this research is asked to respondents: How two industries relate with each other? The answers are grouped into two major categories: direct and indirect relations. First category, **"direct relations"** has three main groups as follow:

- **Relations upon common interests:** necessity based, technology based, common infrastructure (manufacturing or production)

- **Business relations:** customer-driven, project-based, product/component-based, subsidiary industries, logistics, main contractor and subcontractors
- **Forced relations:** by government authorities, constraints from foreign partners (for not involving with defence industry)

Besides, three main groups are also created for second category, **"indirect relations"**, which are:

- **Digitalization and technology-based relations:** electronics, software, common technologies, measurement tools, open source information transfer/sharing, etc.
- **Service industries:** designing, engineering, consulting, logistics, software, service procurement, etc.
- **Networking:** NGO activities, trade fairs, business-to-business (B2B) relations, etc.

Variable B.2 (Comments on four generated terms for industrial relation types): As the deficiency in the literature of describing relationship between industries push this research into inventing new descriptions; respondents are asked to comment on generated four descriptions (interaction, intersection, integration and interdependence) to distinguish and exemplify the connections between industries:

- **Interaction:** networking activities (synergy meetings, trade fairs, NGO activities), feasibility research, inspiration by applications from other industries, management processes, contains other relation types
- **Intersection:** project-based and product-based intersecting operations, voluntary junctions with other industries, usual intersections of industries between some manufacturing and service industries
- **Integration:** integrating parts of products and projects with other industries, output of an industry be an input for another industry, a product/service of an industry be integrated for another industry (like software), modular and complement products, integrations of various industries in part of a project (like

medical and machinery industries for a medical equipment), business part of manufacturing SMEs under bigger projects

- **Interdependence:** mandatory relations of industries for a technology or product, dependency to technological developments (like AI, battery, autonomy studies) dependency to a single source, industry involvement with academic studies

Variable B.3 (Are these descriptions distinguishable?): Participants are asked if they see these four generated descriptions as distinguishable or not. More than half of respondents (12 of 21) said they can clearly tell the difference between these descriptions, arguing that the classification indicates a hierarchy upon density of relations between industries.

Another eight respondents asserted that the descriptions are partially dissociated with these comments: intersection sounds more inclusive (two times), conceptually distinguishable but interwoven in real world, should be well exemplified, technological depth should be examined, "interdisciplinary transfer" may be used instead of interaction.

Only one participant does not accredit, saying these descriptions does not seem discriminable.

Variable B.4 (Most beneficial relation type): The next question was the most beneficial relation type between industries, to their opinions. Interaction is the most chosen relation type among participants with eight supporters. These supporters state that: it should be planned (or constructed), should be two sided, should use as an initiator for new cooperation and is a voluntary kind of relation.

Followingly intersection and interdependence are equally mentioned by six participants, as they made these comments on interdependence: it seems more dominant than others (mentioned twice), better for a sustainable relation and may be beneficial if technology-dependence.

Integration is the last relation type among them, chosen by five participants. These participants added: it is most profitable, seems more wider (said twice) and benefitable for indigenization.

Some participants have additional comments on this issue as follows: survivability and sustainability are also important, firms' interests are prominent factor for relations, common standards are important for relations, science should be common ground for cooperation, answer is changeable from viewpoint, ideal path is: interact-intersect-integrate and it depends on problems of firms.

Variable B.5 (Interdependence): Participants are asked if they believe there should be interdependence in industry relations or not. Their opinions are equally balanced about the necessity of the interdependency between industries, as eight of them said yes and another eight of them said no to this question, while last five respondents said there are naturally dependent and this question seems unnecessary. Participants who support the necessity claimed: in-firm civil-defence balance should be sustained, because of national development, technological dependence is necessary, it is like a marriage (when it is dependent, it is sustainable), economic dependency between nations is positive for deterrence.

On the contrary, these are alleged by those who opposed to a necessity of interdependence: since pace of industries are different, it sounds negative, defence industry should not be dependent to private sector, it should be independent or optionally dependent and mistrust between industries make it harder. Finally, respondents who believe industries are naturally dependent to each other, asserted: defence industry is already dependent to some civil industries (like motors, drive systems, etc.), it is unavoidable due to world commerce and due to production infrastructure.

Variable B.6 (Integration): When it is asked, two third of respondents (14 of 21) give credence to the necessity of integration between industries. They suggest that: integration will occur more between health and electronics, integration of civil products (like software) into defence industry is necessary, it already exists for customized and standard products, it is better for cumulative development and efficiency, it is an unavoidable process and naturally happens after intersection, it is more important for SMEs, it widens with open source platforms and modularity is needed.

On the opposite direction, two respondents do not believe that integration is a necessity for relations as they claim: embargos make it harder, forced integration is negative for market, it is hard for civil industries to pass over barriers, hard to maintain and sustain in Turkey, each integrator tries to gain profit (cooperation not working).

Last four participants did not comment on this issue.

Variable B.7 (Level of relations between industries in global scale): Next question was about the current level of relationship between defence industry and civil industries in global scale regarding these terms. Nine participants (of 21) see the achieved level of relations between defence and civil industries weak in global scale. Their comments included these points: there are a few governments forced projects, it is mostly weak for many regions/countries (but not for all) and weak except product suppliers, as an example: security clearance needed even in recruiting trainees in defence industry, defence industry has not open platforms like civil industries.

On the other hand, another four participants interpreted the relations as well-maintained by adding that many examples in aviation/aerospace industry (e.g. military and commercial sections of AIRBUS, BOEING, EMBRAER), DARPA as a best practice of collaboration, it has become critical and wider due to economic crisis, good examples of companies serving in both industries (e.g. Mitsubishi, Daewoo, Samsung, Rotem) are there in Far East.

Same amount of people (4 of 21) said the current level of relations is partially-maintained as two industries getting closer and world is still bearing arms. They added that more innovative perspective and communication with civil industries are necessary, there is no perfect example as a country, EU feeds both civil and defence industries and cooperation between them while United States seems to have a more conservative approach on defence industry. Last four participants did not comment on this issue.

Variable B.8 (Current level of cooperation between industries in Turkey): Similar to the previous question, current level of cooperation between industries for Turkey is asked to respondents. More than half of them (11 of 21) see the achieved level of relations between defence and civil industries weak in Turkey, as they point following

issues: technology sharing is weak, defence industry is an isolated industry to the perception in Turkey, civil versions are there are structural and psychological barriers in front of better relations.

On the contrary, five participants assert that the relations are well-maintained in Turkey due to softer/easier environment for confidentiality and wider opportunities for SMEs. Additionally, side industries are interested more in defence industry, and relations are developing day by day in Turkey.

Another three participants said the current level of relations is partially-maintained and getting better, as they added: government support to defence industry may harm civil industries, civil industries show a tendency to defence industry but not vice versa, actions taken to strengthen TSKGV (Turkish Armed Forces Foundation, in Turkish: *Türk Silahlı Kuvvetlerini Güçlendirme Vakfi*) companies harm other private companies in defence sector, holding companies are more advantageous on constructing relationships, relations do not benefit to costs, relations may increase as defence budgets increases, civil applications of defence companies have still defensive branding, commercial expectation arising from government in defence industry vs. from customer in civil industries, more systematic approach is needed as defence projects/budget are increasing.

Variable B.9 (Examples for collaboration of defence and civil industries): Positive or negative examples (of specific cases) for relationship between defence and civil industries in Turkey are requested from respondents. There are mostly positive examples given as follows: a start-up in Bilkent Cyberpark provides software for a defence company, a defence company applied to civil industries for rocket insulation solutions, a defence company benefits from civil industries about multirotor drone technology, a public institution is working with defence industry on train control management systems, CBRN systems of civil industry are used widely in defence industry, ballistic protection applications in civil products, obstacle detection/avoidance system for both military and civil helicopters, traffic control systems and medical equipment produced by a defence company.

There are also some negative examples mentioned by interviewees related to this section, which are: a failed IFF (identification friend or foe) system project (carried out by a defence & civil company), unfinished attempt of mobile phone project (of a defence company), fatal results in military due to wrong selection of wearable technologies, stay of execution in the middle of a defence project.

Variable B.10 (Suggestions for defence and civil industries' relations in Turkey): As another crucial variable of interviews, suggestions for relations between defence and civil industries are made by respondents. As there is a long list of suggestions made, these are grouped under three categories.

First category of suggestions related to "interactions" includes: civil companies learn benefits of entry to defence industry with EYDEP (industrial competence evaluation and supporting program) of SSB, activating product library for dual-use products, cumulative data of defence industry should be transferred, needs of defence industry should be known by civil industries, B2B organizations of SSB may be benefitable, open conferences can be prepared for defence industry needs, examples of clusters and associations like Ankara Aerospace Industrial Zone (HAB, in Turkish: *Ankara Uzay ve Havacılık İhtisas OSB*), Istanbul Defence, Aviation and Space Cluster Association (SAHA Istanbul, in Turkish: *Savunma, Havacılık ve Uzay Kümelenmesi Derneği*) and Ostim Defense and Aviation Cluster (OSSA, in Turkish: *Ostim Savunma ve Havacılık Kümelenmesi*) are producing natural relations between industries, defence industry should empathize with civil industries, cooperation in pre-competition is so weak, more systematic interactions needed, synergy meetings and facilitating mechanisms are needed between industries and firms, methodological benchmark for operational excellence, a management method for orientation between defence industry and civil industries is needed, defence companies are only interested in defence industry, academy-industry relations are weak due to insufficient promoting mechanisms.

Suggestions under second category are related to "policies", which are:

Offset mechanisms or nationalization obligations can be applied to civil industries, untidy mechanisms support same technology multiple times (should be eliminated), limited resources should be guided via solid and smart decisions, roadmaps should be

prepared and inspected by one body (not by many institutions), focusing/investing and deepening on selected technologies is required, success on defence industry should be carried to civil industries, it is better to apply our agenda with our best effort, better results may be possible with better legislation, specialized technology centres can be beneficial (Russian example of Kazan aerospace cluster), critical defence technologies and components should be nationalized (due to increasing international restrictions), should focus on technological gain rather than products, small R&D firms should be supported to be alive (public procurement for innovation, mentioned in Section 4.3.2)

Other suggestions under the category of "resources" are listed as follow: serious part of human resource prefers working in defence industry has negative effect on national firms in civil industries, applications like "revolving door" in EU and the United States for movement of personnel (DARPA and DoD examples) may serve as a model, short-term working of defence industry professionals in civil industries may be benefitable, human resource transitivity is low between defence industry and civil industries, very low rates of civil industries personnel to transfer into defence industry due to perception of experience, mutual use/sharing of testing infrastructure and mutual suppliers for both industries may also beneficial.

Variable B.11 (Familiarity with dual-use term): At this part, familiarity of participants with "dual-use technologies" term is interrogated. Not surprisingly (because of sampling method of research -i.e. selection process of interviewees-), all participants except three are well aware for dual-use term and applications. Two of these three participants said they have heard this term but not have detail information, and another participant said he/she has not heard about it.

Variable B.12 (Most-known examples for dual-use): For those who are familiar with dual-use term, first instances that come to their mind are asked to investigate most-known cases. To their answers, following dual-use technologies/products are grouped by industries:

- **Medical:** bleeding-stopper (hemostat)
- **Materials:** aluminium pipes (for rockets and gas distribution systems), composite materials (aerospace and construction industry)

- **Electronics:** signal processing systems, control systems, batteries, daylight and night-vision optics, high power lasers (for weapons and computer numerical control [CNC] sheet cutters), imaging radars, chips (integrated circuits), simulation and training solutions
- **Textile:** durable wearable technologies
- **Machinery manufacturing:** slip rings (for weapon systems and computer tomography), gyros (for aviation)
- **ICT:** Internet, satellites, antennas, radio-sets, communication systems, cyber security technologies, AI algorithms, big data analytics, TCIP (protocol developed for military use at first, extensive usage now)
- **Food:** Canned foods (developed for military use at first, extensive usage now)
- **Aerospace:** avionics, most of aircrafts, quadrotors
- **Shipbuilding:** most of naval platforms
- **Automotive:** most of land platforms (trucks, pickups), axes and chassis frames, transmissions, motors, braking systems

Variable B.13 (The future of dual-use applications): Followingly, their prediction about the level of applications of dual-use technologies in near future is asked. Vast majority (19 of 21) of participants said they believe that dual-use technologies will be used more extensively in near future. Fundamental grounds for this argument are: cost effectiveness, importance of reusability and sustainability, faster development of civil industries, growing referring of defence industry to civil industries, one-time only R&D spending, higher R&D spending in defence industry, increasing of international sanctions and official guidance for it.

One participant has doubt about it and another participant does not join to this prediction because of the psychological and structural barriers between defence and civil industries.

Variable B.14 (Dual-use as a model/tool for collaboration between industries): Another important question for this research is to understand the position of dual-use technologies for collaboration of defence and civil industries. Participants are separated into four groups on this question.

First group of fifteen people see dual-use as a right model (or tool) for the collaboration, since: it contributes sustainability of defence firms and it serves mutual purpose for both industries as well as cost-efficient wars become more important in defence industry.

Second group of two participants claimed that dual-use is a result, rather than a cause. That is because common technologies lead common applications and it is not possible to model because it is generally accidental results.

Third group, consists of three respondents, remain neutral on this issue and note these points: some defence industry companies consider it for new investment decisions, conduct business on both side is not easy for companies, harmful products should not be hand over to civil industries, government support on defence companies is not fair in their dual-use attempts into civil industries because it may harm civil industries, it depends on the application field, roadmaps/scenarios and case studies should be studied, it is more feasible for higher number of productions, some countries (like the United States) may see dual-use as a threat rather than an advantageous tool.

Only one respondent in the fourth group dissociates from others claiming that the dual-use application is a compulsory tool for relations.

Variable B.15 (Effects of boosting defence industry on civil industries): Maybe the most important input from participants are received through this variable in scope of interviews, as the following inquisition is also among research questions: positive and negative effects of boosting defence industry on other industries.

Above three fourth of interviewees (16 of 21) possess positive impression about effects of boosting defence industry on others, and reasons are: defence industry helps on solving emerging problems of industries, countries in a good state in defence industry are also in good state in civil industries (in general), it provides great benefits to civil

industries like management culture and quality standards, it helps competitive power and self-confidence of a country, defence industry has seen as a locomotive industry, defence industry is supported because it seems closer to the technology development and because countries need to be independent, defence industry is serving to preserve the safety of a country and a stable environment for civil industries to run freely, defence industry has big potential of export for value-added products, investment on defence industry spreads to SMEs/technology development zone companies in turn, defence industry makes related industries transformed (OSTİM case as an example), mega defence projects make great contributions on several civil industries regarding many aspects (like A400M), civil industries follow technological advances of defence industry (defence industry drives civil industries), emerging technologies are being studied in defence industry, defence industry interests problems even if it is unfeasible so it opens roads for civil industries, defence industry has not negative effect on civil industries but has positive effects on sub-industries, it can be economically negative if defence industry stands on imports.

Another participant who claims there are negative effects of boosting, which are due to: specialized position of defence industry hardens its cooperation with civil industries, clusters do not perform well and SMEs are crushed by bigger companies and defence industry investments harm GDP because of higher compensation periods.

On the other hand, two participants believed that there are both positive and negative effects (mixed), that are: being economically strong is also kind of defence, protecting civil industry companies as well as defence industry is also important, civil and defence products/sales should be balanced for more sustainability and resources (GDP) should be well adjusted between defence industry and civil industries.

Last two interviewees remained neutral on this issue as they noted: governments should aware of acquisitions in defence industry, defence industry should learn to act like civil industry when resources are limited, defence spending is kind of compulsory for states and civil industry is faster on finding economic solutions.

Variable B.16 (Leverage impact of boosting defence industry in developing countries): Respondents are asked if they believe of "the leverage impact of boosting

defence industry in developing countries" or not. More than half of the respondents (11 of 21) acknowledged the contribution of boosting defence industry to others in developing countries, and they concluded: business share for sub-industries/SMEs will be beneficial, Turkish examples showed defence industry backed healthcare and transportation solutions, and more defence applications in civil industries expand export possibilities.

Additional five participants shared this idea under certain conditions: balance on development is important, it depends on structural strength of countries, it should be well observed by higher authorities, human resource (HR) accumulation should not sabotage civil industries, only if defence industry has R&D and production weighted activities, confidentiality and spending of defence industry should be calibrated and technology transfer between industries are not occurring by itself.

Remaining five participants did not join to this argument, because: volume of defence industry is small relatively to civil industries (e.g. footwear industry is bigger than defence industry in some countries), boosting civil industries should be apart from boosting defence industry, it is not good if defence industry is funded by government and has lower export rates, prioritizing economy is more important for developing countries, smaller countries better to prioritize stepping into military and political unions rather than expanding their military forces.

Variable B.17 (Leading technologies of today): Another vivid question is directed to interviewees for analysing course of events better, that is the point of their views about leading technologies of today's world (defence or civil technologies).

Almost two third of participants (13 of 21) believed that civil technologies (like automotive, health, software, computer, touch screen, faster production technologies) are leading today, since: defence industry often runs after civil technologies, most of emerging technologies (like aerospace, artificial intelligence (AI), autonomy, software and simulation technologies) are civil technologies and NATO joins this argument.

Other four interviewees believed that defence technologies are leading today, as they added: there is a flow still exists from defence industry to civil industries, difference exists on technology-based flow (from defence to civil) vs. product-based flow (from

civil to defence), SWaP-C (size weight power and cost) term applies to defence industry and stairs effect applies to development of science (based on university-industry relationship) regarding this issue.

Last four respondents said that the answer depends on sectors, e.g. autonomy and software are leading technologies of civil industries while rockets and CBRN are leading technologies of defence industry.

Table 14: Variables and Final Codes of Part B

#	*Variables*	*Final Codes*
B.1.	Relations between two industries	Interviewees' answers about relations between any two industries can be divided by two, as direct and indirect relations. Direct relations include relations upon common interests, business relations and forced relations while indirect relations cover digitalization and technology-based relations, relations via service industries and networking.
B.2	Comments on generated four descriptions	Four new descriptions are made for defining relation types between industries. These descriptions are interaction, intersection, integration and interdependence. Each description has different examples of application for a better understanding.
B.3	Are descriptions distinguishable?	Asking interviewees' their opinion, almost two third of them (57%) agreed that these generated descriptions could describe relation types while many others (38%) agreed with minor addition or corrections. Only one interviewee did not agree on these identifications.
B.4	Most beneficial relation type	Most beneficial relation type seems interaction to the greater part of interviewees (38%), followingly intersection and interdependency have equal supporter rates (28,5%). Only five out of twenty-one interviewees chose (24%) integration as the most useful relation type between industries.

Table 14: Variables and Final Codes of Part B (continued)

B.5	Necessity of interdependence	Interviewees' opinions are equally balanced about the necessity of interdependency between industries. 38% of them believe that there should be dependency while same number of objectors believe not so. There is also another (24%) who believes that this dependency is natural and already exists.
B.6	Necessity of integration	Two third (66,7%) of interviewees confirmed that integration between industries is a necessity. They said it helps efficiency between industries and cumulative development, most importantly for SMEs. On the other hand, two of them (9,5%) thinks essential integration may become harmful because it is hard to maintain and sustain.
B.7	Achieved level between industries (global)	Nine of twenty-one (43%) participants see the achieved level of relations between defence and civil industries weak in global scale as they said there are many steps to be taken for better relations. On the other hand, 19% of the participants interpreted the relations as well-maintained with their examples and a same amount of people said the current level of relations is partially-maintained as two industries getting closer and world is still bearing arms.
B.8	Current level of cooperation between industries (for Turkey)	Eleven of twenty-one (52%) participants see the achieved level of relations between defence and civil industries in Turkey weak as they said there are structural and psychological barriers in front of better relations. On the contrary, five participants (24%) asserts that the relations are well-maintained in Turkey due to softer confidentiality and wider opportunities for SMEs while three participants said the current level of relations is partially-maintained and getting better but government support to defence industry may harm civil industries.

Table 14: Variables and Final Codes of Part B (continued)

B.9	Good/bad example for relationship between defence and civil industries	There are mostly positive examples of collaboration between defence and civil industries in Turkey. For example, defence companies involve with civil industries about implementing civil products or solutions for dual-use.
B.10	Suggestions for relations of defence and civil industries (for Turkey)	There is a long list of suggestions for enhancing relations between defence industry and civil industries in Turkey made by participants. These suggestions can be labelled under three interrelated groups, which are suggestions for interactions, policies and resources. Suggestions for interactions were about the need for more systematic interaction mechanisms to make civil industries realize needs of defence industry. There were wide range of suggestions for policies, but the foremost one was tidying up the supporting and decision mechanisms by authorities. Most of the suggestions for resources points out that human resources should experience both industries.
B.11	Familiarity with dual-use term	Only one of twenty-one interviewees hadn't heard about "dual-use technologies" term while others were familiar with.
B.12	Most-known examples for dual-use	Dual-use term reminds interviewees many applications in ICT, electronics, automotive, machinery, aerospace, ship building, medical, food and textile industries as well as some materials.
B.13	Usage of dual-use in future	Most of the interviewees (90%) believed that the usage of dual-use technologies/products will be increased in near future. The foremost reasons are cost effectiveness, increasing sanctions, faster development of civil industries.

Table 14: Variables and Final Codes of Part B (continued)

B.14	Dual-use as a model/tool for defence-civil industries' relations	Most of the interviewees (71%) see dual-use as a right model/tool for relations of defence and civil industries because of its contribution to sustainability of companies and cost-efficiency of products. Besides, three of twenty-one (14%) remained neutral. In addition, two interviewees said dual-use is not a tool rather is a result and one interviewee said it is a compulsory tool, whether correct or not.
B.15	Effects of boosting defence industry on other industries	Above three fourth (76%) of interviewees asserted that effects of boosting defence industry on civil industries are positive. They said it helps efficiency between industries and cumulative development, most importantly for SMEs. In addition, two respondents remained neutral and other two has said it has both positive and negative effects. Only one respondent said it harms GNP due to its longer compensation periods
B.16	Defence industry as a lever to other industries in developing countries	More than half (52%) of respondents said that defence industry has a lever role on civil industries in developing countries. Another five of them (24%) agrees to this phrase but under certain conditions. Additionally, five interviewees believe on the contrary, saying the volume of defence industry is lower and importance of commercial side is much bigger.
B.17	Which type of technology is leading today?	Almost two third of interviewees believe that civil technologies are leading nowadays, while other 19% says defence technologies are outriding and last 19% says the answer depends on sectors.

6.2.3 Summary of Part C: Ending

Last part of interview includes four variables that are related to policy suggestions and best collaboration practices of defence and civil industries, all summarized in proper categories below. Variables in Part C and outputs as final codes are shown in Table 15.

Variable C.1: Considering local and global examples from past till today, coherent and beneficial inter industry collaboration practices between civil and defence industries are asked to bring forward by interviewees. Answers are grouped under five categories: organizational examples, example of companies serving both industries, technology-based, product-based and project-based examples.

- **Organizational examples:** applications of DARPA, NASA as a public institution (shares its experience and methodology with civil industries, studies cutting-edge technologies), support on development of Silicon Valley (due to the Cold War), R&D consortiums between U.S. Federal Aviation Administration (FAA) and universities
- **Companies serving both industries:** aviation components (Alp Havacılık), aircraft producers (BOEING, AIRBUS, EMBRAER, TAI), ship building companies (Anadolu, ARES, Yonca-Onuk, etc.), land platform producers (Mercedes-Benz, BMC, Otokar, ISUZU, Koluman)
- **Technology-based examples:** internet, communication technologies, imaging technologies, electromagnetic technology, guidance technologies (gyroscope, etc.)
- **Product-based examples:** rocket systems, infrared cameras (produced for military use), ventilating equipment, CNC machining tool (ordered by military, made by universities) radar, quadrotors, many aviation products are common, accelerometers (best quality product used in defence industry while others go to civil industries), ballistic protected minibus/pickup trucks, microchips (for aerospace industry) to cheaper computers
- **Project-based examples:** ballistic hangar, Project A400M (defence product produced with commercial approach), Falcon projects (Space X), Project Peace Eagle (Barış Kartalı, Boeing 737 AEW&C), Oruç Reis (ship of defence project and civil product)

Variable C.2: Participants are asked if they were in a position of policymaker, which policies would they implement for more effective relations between defence and civil

industries. This variable has provided input for final part of policy recommendations. Assessments and suggestions of interviewees are grouped under three interrelated labels, which are interaction, policies and resources, all explained detailly below:

- **Interaction:** enhancing "cooperation before competition", more interaction should be planned (which will decrease costs), cost reductive applications can be transferred between civil and defence sides within bigger companies, defence industry is weak on international cooperation and common projects, TSKGV companies should be disciplined for cooperation with others (main problem is job culture of these companies), operational experience of civil industries can be transferred to (sharing best practices) defence industry. Main problem is job culture of TSKGV companies, mechanisms for taking feedbacks will benefit industries (starting from intersecting industries of civil and defence industries), defence projects can be more cost-effective with considering civil side (scale economy), more facilitation and synergy meetings between defence industry and civil industries, egos of defence industries should be scythed, enhancing relation with universities, SSB may increase communications between industries, companies should be guided to domestic cooperation & international competition, defence industry should support agriculture more with advanced technologies.

- **Policies:** enhancing of EYDEP activities (a process of SSB for companies), re-evaluate defence industry export with export of civil industries, focusing on decreasing imports, TSKGV companies see themselves as monopoly, technology roadmap and will/power of implementation of these roadmaps is needed, prioritization of defence needs, qualified companies can be categorized into "sectoral pools", quantity of vertical and horizontal technology centres should be increased (like South Korea) to stop brain drain, confidentiality in defence industry can be slackened (except critical subjects), SSB like institutions are needed for main civil industries for being supported (said twice), closing of DPT was a huge mistake as it was a solid institution like SSB, ministry policies are changing with every ministers (unlike SSB, that can perform statically), guided projects needed for civil industries, if decision mechanisms may run with multi-stakeholder, power will spread through bottom and turn back with more benefit to higher, both sides

(defence and civil sides) of companies should be supported (e.g. BOEING, Airbus), projects/processes in progress should be centralized because there are too many duplicate of them, someone (as an institution) should monitor all technological projects in macro view, foreign dependent areas should be analysed and then collaborative work of civil and defence industries needed to overcome these dependency, calls for common guided projects needed, structures of TSKGV companies should be changed (seems old fashioned), study for focus mechanisms for civil use of defence products/technologies, standardization may be stretched for dual-use products, certification issues should be solved primarily, number of mega-sized focus projects (like MİLGEM, ANKA, ALTAY, TOGG) need to be increased, following method can be used by a wise expert group in the following order: prepare a strategy, analyse situation, list fundamental national capabilities and monitor KPI.

- **Resources:** new products create employment and limit foreign currency exit, TSKGV companies absorb the HR and other resources for inefficient results (better to go with small and dynamic -techno park- companies), TSKGV companies prohibit doing business with to its previous employees when they leave (e.g. Microsoft can outsource a job to its previous employees), no limit to incentive funds for start-ups in incubation centres/techno parks (lowest level of pyramid), obligatory application of civil version if an (applicable) technology gained in defence industry (for no more import on the same technology), the more resource the more cooperation may exist, access to resources in defence industry is easier than in civil industries, more investment on fundamental science is needed (no more move forward for Turkey with reverse engineering), government resources/funds draw attention of industries, SSB can ease to access defence industry database for companies, expert pool should be dedicated to cooperative work on critical technologies.

Variable C.3: Additional to the previous question, it is asked specifically what would they update for a stronger infrastructure for defence industry (and related civil industries). Their answers are grouped under three headlines once again, which are; human resources, technologies and physical infrastructure.

- **Human resources:** new legislation to protect ecosystem and HR, specific HR working on digitalization is needed, academic programs specified to defence industry will be useful, software issues should be kept alive, experienced HR should kept domestic, more analysis needed for brain drain and bridging the gap, more planned investment on HR, HR should be directed to selected/focused areas
- **Technologies:** self-sufficiency needed on sensors (said twice), investment on control systems are critical (said twice), know-how of material technologies (said twice), focus on critical technologies that money cannot buy, including SMEs on technological layer, technology development processes are more crucial than product development, breaking foreign dependency on critical subjects, primarily developing technologies which are more possible to be restricted by others
- **Physical infrastructure:** infrastructure for test and qualification process (may be with public-private cooperation), common use of testing infrastructure (civil and defence), production capability of raw material, industries working for fundamental needs should be supported, huge investments that civil industry cannot afford can be initiated by government, common use of empty capacities of industries, better infrastructure needed for cyber/data security and electronic war and stopping repeated investments.

Variable C.4: As a critical question for understanding respondents' perspectives on defence industry in Turkey, they are asked what if they were owner of a large-sized company that operates in a civil sector in Turkey, and found out their products may have dual-use function, would they consider to enter defence industry too and why. There were quite different answers and reasons.

Seven of them preferred to involve defence industry too, as they noted these reasons: resources are more accessible, satisfaction of contribution to the national interest, potential of higher financial profits, developing a culture for company, sectoral diversity is better for business, it is a new know-how area and a prestigious business.

Ten participants said they could prefer to enter under certain conditions, like if: there is chance for export, will be a seller rather than only a producer, not compete with bigger players (like Aselsan, TAI etc.), not harm to their main business, necessary

investment is reasonable and a dual-use product is ready. They also reported that: short-term projects with higher profits are better, entry with a new organizational structure is important and a feasibility study is required.

On the contrary, two respondents said they would not enter into defence industry, because of: long-term returns of investments, the higher political effect on business, the high risk to be taken as a big player, tough competition without a ready product, the hardness for early stages in defence industry, the fatality if financing and infrastructure are insufficient. Last two interviewees did not specify their preference.

Table 15: Variables and Final Codes of Part C

#	*Variables*	*Final Codes*
C.1	Best practices of collaboration between defence and civil industries	Best practices of collaboration between defence and civil industries can be described under five groups, that are organizational examples (like DARPA, NASA, FAA), product-based examples (like CNC machining, radars, microchips), project-based examples (like A400M, BOEING 737 AEW&C, Oruç Reis), technology-based examples (like internet, imaging and communications technologies) and companies serving both industries (many land, naval and aviation firms).

Table 15: Variables and Final Codes of Part C (continued)

C.2	Policy suggestions for relations of defence and civil industries	Too much suggestions for more effective collaboration mechanisms of defence and civil industries made by respondents. These suggestions can be labelled under three interrelated groups, which are suggestions for interactions, policies and resources. Although labels are selected through their relevance, all suggestions may be useful for policymakers. Suggestions for interactions were mainly about increasing synergy and sharing experiences more between defence and civil industries. There were wide range of suggestions for policies, but prominent ones are the need for an SSB-like authority to support civil industries and to prohibit negative effects of TSKGV companies on other industries. For the suggestions of resources labelled, it is frequently-cited that more support is needed for base level and increasing resources means increasing cooperation between industries.
C.3	Policy suggestions for defence industrial base (and infrastructure of related civil industries)	Policy suggestions (of interviewees) for a better infrastructure of defence industry and related civil industries contain many crucial and mostly long-term policy recommendations. All are grouped under three labels: human resources, technologies and physical infrastructure.
C.4	Market entry decision for defence industry	Most of the interviewees stated that they could go into defence industry directly (33%) or under certain conditions (47%). Their main points were higher profits, accessible resources and prestigious nature of defence industry for direct-entrants, while conditional entrants mentioned about commercial or organizational readiness and structural requirements. Only two out of 21 said they would not enter because defence industry contains risks of commercial and political structure.

6.3 Discussion: Comparison of this Study with the Literature

To discuss in general, two opposite approaches are dominating the literature. Former approach claims that defence industry and related efforts are not optional and does not cause other economic activities to be damaged. Rather it is a necessity for nations, feedbacks national economy by triggering developments in industries through several mechanisms, thus has positive effects on macro development. On the contrary, latter approach asserts that increasing of defence expenditures and the increasing size of defence industry are not natural (or not necessary) processes for nations and are not useful for nations' own good, because it exploits countries' resources like qualified man power and funds for high-tech R&D activities. Both approaches have great number of supporters from academy, public and private sectors.

Civil and military dichotomy does not distinguish two sides with a sharp border. Industries serving to one side (or both sides) may realize numerous opportunities to increase inter-industrial relations. In this regard, today's interwoven environment of economics and politics enable us to mitigate contrast between civil and defence industries through novel mechanisms.

At this point, we can bring outputs of this study up for discussion., These distinctive characteristics of defence industry overlaps between interview data and the literature:

- Governments as restricted and sole customers
- Strong government support alongside its higher intervention and enforcement
- Tough military standards/requirements and well-adapted global regulations
- Unique market structure with hard processes for entrants and leavers
- Compelling confidentiality issues and its effect on cooperation and marketing

Deductions from the study in scope of this thesis are summarized under three groups: First group of findings include that are correlated with the literature, second group of findings that are absent in the literature and the last group concludes in contrast to the literature.

Having regard to the findings in this chapter, following aspects correlated with the literature review:

- Defence industry can be defined as a specific industry and has apparent borders with civil industries except its intersection with aerospace sector. Many sources define defence and aerospace as a single integrated industry, but an interviewee suggested that the aviation (aeronautics) part may be included to defence industry but the space part should be kept apart.
- Defence industry has special characteristics that detach it from other industries, which are mentioned in detail in Section 2.2 and Subsection 6.2.1.1 (Variable A.3)
- Achieved level of relations between defence and civil industries has enhanced thus far but there is still a need for more distinctive supporting mechanisms to remove barriers between industries in order to connect industries more. Similar situation is present for Turkey in spite of strong government support to the defence industry.
- The applications of dual-use technologies/products is believed to be a right model for enhancing relations between defence and civil industries. The number of these applications will be increased in the following years due to the expected development of civil industries and its contribution to the cost-effectivity.
- The R&D spending for civil purposes has by far surpassed its defence counterpart for years. Civil technologies are, predominantly and not surprisingly, leading the technological development.
- Even some researchers (Aya, 2005; Cappelen et al., 1984; Kentor & Kick, 2008) claim the opposite, this study suggests that the activities of defence industry reinforce other industries and subsidiaries with its high-tech and well-funded environment.
- Most of the significant technological developments originating from defence industry has become dual-use technologies and these technologies have been great pushers for the society and possessed significant economical values of its inventors.

In addition to the correlating arguments, these points remain uncovered and may provide novel contributions into the existing literature with this study:

- Most of distinctive characteristics of defence industry complicate its relations with civil industries.
- Defence industry is related to civil industries in a wide frame but the level of those relations depends on its subsectors.
- Relations between industries can be grouped by two as direct and indirect relations but a more interpretive categorization for connections is defined as following: interaction, intersection, integration, and interdependence.
- Most beneficial relation type between industries is subject to several elements like whether for short- or long-term, from financial or strategical aspect, etc.
- Interdependency between industries can be beneficial to long-term collaborations.
- Integration of industries seems to be a necessity for both sides (civil and defence), as it helps cumulative development and provides cost-effective solutions.
- It will ignite both economic and technological success for developing countries if they have a strategical defence procurement plan with the priorities of enabling the domestic development capabilities and using the potential occasions for co-development/production regarding defence projects.
- Best practices of collaboration between defence and civil industries are categorized under organizational, product-based, project-based, technology-based and corporative (that are serving in both sides) examples.
- Government-funded companies or quasi-public institutions may damage the competitiveness and equality of opportunity in the market environment of defence and civil industries if their business could not be balanced with non-public sales.
- Salary gap between defence and civil industries seems high and it affects the quality of HR in civil industries.

- It is still the case that professionals and companies are inclined to enter defence industry under certain conditions because of business prestige, higher profits and potential involvement with technological advancement.
- The awareness level for the (importance of) indigenousness is higher in defence industry than in civil industries.

Lastly, the only point deducted from this research and is in contradiction with the previous knowledge is stated below:

- Military expenditure does not constitute an impediment for other industries since its proportion to GDP is relatively lower than other public expenses and market volume of defence industry is relatively lower than civil markets.

It cannot be determined that the main reason for developing countries not achieving a competitive position in global defence market is due to policy/legislation, technological development level or limited sources/capability of industries.

6.4 Summary of the Chapter

This chapter submitted a summary of the analysed data and the related findings of interviews through variables for introduction, body and ending parts of the interview study. Tables created for showing the final data are listed above (Table 13, Table 14 and Table 15) and all the variables are shown together in Table 16 below.

Elaborative analysis of interviews provides this research to compare its outcomes with the existing literature data for inter-industrial relations in global scale and the specific data generated for Turkey. In order to conclude wider recommendations at the end, both national and global perspectives of interviewees are obtained via consecutive questions.

The research method adopted for this study ensures that the writer's neutral position has not influenced the data gathered through the interview process. Hence, predictive results and subjective recommendations are not mentioned till the conclusion chapter.

Note that, many published and unpublished resources regarding our subject are examined and used, in addition to the data collected from semi-structured interviews, that are designed and conducted specifically to this research. Literature outputs are not gathered into a mere chapter, rather they are penetrated in various parts of chapters related to their relevancy.

To make inferences on the subject, comparison of the outputs of this study and the literature are summarized in Section 6.3 under four groups: overlapping characteristics of defence industry, findings that are in correlation and in contrast with the literature, and those that are absent in the literature.

Table 16: All Variables of Interview Study (Part A, Part B, Part C)

Variables of Part A: Introduction	Variables of Part B: Body	Variables of Part C: Ending
•*A.1: Defining industries* •*A.2: Are characteristics distinguishable?* •*A.3: Distinctive characteristics of defence industry* •*A.4: Are there any barriers due to characteristics?* •*A.5:Characteristics that harden relations* •*A.6: Most related industries*	•*B.1: Relations between two industries* •*B.2: Comments on four generated descriptions* •*B.3: Are these descriptions distinguishable?* •*B.4: Most beneficial relation type* •*B.5:Interdependence* •*B.6: Integration* •*B.7: The level of relations between industries in global scale* •*B.8: Current level of cooperation between industries in Turkey* •*B.9: Examples for collaboration of defence and civil industries* •*B.10: Suggestions for defence and civil industries' relations in Turkey* •*B.11: Familiarity with dual-use term* •*B.12: Most-known examples for dual-use* •*B.13: The future of dual-use applications* •*B.14: Dual-use as a model/tool for collaboration between industries* •*B.15: Effects of boosting defence industry on civil industries* •*B.16: Leverage impact of boosting defence industry in developing countries* •*B.17: Leading technologies of today*	•*C.1: Best practices of collaboration between defence and civil industries* •*C.2: Policy suggestions for relations of defence and civil industries* •*C.3: Policy suggestions for defence industrial base (and infrastructure of related civil industries)* •*C.4: Market entry decision for defence industry*

CHAPTER 7

CONCLUSIONS AND POLICY RECOMMENDATIONS

Technological advance and innovation capacity are potential sources of a sustainable development for nations. Industrialisation supported by the continuing achievements in technology, productivity and learning capacity is one of the most essential articles for success in global economy. Any developmental and political agenda ignoring these matters will probably fail. In this direction, defence and civil industries are inseparably dependent to each other with the technological, productional and infrastructural capacity of a country.

Defence industry, defined as "the cumulative of public and private organizations taking place in any operations (designing, developing, manufacturing, etc.) aiming to meet the security and defence needs of a country" in this thesis, is a critical part of national sovereignty. Therefore, reducing dependence on foreign sources is essential to secure national independence. The significant amount of defence expenditures necessitates establishing rational connections between defence and civil industries in order to create technological, industrial and economical surplus.

In this chapter, final conclusions and specific recommendations for increasing the effectiveness of defence industry and its relations with civil industries are presented. The first section (7.1) includes the acquired answers for aforementioned research questions of this thesis. Following section (7.2) contains two categories based on the findings: policy recommendations for industrial relation mechanisms (7.2.1) and for defence industrial base (7.2.2). Section 7.3 involves with the limitations of the study and Section 7.4 discusses the further studies. The last section (7.5) comprises last remarks on the study.

7.1 Conclusions

Defence industry differentiates from civil industries in business manner due to its characteristics and specific needs. To maintain a sustainable industrial development, production capacity and human resources of Turkey should be utilised with rational policies and well-determined objectives.

Most importantly, seeking answers for the three research questions of this study led us to the following conclusions for each research question respectively:

- Most of distinctive characteristics of defence industry complicate its relations with civil industries. Defence industry is related to civil industries in a wide frame and the current extent of connections between defence and civil industries are determined by its subsectors and is changing from country to country. Achieved level of relations between defence and civil industries are not strong in global scale and there are many steps to be taken for better relations.

  For Turkey, a significant progress has been made recently regarding these relations, but more distinctive supporting mechanisms are needed to remove structural and psychological barriers in front of wider opportunities. Not surprisingly, forthcoming challenges and arms (and technology) embargos will potentially increase the collaboration and connections between industries.

- To underline the positive effects again, this study suggests that activities of defence industry reinforce other industries and subsidiaries with its high-tech and well-funded environment. The awareness level for the (importance of) indigenousness is relatively higher in defence industry than in civil industries and it provides an immeasurable contribution to both sectors. In addition, defence expenditures do not constitute an impediment for other industries since its proportion to GDP is relatively lower than other public expenses, and market volume of defence industry is relatively lower than civil markets.

  On the contrary, to summarize potential negative effects of defence industry on other industries, the salary gap between defence and civil industries and the

excessive government support are counted among foremost complaints of civil industries. Government-funded companies or QPEs may damage the competitiveness and equality of opportunity in the market environment of defence and civil industries if their business could not be balanced with non-public sales and an increase in their export shares. Similarly, government funds and regular support mechanisms for industries should be designed and planned sensitively in order to sustain a balanced environment for civil industries.

- Best practices of collaboration between defence and civil industries are categorized under organizational, product-based, project-based, technology-based and corporative (that are serving in both sides) examples in Chapter 6. Most beneficial relation type between industries is subject to several elements like whether for short- or long-term, or from financial to strategical aspect, etc. For instance, interdependency between industries can be beneficial to long-term collaborations. Besides, integration of industries seems to be a necessity for both sides (civil and defence), as it helps cumulative development and provides cost-effective solutions.

  The applications of dual-use technologies/products is believed to be a right model for enhancing relations between defence and civil industries. The number of these applications will be increased in the following years due to the expected development of civil industries and its contribution to the cost-effectivity. It is confirmed that the civil technologies are, predominantly and not surprisingly, leading the technological development today.

  Finally, it will ignite both economic and technological success for developing countries if they can carry public procurement for innovation into effect and have a strategical defence procurement plan with the priorities of enabling the domestic development capabilities. Besides, it is important utilizing the potential co-development/production opportunities regarding defence projects, because these opportunities can be seen as a chance with regards to (technological) learning and knowledge spillover.

7.2 Policy Focus and Recommendations

First of all, it is important to make country-specific policy recommendations and to take advantage of previous experiences of other countries. It should be noted again that the policy recommendations in this thesis are made for Turkey and are expected to be useful and applicable for other countries (more in particular for developing countries) with proper analyses and further research for implementation.

A major assessment for development of a country is the absorptive capacity in STI literature. In this section, applicable policies are suggested for increasing the capacity of firms, universities, other public and private institutions, industries and all stakeholders in Turkey. The main philosophy of policy recommendations is built on developing the key factors of HR, infrastructural capacity, technological and institutional competencies and the consecutive increase in learning and applying capacities of shareholders in the long run.

Turkey has given strategical importance to decrease its foreign-dependency and to increase the level of indigenousness in defence industry via undertaking broad actions and putting a decisive support with various public institutions. Pursuing this political (or strategical) objective, Turkey may become a global player in some sectors of defence industry if and only if rational policies rather than ambitious tending would be applied on this field of industry in following years.

Industrialization is a process of domestic capacity building (of production, technology, R&D and human capability, etc.). A successful and a qualified industrialization is based upon educated employment and sufficient financial structure as well as a proper and a stable environment for investment. Stepping into next stage is possible only with the determination of preferred sectors and the specification of measurable targets.

Defence industry prefers narrow and focused networking due to the sensitivity of confidentiality for defence technologies (Pittaway et al., 2004). This also affects the volume of its relations with other industries and proves the reason of unwillingness to establish more connections, because defence industry does not consider new connections as new opportunities. Additionally, and not surprisingly, established

networks between main and subcontractors in defence industry are proved to be more sustainable than networks in other industries because of longer contract periods and mutual trust environment.

Practical instruments of policymakers should pave the way for the formation of a combined civil and defence industrial base, which will be able to supply the requirements of self-defence of a country in a responsive, affordable, and explicitly reasonable method.

7.2.1 Policy Recommendations for Valuable Relation Mechanisms

To increase the coordination between policymaking bodies and to build long-term relations between defence and civil industries, there are five policy recommendations for valuable relation mechanisms. Following recommendations are indicated with the initial "R" for easy tracking:

R.1 (Micro-level): Defence policy should be aligned with industrial policy not later than the planning phase of these policies. In many countries, policymakers in different government bodies prioritize their interests and are not inclined to make policies co-ordinately with other government bodies (or to consider other policies of the same government). This perspective often diverges from an integrated grand policy and ends up with fragmented policies for a government. In order to prevent this potential distortion, there may better to have a supervision government body on policymakers for controlling policies that have intersecting areas of multiple government institutions.

For Turkey, DPT was undertaking this duty as a competent government body, later it converted to the KB, and finally transformed into the Presidency of Strategy and Budget, which is focused on the budgetary coordination of institutions in addition to the plans and the programmes of the government. At this point today, there are also permanent Presidential Policy Councils that are assigned only with making recommendations on policies in macro scale for several subjects, such as Science,

Technology and Innovation Policy or Security and Foreign Policy, all chaired by the President himself. Still there seems lack of a single duly-authorized body for supervising and removing policy disorders between all policymakers (i.e. councils, institutions and other structures) on behalf of the government. This issue is also mentioned in the 11th Development Plan, underlining the importance of increasing the capacity of public institutions for policymaking and the fact that a focused and coordinated policy framework has not yet been constituted for civil industries in addition to defence industry (KB, 2018d, p. xviii-xxi, 158).

R.2 (Meso-level): Majority of interviewees suggest that *interaction* is the most beneficial relation type. In this extent, both literature and interview data suggest that the human resource should experience both sides (defence and civil) of industries. Rotations of personnel between civil and defence industries or between public and private sectors may contribute to develop a mutual understanding and exchange of sympathy (as mentioned detailly in the previous section).

The application of "revolving door", i.e. simultaneous personnel movement between governmental and industrial positions for a time to develop a reciprocal understanding of each other, may be another policy tool for interaction between industries and the government. For instance, technical staff of DARPA, selected mostly among experienced researchers and professionals, is assigned for 3-5 years (an average project length) and subjected to rotation (Yazan, 2004, p. 84).

Similar rotation of personnel can be applied in specific institutions for limited time periods and under certain conditions to rule out setting bad examples; because intimate relations between military, government agencies and companies may cause conflict of interests and malpractice as there are significant critics regarding this application in various countries, such as the United States (Project on Government Oversight, n.d.). DARPA-like personnel regime can be composed from sections of government agencies to keep away solid bureaucratic approach and hiring problems.

R.3 (Meso-level): Another suggestion for a valuable relation mechanism is the establishment of organic and durable linkages that will catalyse university-industry relations and the collaborative work between them in the long-term. Since many

professionals, who are not involved with a master's or doctorate degrees, do not engage universities after their graduation, a new method is needed for developing connections. Academy can encourage more professionals to be tied to universities again, alongside their occupations, via offering special education such as certificate programs or opportunities for contribution to academic studies, all designed only for non-academic professionals (those working in the industry or government agencies, etc). There are such examples both in Turkey (METU CEC, n.d.; ITU SEM, n.d.) and in the world (MIT, n.d.) but many of them are institutional examples rather than a part of a systematic, large-scale policy. It should be noted that it is not preferred to make more recommendations about enhancing the relationship between academia-government-industry triangle, because there are many conclusions already drawn on this issue in the literature. Nothing but it can be said that the universities' role at the intersecting point of this triangle is very crucial to reinforce the structure of relationships with its facilitator and active energy as well as its critical position with the potential of unravelling troubles of industries related to HR.

R.4 (Macro-level): In order to widen collaborative business areas between industries, related government agencies should take the lead for appropriate guidance for country-wide support mechanisms for collaborative business areas of specified sectors may be applied in medium/long period. Government agencies can promote companies for inter-industrial cooperation via setting up a reward system for strategic and productive activities/projects between them.

R.5 (Macro-level): The long-standing off-set mechanism that has been applying successfully by defence industry (with significant outcomes for defence industrial base) can be adapted into civil industries by related government bodies that should be assigned for this adaptation. To decrease the negative effects of import for industries, wider off-set mechanisms can be applied especially for large-sized public procurements to allow similar achievements and increase ties between two industries.

Table 17: Summary of Recommendations for Establishing Valuable Relation Mechanisms

#	POLICY LEVEL	POLICY AIM	POLICY RECOMMENDATION	POLICY TOOL
R.1	Micro	To synchronize defence and industry policies at the early phases of planning	A single duly-authorized body should supervise intersecting areas of policies between public institutions to remove policy disorders	A government body should be assigned for this task (or a new body should be established)
R.2	Meso	To increase experience of technical and managerial staff and develop a mutual understanding between industries	Legal opportunities for rotation of personnel can be a solution for understanding each other	Rotation of personnel can be applied between defence and civil industries (or public and private sectors) for limited time periods under new labour acts to be enacted
R.3	Meso	To develop collaborative works between academy and industries via long-term and organic linkages	A systematic approach is needed for academy to make more professionals involved with universities through academic or working purposes	With a systematic planning, Council of Higher Education (YÖK) may design special academic programs only for professionals and offer wider opportunities for them to participate in scientific research or involve with collaborative projects
R.4	Macro	To widen collaborative business areas between industries	Related government agencies should take the lead for appropriate guidance for country-wide support mechanisms	Government agencies can promote companies for inter-industrial cooperation via setting up a reward system for strategic and productive activities/projects between them
R.5	Macro	To decrease the negative effects of import for industries	Off-set mechanisms of defence industry can be adapted into civil industries	Related government bodies should be assigned for adaptation of off-set mechanisms used in defence industry into civil industries

7.2.2 Policy Recommendations for Updating Defence Industrial Base

There are seven policy recommendations for updating defence industrial base and decreasing foreign dependencies due to inadequate domestic infrastructure. Following recommendations are indicated with the initial "P" for easy tracking:

P.1 (Micro-level): A policy suggestion mentioned both in interviews and in the literature (by Yazan, 2004, p. 78) to establish a new government institute for managing and directing military innovation through the example of DARPA, which is worth to consider. Though, it may be much better not to create a new public institution as it would take significant time and need public resource to found a whole new body, recruit personnel and build physical and bureaucratic infrastructure with the expectation of proper performance.

Since the performance and the success that SSB demonstrates in its area of responsibility are appreciated by many researchers, interviewees and the public, an alternative suggestion would be a new institute to be formed under SSB. All defence-related R&D and innovation activities, and other relevant government bodies (with similar objectives) to be gathered in this DARPA-like structure along with proper and wider funding mechanisms. It may ease the management of this critical issue by the state and prevent unnecessary/recurrent spending and funding/carrying out overlapping projects in addition to intercept the potential disconnection for policies between government agencies. Among the objectives of this government body should be integrating defence and civil ecosystems (government, academia, defence and civil industries) with the purpose of spin-off by reaching more SMEs and universities and taking special interest by drawing both industries' attraction into the dual-use technologies and products, because developing relationship between two industries is much more possible in the R&D phase.

Similar action is in the works by the UK government as they follow the example of DARPA (Stokstad, 2019). A task sharing is also realized within DoD in 2018 with a similar objective. Responsibilities regarding defence industry are divided into two by assigning Under Secretaries for the Office of Defense for Acquisition & Sustainment

(OUSD [A&S]) and the Office of Defense for Research and Engineering (OUSD [R&E], also called as the Chief Technology Officer of DoD) in order to separate defence R&D and defence procurement (McCormick, Hunter, Cohen, & Sanders, 2019, p. 4).

P.2 (Meso-level): Supporting all kinds of R&D activities from the base level (individual, start-up, etc.) is the only way up to climb the pyramid of development to feed industries with an adequate level of domestic R&D activities. Improvements to be made by government authorities on both the allocated resources (without economic pretexts) and the accessibility to these resources (formal processes) will increase the speed of technological and economic outcomes eventually.

P.3 (Meso-level): Self-sufficiency in materials technologies should be analysed to determine which technologies are not reachable or hard to reach in both peace- and wartimes. This analysis will help specifying strategical focal points among those technologies through technology readiness levels. Supply chain of defence materials and related materials technologies should be investigated by related government authorities for further planning to achieve self-sufficiency. A similar effort has been making under SSB projects like YETEN (Inventory of Abilities, in Turkish: *Yetenek Envanteri*) in along with this objective in a more general manner.

P.4 (Meso-level): To increase potential benefits of dual-use products/technologies, opportunities of dual-use products/technologies can be highlighted via new mechanisms and legal processes to be eased via readjustment of related laws. Dual-use products may be categorized as harmful and unharmful goods in accordance with the international agreements that Turkey is currently participating. Average time for granting export licenses for unharmed products may be reduced as low as a commercial product with readjustments to be made by policymakers and government institutions via taking this issue earnestly to increase potential benefits. Companies can be encouraged further to produce dual-use products/technologies via effectuating new incentive mechanisms.

P.5 (Macro-level): Another critical issue is the strategic management of competition between companies by governmental authorities. It should be understood by every

element in the defence market that destructive competition is harmful and must be avoided. There are countries that do not allow defence companies to compete with each other in domestic market and force those companies for domestic cooperation and global competition. Several government bodies can be assigned to monitor the total number of players in strategic fields of industry to prevent large recurrent costs and destructive competition. (Example: SSB)

P.6 (Macro-level): Developing countries in particular have wider field of investments. Thus, large-sized investments should be evaluated in detail and planned with a better integration between industries to minimize waste of resources and recurrence. Large-sized investments can be subjected to permission from designated government bodies to ensure national resources are planned properly. It is also government's duty to make huge investments that civil industries cannot afford, reinforce the industrial infrastructure and ensure idle capacities to be used commonly by industries.

P.7 (Macro-level): Public procurement for innovation model should be widened into civil industries to accelerate industrialization and technological development in the country. Government agencies should use public procurement for innovation in a wider extent by considering defence industry experiences.

Table 18: Summary of Recommendations for Updating Defence Industrial Base

#	POLICY LEVEL	POLICY AIM	POLICY RECOMMENDATION	POLICY TOOL
P.1	Micro	To manage all defence-related R&D activities in a more productive and an easier way	A new public institution can be founded to manage and gather all defence related R&D and innovation activities of all relevant government bodies under one roof	An institute like DARPA to be established under SSB can manage all public defence-related R&D activities, and prevent unnecessary/recurrent costs, overlapping projects and potential disconnection between relevant agencies

Table 18: Summary of Recommendations for Updating Defence Industrial Base (continued)

P.2	Meso	To feed industries with an adequate level of domestic R&D activities	All kinds of R&D activities from the very base level (individual, start-up, etc.) should be supported to the highest degree	Allocated budget and formal processes for R&D activities should be improved by government authorities
P.3	Meso	To determine strategic focal points regarding materials technologies	Availability of materials technologies should be analysed to determine which technologies are not reachable or hard to reach in both peace- and wartimes	Supply chain of defence materials and critical materials technologies should be investigated by related government authorities for further planning to achieve self-sufficiency
P.4	Meso	To increase potential benefits of dual-use products/ technologies	Legal processes to be eased and opportunities of dual-use products/technologies to be highlighted via establishing new mechanisms and the readjustment of related laws	Duration for granting export licenses for unharmed dual-use products may be reduced and companies can be encouraged to produce dual-use products/technologies via incentive mechanisms
P.5	Macro	To have a strategic management of competition between domestic companies	Industries should be overseen by related authorities to prevent destructive competition between domestic players	Several government bodies can be assigned to monitor the total number of players in strategic fields of industry to prevent large recurrent costs and destructive competition (Example: SSB)
P.6	Macro	To plan and utilize domestic resources of industries more carefully	Large-sized investments should be planned with a better integration between authorities to reinforce the industrial infrastructure and using idle capacity	Large-sized investments can be subjected to permission from designated government bodies to ensure national resources are planned properly
P.7	Macro	To accelerate industrializatio n and technological development in the country	Public procurement for innovation model should be widened into civil industries	Government agencies should use public procurement for innovation in a wider extent by considering defence industry experiences

7.3 Limitations of the Study

A thesis study is bounded by limited time and resources. Therefore, limited number of interviews could be conducted with numbered people from definite organizations. In addition to these limitations, a rarely seen situation of global pandemic emerged throughout a significant period of this research, which affected the schedule and the type of interviewing.

In addition, literature data collected for this study is sufficient to sort out except few sections (which give some space for novel addition). It is just because defence industry has been a popular subject since decades and many public, private and academic research have already been made. However, it is not possible to get and sort all relevant data and use the best portion of it. That is why the final edition of this study may include insufficient conclusions and recommendations.

Especially it is in the nature of qualitative approach and should be appreciated that such studies contain personal views and cultural approaches and may not allege absolute conclusions.

Although the methodology of the study and conclusions that are deducted from this methodology may be applicable to generalize, it should be noted that particular findings concluded from interviews and partial data used in various sections of this study are mostly related to Turkey and country-specific. Hence, these remarks and recommendations made for Turkey may display a limited applicability to generalize for researchers interested in a similar study for other countries.

7.4 Discussion for Further Studies

This thesis is believed to contribute to the literature on several subjects mentioned before, but the subject of inter-industry relations is found to be largely unstudied, so it may be expected that more studies to be conducted on this issue. Besides, HR of defence industry may be another subject to be studied in detail as it would become

more important in near future. Digitalization of defence industry and the opportunities it offers in this industry would be another subject worth to study. A challenging issue for Turkey, motor and power train systems, can be another research subject with regards to economy and politics, because these are counted among critical subsystems for both defence and civil applications. Challenges for developing countries to become a self-sufficient global competitor in defence industry may be investigated separately. Country-specific studies similar to this thesis may result in original policy recommendations to be made for defence and civil industries of those countries.

7.5 Last Remarks on the Study

There is no certain type of defining or absolute explanation for relationship between industries. Therefore, four descriptions coined for describing inter-industry connections in scope of this study do not have such a claim. Yet, these four descriptions are novel and fresh descriptions that characterize a theoretical framework for this research and contribute to the common literature hopefully.

Since policy recommendations should be tailored for each country, those made in scope of this study are focused on Turkey. However, it can be expected that conclusions and recommendations be useful/helpful for other developing countries having similar structural conditions regarding defence industry.

Thus and so the study makes a unique contribution by filling the gap in the existing literature on the subject of defence industry's relations with and effects on civil industries with specific recommendations for Turkey.

REFERENCES

Adams, W., & Adams, W. J. (1972). *The military-industrial complex: A market structure analysis.* The American Economic Review, 62(1/2), 279-287.

Adams, W.C. (2015). *Handbook of practical program evaluation* ed. 4. Chapter: Conducting Semi-Structured Interviews USA: John Wiley & Sons.

Aerospace Industries Association (AIA). (2018). *Fostering the Manufacturing & Defense Industrial Base of the Future.* AIA Report. Arlington, VA: AIA. Retrieved December 3, 2019 from: http://www.aia-aerospace.org/wp-content/uploads/ 2018/04/MDIB_EO_ResponsePaper.pdf

Atkinson, P., Coffey, A., & Delamont, S. (2001). *A Debate about Our Canon. Qualitative Research*, 1(1), 5–21.

Aya, S. (2005). *The effects of military expenditures on Turkish economy: a general equilibrium model analysis* (Thesis Number: 188419) [Doctoral dissertation, Bilkent University]. YÖK Ulusal Tez Merkezi.

Aydin, H. (2007, July). *An Analysis of input-output inter industry linkages in the Turkish Economy.* In 16th International Input-Output Conference, Istanbul. 2-6.

Bain J.S. (1959). *Industrial Organization*. New York: John Wiley & Sons, Inc. (II edition, 1967).

Bandeira, L. A. M. (2019). The Military-Industrial Complex in the West and the Opposing Power Sphere in the East. In *The World Disorder*. Springer, Cham. 21-34.

Bellais, R. (2009). Defense innovation at any (out of control) cost? The stalemate in today's R&D and an alternative model. *The Economics of Peace and Security Journal*, 4(1).

Bellais, R., & Guichard, R. (2006). Defense innovation, technology transfers and public policy. *Defence and peace economics*, 17(3), 273-286.

Bertaux, D. 1981. From the life-history approach to the transformation of sociological practice. In *Biography and society: The life history approach in the social sciences*, ed. by D. Bertaux, 29–45. London: Sage.

Beyoğlu, B. E. (2006). *Türk Savunma Sektörünün Yapısal Analizi ve Sanayileşme Modeli Önerisi* [Structural Analysis of the Turkish Defence Industry and Suggestion for Industrialisation Model] (Thesis Number: 219991) [Master's thesis, Ankara: Turkish Military Academy]. YÖK Ulusal Tez Merkezi. 7.

Blenko, M. W., Mankins, M. C., & Rogers, P. (2010). *Decide & deliver: 5 steps to breakthrough performance in your organization.* Harvard Business Press.

Boemcken, M. V. (2017). *Defence conversion: Dead duck or still a relevant object of study?*.

Brandt, L. (1994). Defense Conversion and Dual-Use Technology: The Push Toward Civil-Military Integration. *Policy Studies Journal*, 22(2), 359-370.

Brunskill, I. (1992). *Making it: A Federal Approach to Industrial Policy.* Institute for Public Policy Research.

Bryman, A. (2012). *Social research methods.* Oxford University Press.

Bukkvoll, T., Malmlöf, T., & Makienko, K. (2017). The defence industry as a locomotive for technological renewal in Russia: are the conditions in place?. *Post-Communist Economies*, 29(2), 232-249.

Cappelen, Å., Gleditsch, N. P., & Bjerkholt, O. (1984). Military spending and economic growth in the OECD countries. *Journal of Peace Research*, 21(4), 361-373.

Canbay, Ş. (2010). *Savunma Harcamalarının ve Savunma Sanayiinin Makro Ekonomik Etkileri ve Türkiye Örneği* [The macro economic effects of the defence expenditures and defence industry and Turkey model] (Thesis Number: 253294) [Master's thesis, Sakarya University]. YÖK Ulusal Tez Merkezi.

Candar, Ö. (2003). *Military expenditures and economic growth in Turkey* (Thesis Number: 137694) [Doctoral dissertation, Bilkent University]. YÖK Ulusal Tez Merkezi.

Chao, P. A. (2005, March). The structure and dynamics of the defense industry. In *Security Studies Program Seminar*.

Choy, L. T. (2014). The Strengths and Weaknesses of Research Methodology: Comparison and Complimentary between Qualitative and Quantitative Approaches. *IOSR Journal of Humanities and Social Science*, 19(4), 99–104.

Christians, C.G. (2005). *Ethics and politics in qualitative research.* In N.K. Denzin & Y.S. Lincoln (Eds.) The SAGE Handbook of Qualitative Research 3rd Ed., (pp. 144-145). London: SAGE Publications.

Cowan, R., & Foray, D. (1995). Quandaries in the economics of dual technologies and spillovers from military to civilian research and development. *Research Policy*, 24, 851–868.

Creswell, J. 1998. *Qualitative inquiry and research design: Choosing among five traditions*. Thousand Oaks, CA: Sage Publications.

Creswell, J. W. (2009). *Research Design: Qualitative, Quantitative and Mixed Method Approaches* (3rd Ed.). Los Angeles: SAGE Publications.

DARPA official website: *About Us / Mission*. Retrieved April 27, 2020, from: https://www.darpa.mil/about-us/mission

Day, D. T. (2012, September). The limits of monopsony pricing power in the markets for defense goods. *Defense Acquisition University Research Symposium*.

Defense News. (2020). *Defense News Top 100 Defence Companies List*, Retrieved August 21, 2020, from: https://people.defensenews.com/top-100/.

Demirel, A. (2012). *Türkiye'de savunma sanayinin sanayileşmesini etkileyen faktörlerin* [The analysis of factors affecting the industrialization on defense industry in Turkey] (Thesis Number: 347567) [Doctoral dissertation, Turkish Military Academy]. YÖK Ulusal Tez Merkezi.

Denzin, N. K. & Lincoln, Y. S. (Eds.). (2005). *The Sage handbook of qualitative research* (3rd Ed.). London: Sage Publications.

Dey, I (1993). *Qualitative data analysis: A user-friendly guide for social scientists*. London: Routledge.

Diener, E. & Crandall, R. (1978). *Ethics in Social and Behavioral Research*. Chicago: University of Chicago Press.

Domholdt, E. (1993). *Physical Therapy Research: Principles and Applications*. W B Saunders, Philadelphia.

DPT (State Planning Organization). (2000). *Sekizinci Beş Yıllık Kalkınma Planı, Makine, İmalat Sanayi Özel İhtisas Komisyon Raporu [Eighth Development Plan, Specialised Commission Report on Machinery Manufacturing Industry]*. Ankara: DPT (Issue: DPT: 2538 - ÖİK: 552).

Dumas, L. J. (1988). Economic Conversion: The Critical Link. *Bulletin of Peace Proposals*, 19(1), 1–10.

Dunn, D. L. (1995). Sociological Dimensions of Economic Conversion. In L. J. Dumas (Ed.), *The Socio-Economics of Conversion from War to Peace*. New York & London: M.E. Sharpe. 23-44.

Dunne, J. P., & Sköns, E. (2010). *FWC Sector Competitiveness Studies− Study on the Impact of Emerging Defence Markets and Competitors on the Competitiveness of the European Defence Sector*. Final Report, 2, 12-93. Retrieved June 2, 2020, from: http://www.decision.eu/wp-content/uploads/2016/11/Study-on-the-Impact-of-Emerging-Defence-

Markets-and-Competitors-on-the-Competitiveness-of-the-European-Defence-Sector.pdf

Dunne, P. (2015). *Sector Futures: Defence industry*. European Monitoring Centre on Change. Retrieved July 1, 2020, from: https://www.eurofound.europa.eu/observatories/emcc/articles/business/sector-futures-defence-industry

Durmaz, M. (2016). Defense technology development: does every country need an organization like DARPA?. *Innovation, 18(1),* 2-12.

Dworkin, S. L. (2012). Sample size policy for qualitative studies using in-depth interviews. *Archives of Sexual Behavior, 41(6),* 1319-1320. doi: 10.1007/s10508-012-0016-6.

Edquist, C., Hommen, L., Tsipouri, L., & Tsipouri, L. J. (Eds.). (2000). *Public technology procurement and innovation* (Vol. 16). Springer Science & Business Media.

Eisenhower, D.D. (1953). *"The Chance for Peace" Address*. Eisenhower Library. Retrieved June 13, 2020, from: https://www.eisenhowerlibrary.gov/sites/default/files/file/chance_for_peace.pdf

Eisenhower, D.D. (1961). *Farewell Address*. Eisenhower Library. Retrieved June 13, 2020, from: https://www.eisenhowerlibrary.gov/sites/default/files/file/farewell_address.pdf

Erdil, E., Pamukçu, M. T., & Akçomak, İ. S. (n.d.). Ankara İli Bilgi İletişim Teknolojileri Sektörü Yenilik Kapasitesi ve Üniversite-Sanayi İşbirlikleri. [Innovation Capacity and University-Industry Relationship of IT Sector Settled in Ankara] (Working Paper: STPS-WP-15/01). METU.

Erdil, E., Pamukçu, M. T., & Çiftçi, G. G. (2016). *RIO Country Report 2015: Turkey*. EUR 27871 EN. doi:10.2791/474716

Ergocun, G. (2020, June 10). *Aselsan signs $31.3M mechanical ventilator order deal.* Anadolu Agency News.

https://www.aa.com.tr/en/economy/aselsan-signs-313m-mechanical-ventilator-order-deal/1871787

EU Commission. (2017, June 7). *Launching the European Defence Fund*. Retrieved July 6, 2020, from: https://ec.europa.eu/docsroom/documents/23605/ attachments/2/ translations/en/renditions/native

EU Council Regulation (EC) No. 428/2009. (2009, May 5). *Community regime for the control of exports, transfer, brokering and transit of dual-use items*. Retrieved June 15, 2020, from: https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1595346818514&uri=CELEX: 02009R0428-20191231

European Commission (EC). (2006). *NACE Rev. 2. Statistical classification of economic activities in the European Community*. Luxembourg: Office for Official Publications of the European Communities. Retrieved June 1, 2020, from: https://ec.europa.eu/eurostat/documents/3859598/5902521/KS-RA-07-015-EN.PDF

European Commission. (n.d.). *EU Transfers of defense-related products: The Transfer Directive*. Retrieved March 10, 2020, from: https://ec.europa.eu/growth/ sectors/defence/transfers-products_nn

Executive Office of the President, Office of Management and Budget. (2017). North American Industry Classification System (NAICS) Manual. United States. Retrieved June 1, 2020, from: https://www.census.gov/eos/www/naics/ 2017NAICS/ 2017_NAICS_Manual.pdf

Executive Order (EO) No. 13806. (2017). Retrieved June 10, 2020, from: https://www.whitehouse.gov/presidential-actions/presidential-executive-order-assessing-strengthening-manufacturing-defense-industrial-base-supply-chain-resiliency-united-states/

Federal Office for Economic Affairs and Export Control (BAFA). *Foreign Trade, Export Control*. Retrieved June 20, 2020, from: https://www.bafa.de/EN/Foreign_Trade/Export_Control/export_control_node.html

Foster, R.N., & Kaplan, S. (2001, September). *Creative Destruction: Why companies that are built to last underperform the market-And how to success fully transform them*. USA: Currency.

Frederiksen, P. C., & Looney, R. E. (1983). Defense expenditures and economic growth in developing countries. *Armed Forces & Society, 9(4),* 633-645.

Frey, J. H. (2004). 'Telephone Surveys', in M. S. Lewis-Beck, A. Bryman, and T. F. Liao (eds), *The Sage Encyclopedia of Social Science Research Methods*. 3 vols. Thousand Oaks, CA: Sage.

Gansler, J. S. (1988). Integrating civilian and military industry. *Issues in Science and Technology, 5(1),* 68-73.

García-Alonso, M. D., & Levine, P. (2008). Strategic procurement, openness and market structure. *International Journal of Industrial Organization, 26(5),* 1180-1190.

Geels, F. W. (2002). Technological transitions as evolutionary reconfiguration processes: a multi-level perspective and a case-study. *Research policy, 31(8-9),* 1257-1274.

Gholz, E. (2011). Eisenhower versus the Spin-off Story: Did the Rise of the Military–Industrial Complex Hurt or Help America's Commercial Aircraft Industry?. *Enterprise & Society, 12(1),* 46-95.

Gibbs, G. R. (2010). *Analyzing qualitative data*. Los Angeles, CA: SAGE. 44-45.

Gibbs, G. R. (2007). Thematic coding and categorizing. *Analyzing qualitative data*. London: Sage, 38-56.

Glaser, B. G. (1992). *Basics of grounded theory analysis: Emergence vs forcing*. Mill Valley, CA: Sociology Press.

Government of the Russian Federation, Federal Service for Technical and Export Control (Official Website) (n.d.). *Information on powers of FSTEC of Russia;*

list of regulatory legal acts determining these powers. Retrieved July 11, 2020, from: https://fstec.ru/en/359-powers

Gökpınar, E.S. (2016). Bölüm 22: Savunma Sanayiinde Ar-Ge ve Yenilik [Chapter 22: R&D and Innovation In Defence Industry]. in Eds: Erdil, E., Pamukçu, M. T., Akçomak, İ. S., & Tiryakioğlu, M. (Eds.), *Bilim, Teknoloji ve Yenilik: Kavramlar, Kuramlar ve Politika*. İstanbul: İstanbul Bilgi Üniversitesi Yayınları.

Gökpınar, S. (2003). *Ülkemizde savunma sanayii alanında araştırma ve geliştirmeye dayalı tedarik süreç modeli oluşturulması [A national process model proposal for research and development directed weapon acquisition form defense industry]* (Thesis Number: 141247) [Master's thesis, Ankara University]. YÖK Ulusal Tez Merkezi.

Gökpınar, S. (2013). *Türk savunma sanayinin bir inovasyon sistemi olarak incelenmesi [Evaluation of Turkish defense industry from innovation systems perspective]* (Thesis Number: 358763) [Doctoral dissertation, Turkish Military Academy]. YÖK Ulusal Tez Merkezi.

Guest, G., Bunce, A., & Johnson, L. (2006). How many interviews are enough? An experiment with data saturation and variability. *Field methods, 18(1),* 59-82.

Gummett, P., & Reppy, J. (Eds.). (1988). *The relations between defence and civil technologies*. Dordrecht: Kluwer Academic Publishers.

Hall, P. (2007). *Defence procurement, innovation and the national innovation system*. Manchester Business School.

Hall, P., & James, A. (2009). Industry structure and innovation in the UK defense sector. *The Economics of Peace and Security Journal, 4(1)*.

Hartley, K., & Belin, J. (Eds.). (2019). *The Economics of the Global Defence Industry*. Routledge.

Istanbul Chamber of Commerce. (2020, July). *Turkey's Top 500 Industrial Enterprises (ISO 500) List of 2019.* Retrieved July 17, 2020, from: http://www.iso500.org.tr/500-buyuk-sanayi-kurulusu/2019/.

Istanbul Shipyard, (n.d.) *SNR-SEISMIC Research Vessel*. Retrieved July 16, 2020, from: https://www.istanbulshipyard.com/en/ship-building/commercial-vessels/special-projects/snr-seismic

Istanbul Technical University, Sürekli Eğitim Merkezi (İTÜSEM). (n.d.). R&D, Technology and Innovation Management Program. Retrieved June 6, 2020, from: http://itusem.itu.edu.tr/egitimler-ve-programlar/tc-sanayi-teknoloji-bakanligi-protokol-programlari/arge-teknoloji-ve-inovasyon-yonetimi-sertifika-programi

Kasalak, S. (2006). *Military spending multiplier of Turkey: an empirical analysis for Turkey* (Thesis Number: 186326) [Doctoral dissertation, Bilkent University]. YÖK Ulusal Tez Merkezi.

Kentor, J., & Kick, E. (2008). Bringing the military back in: Military expenditures and economic growth 1990 to 2003. *Journal of World-Systems Research*, 142-172.

Koçoğlu, M. (2014). *Askeri Harcamaların Ekonomik Büyüme Üzerine Etkisi; Afrika Ülkelerinden Sub-Saharan Afrika Örneği [The impact of military expenditure on economic growth on Sub-Sharan Africa model from African countries] (Thesis number: 383877)* [Master's thesis, Nevşehir Hacı Bektaş Veli University]. YÖK Ulusal Tez Merkezi.

Koutrakos, P. (2001). *Trade, foreign policy and defence in EU constitutional law: The legal regulation of sanctions, exports of dual-use goods and armaments*. Hart publishing.

Kremlin (Official Website). (2015, June 16). *Event: International Military-Technical Forum ARMY-2015*. http://en.kremlin.ru/ events/president/news/ 49710

Kurç, Ç. (2020, April 26). *COVID-19 Sonrasında Savunma Sanayi* [Defence Industry after COVID-19]. Ankara: Institute for Future Research. Retrieved June 5, 2020, from: https://www.gelecek.org.tr/post/covid-19-sonras%C4%B1nda-savunma-sanayi

Kuznetsova, N. (2017, December 14). *Export Control of Dual-Use Items in the Russian Federation and the European Union*. Analytical Media "Euroasian Studies". Retrieved May 20, 2020, from: http://greater-europe.org/archives/3808

Lansford, T. (2019). *Evolution and Devolution: The Dynamics of Sovereignty and Security in Post-Cold War Europe*. Routledge.

Lewis, B. (2010). *Faith and power: Religion and politics in the Middle East*. Oxford University Press.

Liman, K. (2020). *Savunma Sanayiinin Türk Kamu Yönetiminde Özgün Gelişim Sürecine Bir Örnek: ATAK Projesi [An Example for the Unique Development Process of Turkish Public Administration in the Defence Industry: ATAK Project]* (Thesis Number: 613086) [Master's Thesis, Atılım University]. YÖK Ulusal Tez Merkezi.

Lofland, J. (1971). *Analyzing Social Settings: A Guide to Qualitative Observation and Analysis*. Belmont, CA: Wadsworth.

Loosveldt, G., & Beullens, K. (2013, June). 'How long will it take?' An analysis of interview length in the fifth round of the European Social Survey. In *Survey Research Methods (Vol. 7), No. 2*, 69-78.

Lopez, C. T. (2020, May 5). *DoD News: DoD Focuses on Sustaining Industrial Base Through Pandemic*. Retrieved June 7, 2020, from: https://www.defense.gov/Explore/News/Article/Article/2177093/dod-focuses-on-sustaining-industrial-base-through-pandemic/#:~:text=That%20memorandum%20defines%20the%20defense,to%20meet%20U.S.%20military%20requirements.

Lorell, M., Lowell, J. Kennedy, M. & Levaux, H. (2000). *Cheaper, faster, better? Commercial approaches to weapons acquisition* (No. RAND/MR-1147-AF). Santa Monica, CA: RAND Corp.

Louth, J., & Taylor, T. (2018). *British Defence in the 21st Century*. Routledge.

Lundvall, B. (2016). Chapter 22: Post script: Why do we need a broad understanding of innovation and of the innovation system?. In Erdil, E., Pamukçu, M. T., Akçomak, İ. S., & Tiryakioğlu, M. (Eds.), *Bilim, Teknoloji ve Yenilik: Kavramlar, Kuramlar ve Politika.* İstanbul: İstanbul Bilgi Üniversitesi Yayınları.

Massachusetts Institute of Technology (MIT), Professional Education. (n.d.). *Professional Certificate Program in Innovation & Technology*. Retrieved June 25, 2020, from: https://professional.mit.edu/programs/certificate-programs/professional-certificate-program-innovation-technology

Mazzucato, M. (2013). *The Entrepreneurial State: debunking private vs. public sector myths*. Anthem Press (1st Ed.).

McCormick, R., Hunter, A. P., Cohen, S., & Sanders, G. (2019). *Acquisition Trends, 2018: Defense Contract Spending Bounces Back*. (CSIS Briefs). Center for Strategic & International Studies. Retrieved May 26, 2020, from: https://csis-website-prod.s3.amazonaws.com/s3fs-public/publication/180913 _Aquisition Trends2018.pdf?E_Nbq8LdAx.lkrenHpD0ZzIZ3Pl9B4U5

METU Continuing Education Center (METUCEC). (n.d.). *Technological Innovation Management Program*. Retrieved June 6, 2020, from: https://sem.metu.edu.tr/egitim/ teknolojik-inovasyon-yonetimi.html

Midmore, P., Munday, M., & Roberts, A. (2006). Assessing industry linkages using regional input–output tables. *Regional Studies, 40(03),* 329-343.

Miles, M.B. & Huberman, A.M. (1994). *Qualitative data analysis: An expanded source book*, 2nd Ed. London: Sage Publications.

Military Industrial Complex. (n.d.). *What is Military-Industrial Complex?*. Retrieved May 15, 2020, from: https://www.militaryindustrialcomplex.com/what-is-the-military-industrial-complex.asp

Ministry of Defence. (2020, April 30). *5201 Sayılı Kanun Gereğince Kontrole Tâbi Tutulacak Harp Araç Ve Gereçleri İle Silah, Mühimmat Ve Bunlara Ait Yedek Parçalar, Askerî Patlayıcı Maddeler, Bunlara Ait Teknolojilere İlişkin Liste (2020 Yılı Kontrole Tabi Malzeme Listesi)* [Communique concerning the List

of 2020 for Controlled Goods under Law No. 5201]. Retrieved July 21, 2020, from: https://www.resmigazete.gov.tr/eskiler/2020/04/20200430-5.htm

Ministry of Foreign Affairs. (n.d.). *Arms Control and Disarmament*. Retrieved uly 13, 2020, from: http://www.mfa.gov.tr/arms-control-and-disarmament.en.mfa

Ministry of Trade. (2018, August 29). *Çift Kullanımlı ve Hassas Maddelerin İhracatının Kontrolüne İlişkin Tebliğ (İhracat: 2003/12)* [Communiqué concerning the Control of the Export of Dual Use and Sensitive Goods]. Retrieved July 11, 2020, from: https://www.ticaret.gov.tr/ihracat/mevzuat/ihracat-rejimi/cift-kullanimli-ve-hassas-maddelerin-ihracatinin-kontrolune-iliskin-teblig-ihrac

Mohajan, H. K. (2018). Qualitative research methodology in social sciences and related subjects. *Journal of Economic Development, Environment and People, 7(1),* 23-48.

Morse, J. 1994. Designing funded qualitative research. In *Handbook for qualitative research*, ed. N. Denzin and Y. Lincoln, 220–35. Thousand Oaks, CA: Sage.

Nester, W. R. (1997). Weapons and Spaceships: The Military-Industrial Complex. In *American Industrial Policy*, 134-192. Palgrave Macmillan, London.

NTV. (2020, June 29). *Türkiye'nin ilk yerli elektrikli treni raylarda [Turkey's first electric train is put on the rails]*. NTV (News). https://www.ntv.com.tr/turkiye/turkiyenin-ilk-yerli-elektrikli-treni-raylarda-ilk-surusu-cumhurbaskani-erdogan-yapacak,gi7HQ4dlE0-hvH93DVfu4A

Organisation for Joint Armament Cooperation (OCCAR). (n.d.) *General Information: A400M – A Tactical and Strategical Airlifter*. Retrieved July 9, 2020, from: http://www.occar.int/programmes/a400m

Özlü, H. (2006). *İkinci Dünya Savaşından günümüze Türkiye' de savunma sanayinin gelişimi (1939-1990) [The Development of Turkish defense industry from World War 2 to present (1939-1990)]* (Thesis Number: 188611) [Doctoral dissertation, Dokuz Eylül University]. YÖK Ulusal Tez Merkezi.

Project on Government Oversight (POGO). (n.d.). *Pentagon Revolving Door Database*. Retrieved June 24, 2020, from: https://www.pogo.org/database/pentagon-revolving-door

Pinto, A. G. C. R. (2017). A Neo-liberal Exception? The Defence Industry 'Turkification' Project. *Development Policy*, 299-331.

Pittaway, L., Robertson, M., Munir, K., Denyer, D., & Neely, A. (2004). Networking and innovation: a systematic review of the evidence. *International journal of management reviews, 5(3-4),* 137-168.

Presidency of the Republic of Turkey, Presidency of Defence Industries. (2017, November). *Endüstriyel Yetkinlik Değerlendirme ve Destekleme Programı (EYDEP) Tanıtım Sunumu* [Intro presentation of EYDEP (industrial competence evaluation and supporting program)] Ankara: T.C. Cumhurbaşkanlığı Savunma Sanayii Başkanlığı.

Presidency of the Republic of Turkey, Presidency of Defence Industries. (2019a, December 5). *Haber: Savunmada Hedef Daha Fazla Yerlilik ve İhracat* [More Indigenousness and Export on Defence Industry] Ankara: T.C. Cumhurbaşkanlığı Savunma Sanayii Başkanlığı. https://www.ssb.gov.tr/Website/contentList.aspx?PageID=2278&LangID=1

Presidency of the Republic of Turkey, Presidency of Defence Industries. (2019b, April 2). *2018-2022 Savunma Sanayii Sektörel Strateji Dokümanı* [Defence Industry Sectoral Strategy Document (2018-2022)] Ankara: T.C. Cumhurbaşkanlığı Savunma Sanayii Başkanlığı. https://www.ssb.gov.tr/Images/Uploads/MyContents/F_20190402102925477924.pdf

Presidency of the Republic of Turkey, Presidency of Defence Industries. (2019c, December 4). *2019-2023 Stratejik Plan* [Strategic Plan (2019-2023)] Ankara: T.C. Cumhurbaşkanlığı Savunma Sanayii Başkanlığı. https://www.ssb.gov.tr/Images/Uploads/MyContents/V_20191204150841743368.pdf

Republic of Turkey, Ministry of Development. (2018a). *On Birinci Kalkınma Planı (2019-2023) Hava Araçları Üretimi ve Bakım Onarımı Çalışma Grubu Raporu* [Eleventh Development Plan (2019-2023), Report of the Study Group

on Aircraft Manufacturing, Maintenance and Repair Industry]. Ankara: T.C. Kalkınma Bakanlığı (Issue: KB: 3038 - ÖİK: 819).

Republic of Turkey, Ministry of Development. (2018b). *On Birinci Kalkınma Planı (2019-2023) Makine Çalışma Grubu Raporu* [Eleventh Development Plan (2019-2023), Report of the Study Group on Machinery Industry]. Ankara: T.C. Kalkınma Bakanlığı (Issue: KB: 2993 - ÖİK: 775).

Republic of Turkey, Ministry of Development. (2018c). *On Birinci Kalkınma Planı (2019-2023) Otomotiv Sanayii Çalışma Grubu Raporu* [Eleventh Development Plan (2019-2023), Report of the Study Group on Automotive Industry]. Ankara: T.C. Kalkınma Bakanlığı (Issue: KB: 3008 - ÖİK: 789).

Republic of Turkey, Ministry of Development. (2018d). *On Birinci Kalkınma Planı (2019-2023) İmalat Sanayii Politikaları Özel İhtisas Komisyonu Raporu* [Eleventh Development Plan (2019-2023), Report of the Commission of Experts on Manufacturing Industry Policies]. Ankara: T.C. Kalkınma Bakanlığı (Issue: KB: 3031 - ÖİK: 813).

Rhodes, C., Hutton, G., & Ward, M. (2020, June 17). *R&D spending in the UK*. House of Commons Library (Commons Research Briefing SN04223). Retrieved June 4, 2020, from: https://commonslibrary.parliament.uk/research-briefings/sn04223/

Roess, R. P., & Sansone, G. (2012). *The Wheels That Drove New York: A History of the New York City Transit System* (Vol. 1). Springer Science & Business Media.

Roland, A. (2007). *The military-industrial complex: Lobby and trope. The Long War: A New History of US National Security Policy Since World War II*. Ed. by Andrew J. Bacevich, 335-370.

Rothwell, R. (1984). Creating a Regional Innovation-Oriented Infrastructure: The Role of Public Procurement. *Annals of public and cooperative economics*, *55(2)*, 159-172.

Saldaña, J. (2015). *The coding manual for qualitative researchers*. Sage.

Sapolsky, H. M., & Gholz, E. (1999). The defense monopoly. *Regulation*, *22*, 39.

SaSaD. (2020a, April 24). *2019 Performans Raporu*. [2019 Performance Report]. Retrieved July 6, 2020, from: https://www.sasad.org.tr/savunma-ve-havacilik-sanayii-performans-raporu-2019/

SaSaD. (2020b, July 16). *Haber: İSO'nun 500 Büyük Sanayii Kuruluşu Listesi'ndeki 18 Üyemiz*. [News: Our 18 members in the list of ISO500]. Retrieved July 17, 2020, from: https://www.sasad.org.tr/isonun-500-buyuk-sanayii-kurulusu-listesindeki-18-uyemiz

Segell, G. (1997). *The Role of Military-industrial Relations in Civil-military Relations and Foreign Policy*. Glen Segell Publishers.

Six, P. Goodwin, N., Peck, E., & Freeman, T. (2006). *Managing Networks of 21st Century Organizations*. New York: Palgrave Macmillan.

Sommer, J. (2020, April 18). *How to Survive the Coronavirus Markets*. New York Times. Retrieved June 2, 2020, from: https://www.nytimes.com/2020/04/18/business/mutfund/stock-market-investing-tips-coronavirus.html

Stokstad, E. (2019, October 22). U.K. science minister says DARPA-like agency is in the works. *Science Mag*. Retrieved May 4, 2020, from: https://www.sciencemag.org/news/ 2019/10/uk-science-minister-says-darpa-agency-works

Strauss, A. L. (1987). *Qualitative analysis for social scientists*. Cambridge University Press. 55-81.

Şenol, T. (2007, May). Uluslararası Boyutuyla Savunma Sanayi Stratejilerine Bir Bakış. *Savunma Sanayi Gündemi*, *vol (1),* 34-39.

The Aerospace and Defence Industries Association of Europe (ASD). (n.d.-a). *About Industry*. Retrieved July 5, 2020, from: https://www.asd-europe.org/about-industry

The Aerospace and Defence Industries Association of Europe (ASD). (n.d.-b). *2019 Facts and Figures*. Retrieved July 8, 2020, from: https://www.asd-europe.org/sites/default/files/atoms/files/ASD%202019%20Facts%20and%20Figures.pdf

The Wassenaar Arrangement (Official website). (n.d.). *Figure: Overview*. Retrieved August 5, 2020, from: https://www.wassenaar.org/about-us/#overview

Tian, N., Kuimova, A., da Silva, D.L., Wezeman, P.D. & Wezeman, S.T. (2020, April). *Trends in World Military Expenditure 2019* (Fact Sheet). Stockholm: Stockholm International Peace Research Institute (SIPRI) Publications. Retrieved August 6, 2020, from: https://www.sipri.org/publications/2020/sipri-fact-sheets/trends-world-military-expenditure-2019

Topçu, M. K. (2010). Savunma Planlamasının Ekonomiye Etkileri ve Savunma Bütçeleri. *Savunma Bilimleri Dergisi*, *9(1),* 75-96.

Topçu, Mustafa Kemal. (2010, 1 May). Savunma Planlamasının Ekonomiye Etkileri ve Savunma Bütçeleri. *Savunma Bilimleri Dergisi*, *Vol (9)*, 75-96.

Turkish Atomic Energy Authority. (2007, December 7). *Nükleer ve Nükleer Çift Kullanımlı Eşyaların İhracatında İzne Esas Olacak Belgenin Verilmesine İlişkin Yönetmelik Kapsamına Giren Eşya Kalemlerini Belirten "Nükleer Transfer Uyarı Listesi" ve "Nükleer Çift Kullanımlı Eşya Listesi"ne İlişkin Tebliğ* [Communiqué concerning the List of Nuclear Dual Use Items Subject to Export Permission]. TAEK/NGD: 2007/1) Retrieved June 8, 2020, from: https://www.resmigazete.gov.tr/eskiler/2007/12/20071207-9.htm

U.S. Department of Commerce, Bureau of Industry and Security. (n.d.). *Turkey Export Control Information*. Retrieved June 8, 2020, from: https://www.bis.doc.gov/index.php/all-articles/220-eco-country-pages/1148-turkey-export-control-information

UK Department for International Trade. (2019, December 31). *UK Strategic Export Control Lists*. Retrieved September 3, 2020, from: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/856510/UK_strategic_export_control_lists_20191231.pdf

UK Ministry Of Defence, Centre for Defence Enterprise. (2015, January 13). *Enduring challenge competition*. Figure is taken from a Disclosed Slide (Slide Number 17) and under copyright Defence Science and Technology Laboratory (2014). Retrieved July 19, 2020, from: https://www.slideshare.net/MOD_CDE/13-january-2015-enduring-challenge

United Nations (UN), Statistics Division. (2008). *International Standard Industrial Classification of All Economic Activities* (ISIC), Rev.4. New York. Retrieved June 1, 2020, from: https://unstats.un.org/unsd/publication/seriesM/seriesm_4rev4e.pdf

University of Cambridge, Department of Materials Science & Metallurgy. (n.d.). *Types of industrial interactions*. Retrieved August 13, 2020, from: https://www.msm.cam.ac.uk/research/opportunities-industry/types-industrial-interactions

Van Nostrand, A. D. (2013). *Fundable knowledge: The marketing of defense technology*. Routledge.

Walia, R. (2015). A Saga of Qualitative Research. *Social Crimonol*, *5(2),* 124.

Walker, G. B., Bella, D. A., & Sprecher, S. J. (Eds.). (1992). *The Military-Industrial Complex: Eisenhower's warning three decades later, Vol (32)*, Peter Lang Pub Incorporated.

White House (Official Website). (2020, April 2). *Memorandum on Order Under the Defense Production Act Regarding 3M Company*. https://www.whitehouse.gov/presidential-actions/memorandum-order-defense-production-act-regarding-3m-company/

White House (Official Website). (n.d.). *Presidents: 34, Dwight D. Eisenhower*. https://www.whitehouse.gov/about-the-white-house/presidents/dwight-d-eisenhower/

Wiśniewski, R. (2012). Defence Industry in the European Union–Challenges and Opportunities in Times of Economic Crisis. *Przegląd Strategiczny*, *2(2)*, 95-113.

World Bank. (n.d.). *Military expenditure (% of GDP) - Turkey* [Data under license of Stockholm International Peace Research Institute (SIPRI), Yearbook: Armaments, Disarmament and International Security]. Retrieved June 14, 2020, from: https://data.worldbank.org/indicator/MS.MIL.XPND.GD.ZS?end=2018&locations=TR&start=1960&view=chart

Yazan, A.M. (2004). *Military Innovation: Critical and Dual Use Technologies* (Thesis Number: 147780) [Master's thesis, Middle East Technical University]. YÖK Ulusal Tez Merkezi.

Zoltan, C., Hernández, H., Tübke, A., Sara, A. & Petros, G. (2019, December 12). *The 2019 EU industrial R&D investment scoreboard*. EU R&D Scoreboard Report. Joint Research Centre (European Commission). doi: 10.2760/045

APPENDICES

A. APPROVAL OF THE METU HUMAN SUBJECTS ETHICS COMMITTEE

UYGULAMALI ETİK ARAŞTIRMA MERKEZİ
APPLIED ETHICS RESEARCH CENTER

ORTA DOĞU TEKNİK ÜNİVERSİTESİ
MIDDLE EAST TECHNICAL UNIVERSITY

DUMLUPINAR BULVARI 06800
ÇANKAYA ANKARA/TURKEY
T: +90 312 210 22 91
F: +90 312 210 79 59
www.uaem.metu.edu.tr

Sayı: 28620816 /087

20 Şubat 2020

Konu: Değerlendirme Sonucu

Gönderen: ODTÜ İnsan Araştırmaları Etik Kurulu (İAEK)

İlgi: İnsan Araştırmaları Etik Kurulu Başvurusu

Sayın Prof.Dr.Erkan ERDİL

Danışmanlığını yaptığınız **F.Emre ERDOĞAN'ın** **"Savunma Sanayinin Sivil Sanayilerle İlişkisinin Analizi"** başlıklı araştırması İnsan Araştırmaları Etik Kurulu tarafından uygun görülmüş ve **087-ODTU-2020** protokol numarası ile onaylanmıştır.

Saygılarımızla bilgilerinize sunarız.

Prof.Dr. Mine MISIRLISOY
Başkan

Prof. Dr. Tolga CAN
Üye

Doç.Dr. Pınar KAYGAN
Üye

Dr. Öğr. Üyesi Ali Emre TURGUT
Üye

Dr. Öğr. Üyesi Şerife SEVİNÇ
Üye

Dr. Öğr. Üyesi Müge GÜNDÜZ
Üye

Dr. Öğr. Üyesi Süreyya Özcan KABASAKAL
Üye

B. TEXT FOR INVITATION TO PARTICIPATION TO THE RESEARCH

February 2020

INFORMED CONSENT FORM FOR RESEARCH PARTICIPANT

This research is conducted by F. Emre ERDOĞAN, an M.S. student in Science and Technology Policy Studies at the Graduate School of Social Sciences of Middle East Technical University, as a part of a thesis under the advisory of Prof. Dr. Erkan ERDİL. This form is prepared to make you informed about the research.

What is the purpose of this research?

The main purpose of this research is to analyse defence industry's relations with and effects on civil industries.

How do we need your help?

If you agree to participate in the research, you are expected to attend a semi-structured interview. In this interview, which is expected to last between 45 minutes and one hour, you will be asked a series of open and closed-ended questions and some additional questions will be asked based on your answers to these questions. Voice recording will be taken during the interview to facilitate transcription of your answers in the content analysis phase after the interview and to shorten the interview time.

How will we use the information we collect from you?

Your participation in research must be entirely voluntary. No identity or institution-determining information is requested from you in the study. Your answers will be kept strictly confidential and will only be evaluated by the researcher. The information obtained from the participants will be collectively evaluated, analysed and used in the aforementioned master thesis and related scientific publications that can be made later.

What you need to know about your participation:

The interview generally does not contain questions or practices that would cause personal discomfort. However, if you feel uncomfortable due to questions or any other reason during participation, you are free to stop the interview and leave. In such a case, it will be sufficient to tell the practitioner that you want to quit.

If you want to get more information about the research:

At the end of the interview, your questions about this study will be answered, your answers will be summarized and possible misunderstandings will be corrected. Thank you in advance for participating in this study. For more information about the study, you can communicate with Prof. Dr. Erkan ERDİL (E-mail: erdil@metu.edu.tr) from Department of Economics, METU or F. Emre ERDOĞAN (E-mail: emre.erdogan@metu.edu.tr).

I have read the above information and fully voluntarily agree with this study.

(After completing and signing the form, return it to the practitioner).

Name Surname Date Signature

... / ... / .....

I attended the interview by phone/video call. ☐

C. INTERVIEW QUESTIONS (SEQUENTIAL DESIGN)

Part A. Opening

A.1: At the beginning, may I want you to define defence and civil industries in short?

A.2: Do you believe defence industry can be distinguished from civil industries with its characteristics?

A.2.1: If yes, can you identify what are the distinctive aspects of defence industry?

A.2.2: If no, can you explain what makes you believe so?

A.3: Do you think the characteristics of defence industry complicate its relations with civil industries?

A.3.1: If yes, what kind of hardness defence industry has over its relation mechanisms with other industries?

A.4: If you think for a moment, which industries seem mostly related with defence industry?

Part B. Body

B.1: To you, how different industries relate with each other? May I get your opinion about inter-industry relations?

B.2: What types of relation sounds more logical to you, if we consider inter-industry relations: interaction, intersection, integration, interdependence?

B.2.1: Are these descriptions distinguishable to you?

(If the answer is no, these descriptions will be defined in short to the interviewee.)

B.2.2: What kind of interaction benefits more to industries?

B.2.3: Do you believe there should be interdependence in modern industry relations?

B.2.4: Is there a necessity for integration between industries?

B.3: Within your perspective to these descriptions, to what extent of interaction/ intersection/ integration/ interdependence (unilateral or dual) have been achieved between defence industry with civil industries in global context, as far as you witness?

B.3.1: What can you say if I ask the same question for Turkey?

B.3.2: What you think about achievements on collaboration of defence and civil industries in Turkey?

B.3.2.1: Would you exemplify your opinion with specific cases?

B.3.2.2: What kind of suggestions can you make to enhance these relations?

B.4. Are you familiar with the dual-use technologies?

B.4.1: If yes, which instances come to your mind at first on this term?

(If no, the term will be explained shortly: dual-use technologies are the ones that have applications in use for both civil and defence industries.)

B.4.1.1: Do you give credence to dual-use technologies for its more extensive usage in industries in near future?

B.4.2: Do you think dual-use technologies constitute a correct model/tool for collaboration/relations between defence and civil industries?

B.5: What do you think about effects of boosting defence industry on other (civil) industries?

B.5.1: What are those identifiable positive and negative effects, if you give some detail?

B.5.2: Do you support the idea of "boosting defence industry has a leverage impact on other industries in a developing country" or not?

B.6: Considering today, do you think civil technologies mostly outride defence technologies or vice versa?

Part C. Closing

C.1: Considering historical cases and today, can you exemplify any global or local good practice you remember as a coherent and beneficial inter-industry collaboration?

C.2: If you were in a position of a higher bureaucrat or a policymaker, what would be your policy suggestions for more effective collaboration mechanisms between defence and civil industries?

C.2.1: In addition, what would you update for a more powerful infrastructure/base of defence industry and related civil industries?

C:3: If you were an executive of a large company that works within civil industry and be able to produce dual-use products, would you consider to go into defence industry? Why?

C.4: Do you have any last words for this interview?

D. TURKISH SUMMARY/TÜRKÇE ÖZET

SAVUNMA SANAYİİNİN SİVİL SANAYİLERLE İLİŞKİSİNİN ANALİZİ: TÜRKİYE İÇİN POLİTİKA ÖNERİLERİ

Bölüm 1: Giriş

Barışı sürdürmek, tüm uluslar için en ciddi ve zorlu konuların başında gelmektedir. Barışın ancak ciddi ölçüde caydırıcı güçlerle sağlanabileceği konusunda küresel bir fikir birliği öteden beri mevcuttur. Tam da bu sebeple, kendi çıkarlarını ve vatandaşlarını korumak için iyi organize edilmiş ve gelişmiş bir ulusal savunma sistemine sahip olmaları devletler açısından zaruri bir enstrümandır. Silahlı kuvvetler ve güvenlik güçlerinin yanı sıra, savunma sanayii de ulusal savunmanın ayrılmaz bir parçasıdır. Ülkeler, genellikle iç ve dış politikalarının merkezine koydukları savunma sanayiinin gelişimi için büyük bir çaba içerisine girmektedirler. Son yıllarda gündeminde daha güçlü, "yerli ve milli" bir savunma sanayii olan ülkelerden birisi de Türkiye'dir. Aşırı devlet desteğiyle sektörün önemli aşamaları geçtiği ancak şimdilerde daha ciddi sınamalarla karşı karşıya kaldığı bir gerçektir. Bazı spesifik savunma sistemlerinde tekel durumunda olan Batılı ülkelerce uygulanan ambargo benzeri sınırlamalar bu duruma örnek teşkil etmektedir. Bu gibi durumlar, Türkiye'yi savunma sanayiine daha fazla bütçe ayırmaya ve ülke çapındaki savunma sanayii altyapısını geliştirmeye teşvik etmektedir.

Savunma sanayii, birbirleriyle ticari faaliyetler, yatırımlar, destekler ve bilgi transferi gibi geniş bir yelpazede ilişkileri bulunan kamu ve özel sektörden birçok paydaşın dahil olduğu, gelişmekte olan bir yapıdır. Savunma sanayii, en ileri ve özgün buluşları teşvik ederek ve öğrenme süreçlerini hızlandırarak ülkelerin özümseme kapasitesinin (absorptive capacity) gelişimine katkıda bulunmaktadır. Ülkelerin, savunma sanayiinde kullanılan en son teknolojilere sahip olmak suretiyle üstünlük elde etmeye

çalıştığı genel kabul gören bir husustur. Bunda savunma sanayiinin on yıllardır teknolojik gelişmelere öncülük etmesi ve sivil sanayilerin de bu gelişmelerden faydalanmasının rolü vardır. Günümüzde ise savunma ve sivil sanayiler arasındaki teknoloji yayınımının (technological diffusion) tek yönlü olmadığı ve sivil sanayilerin bilgi üretimindeki paylarını arttırdığı söylenebilir. Bu sebeple, daha da önem kazanan çift kullanım (dual-use) uygulamaları ile en son teknolojilerin ticarileştirilmesi ve diğer sektörlerde kullanımı savunma ve sivil sanayilerin ortak çıkarınadır. Savunma sanayii açısından büyümeyi sürdürülebilir kılmak için sivil sanayilerle ilişkilerin güçlendirmesi gerekmektedir. Ülkelerin artan savunma bütçeleri ve savunma harcamaları da bu ilişkilerin rasyonel, sağlam ve sürdürülebilir olmasını zaruri hale getirmektedir. Savunmaya ayrılan bu bütçelerin daha efektif kullanılması ve ekonomiye geri kazandırılması savunma sanayiinin yurtiçindeki gelişimi ile daha olasıdır. Bu doğrultuda, ülkeler için savunma sanayii altyapısının etkili, sağlam ve sürdürülebilir gelişimi oldukça önemlidir. Sanayileşmeye etkisi açısından savunma sanayiinin diğer sanayilerle ilişkilerinin analizi bu tezin vargıları ve politika önerilerinin önünü açmıştır. Savunma ve sivil sanayiler arasındaki yapısal farklılıkların tanımlanmasıyla daha doğru bir etkileşim analizinin yapılabilmesi mümkün olmuştur.

Savunma sanayii kendine has özelliklerinin yanı sıra, sivil sektörden makine imalat, metal, kimya, otomotiv, havacılık, gemi inşa gibi birçok sanayi dalı ile yakın ilişkilere sahiptir. Savunma sanayii ile sivil sanayiler arasındaki bu ilişkinin kesişim alanları, etkileşim seviyesi ve savunma sanayiinin diğer sanayilere etkileri açısından incelenmesi gerekmektedir. İlaveten, sanayiler arasındaki tek veya çift yönlü bağımlılık durumları belirlenmeli ve ilişkilerdeki iyi uygulama örnekleri ortaya çıkarılmalıdır.

Literatürden ve mülakatlardan toplanan verileri kullanan bu çalışma, Türkiye'de gittikçe önem kazanan savunma sanayii açısından sanayiler arası politika yapımına katkıda bulunarak Bilim ve Teknoloji Çalışmaları literatüründeki önemli bir boşluğu doldurmayı hedeflenmiştir. Tezin üç temel noktaya ışık tutması beklenmektedir. Aynı zamanda araştırma soruları olarak belirlenen üç husus; savunma ve sivil sanayiler arasındaki ilişkilerin mevcut durumunun belirlenmesi, savunma sanayiinin diğer

sanayiler üzerindeki olumlu ve olumsuz etkilerinin belirlenmesi ve sanayiler arası iş birliğine dair iyi uygulama örneklerinin ön plana çıkarılmasıdır. Bu araştırmanın sonuçları bize sanayiler arasında ilişki mekanizmaları ve Türkiye'nin savunma sanayii altyapısı için yeni önerilerde bulunma imkanı tanıyacaktır. Bu çalışma, savunma sanayii ve sivil sanayilerin ilişkisi alanında yeni bir kaynak olmanın yanı sıra Bilim ve Teknoloji Çalışmaları literatürüne ve Türkiye'deki politika yapıcılara şu üç hususta katkı sağlayacaktır:

- Endüstriler arası ilişkileri sınıflandırmak amacıyla "etkileşim, kesişim, entegrasyon ve bağımlılık" olarak dört yeni ilişki türünün tanımlanması ve literatüre yeni bir bakış açısı getirilmesi,
- Türkiye'deki politika yapıcılar için savunma ve sivil sanayiler arasındaki ilişkinin güçlendirilmesine yönelik somut analizlere ve iyi uygulama örneklerine dayanan en güncel politika önerilerini içermesi,
- Savunma sanayiine ağırlık vermenin diğer sanayiler üzerindeki etkilerinin hem literatür hem de mülakat verileri ele alınarak incelenmesi.

Bu çalışmanın metodolojisi kalitatif yaklaşıma dayanmaktadır. Tekrara düşmemek ve özgün bir katkı sunmak adına mevcut literatür geniş şekilde taranmış, bu aşamada endüstriler arası ilişkilere yönelik yeni bir tarif gereği duyulduğundan yukarıda sıralanan dört yeni ilişki türü tanımlanmıştır. Bu yeni tanımlar, mülakat sürecinde uygunluklarını kanıtlamışlardır. Araştırma verileri, belirlenen üç hedef grupta Türkiye'deki akademisyenler ile kamu ve özel sektörde yönetici pozisyonundaki profesyoneller arasından kota örneklemesi metodu ile seçilen, alanında tecrübe sahibi yirmi bir kişiyle yapılan mülakatlarda toplanmıştır. Bu mülakatlarda toplanan tüm veriler, veri güdümlü kodlama metoduyla üç aşamada analiz edilmiştir. Bu süreçlerde literatürde altı çizilen hata kaynaklarından kaçınılmıştır.

Bölüm 2: Savunma ve Sivil Sanayiler: Tanımlar, Sınırlar ve Karakteristik Özellikler

Bu bölümde ilk olarak savunma sanayiine dair yapılan tanımlar ele alınmış, hangi sanayi kollarının savunma sanayiine dahil edildiği açıklanmıştır. Literatürde savunma sanayii için yapılmış birçok tanımlama bulunmaktadır. Bu tez kapsamında, savunma sanayii "bir ülkenin savunma ve güvenlik ihtiyaçlarını karşılamak üzere faaliyette (tasarım, geliştirme, üretim, vb.) bulunan kamu ve özel sektör organizasyonlarının tümü" şeklinde tanımlanmıştır. Öte yandan, uluslararası birçok danışmanlık ve kredi derecelendirme kuruluşunun görüşüne göre havacılık sektörü savunma sektörü ile aynı başlık altında birlikte ele alınmaktadır. Literatürdeki diğer birçok çalışmada tercih edildiği gibi, bu tez kapsamında da savunma sanayii dışında kalan sanayiler "sivil sanayiler" olarak kategorize edilmiştir.

Konumuzun kapsadığı alanın çizgilerini netleştirmek adına, savunma sanayiinin kapsamı ve sınırları ile savunma sanayii aktivitelerinin çeşitli uluslararası sanayi sınıflandırmalarına göre konumu ele alınmıştır. Örneğin, Avrupa tarafından kullanılan NACE sınıflandırmasına göre 20.51, 25.40, 26.51, 26.70, 30.11, 30.30, 30.40 ve 84.22 kodlu aktivitelerin savunma sanayii ile ilgili olduğu belirlenmiştir. Benzer şekilde en çok kullanılan sanayi sınıflandırma sistemlerinden NAICS'e (ve ISIC'e) göre de savunma sanayii ilgili aktiviteleri Tablo 2'de listelenmiştir.

Bu alandaki pek çok tartışma savunma sanayiinin kendine özgü karakteristiklerini de ilgilendirdiğinden bu karakteristikler tartışılmış ve belirli alt başlıklarda sınıflandırılmıştır. Bu başlıklar; standartlar ve regülasyonlar, gizlilik hususları, sözleşmeler ve yaptırımlar, piyasa dinamikleri ve devlet destekleri olarak beş ana başlık altında toplanmış ve detaylıca ifade edilmiştir.

Savunma sanayiinin diğerlerinden ayrık bir sanayi dalı olmadığı görüşüyle, savunma sanayii ile en çok ilişkisi bulunan sivil sanayiler literatür ve günümüz örnekleri üzerinden tarif edilmeye çalışılmıştır. Ülkeden ülkeye sıralamaları değişmekle birlikte, otomotiv, havacılık ve uzay, elektronik ve haberleşme sanayilerinin savunma sanayii ile en çok ilişkisi olan alanlar olduğu görüşü literatürde hakimdir.

Bölüm 3: Savunma Sanayii Açısından Sanayiler Arası İlişkilerin Analizi

Savunma sanayiinin kendine has özelliklerine rağmen diğer sanayiler ile güçlü ilişkileri olduğu, bu sebeple savunma ve sivil sanayiler arasındaki kesişim alanları ve yoğunluklarının belirlenmesi gerektiği ifade edilmişti. Sanayiler arasındaki ilişki türü ve seviyelerini belirlemek üzere tariflenen dört yeni tanım -etkileşim, kesişim, entegrasyon ve bağımlılık olarak- bu bölümde detaylarıyla açıklanmıştır. Yine sanayiler arası ilişkilerin yoğunluğunun da tanımlanan ilişki türleri arasındaki sıralamayla paralel şekilde arttığı görülmektedir.

Türkiye açısından, savunma sanayiinin ilişkileri kurulduğundan bu yana SSB tarafından izlenmektedir. Özellikle son zamanlarda sektörel yönlendirme artmış, EYDEP (Endüstriyel Yetkinlik Değerlendirme Programı) ve YETEN (Yetenek Envanteri) gibi programlarla sivil alandaki KOBİ'lerin savunma ekosistemindeki varlıklarının güçlendirilmesi hedeflenmiştir.

Çift kullanım uygulamaları önceden bu derece popüler olmasa da, yakın geçmişte teknoloji ve ürün seviyesinde birçok önemli örneği bulunmaktadır. Çift kullanım konseptinin destekçileri günden güne artmakta olup, savunma sanayiinin elverişsiz niteliklerine çözüm üretme fonksiyonu birçok kişi tarafından kabul görmektedir. Kısaca, savunma teknolojileri maliyet etkinliğini arttırdıkça çift kullanım teknoloji örnekleriyle sivil alanda daha sık karşılaşılması beklenmektedir.

Günümüzde savunma ve sivil sanayiler arasındaki teknoloji yayınımının (technological diffusion) tek yönlü olmadığı ve sivil sanayilerin bilgi üretimindeki paylarını arttırdığı söylenebilir. Bu sebeple, daha da önem kazanan çift kullanım (dual-use) uygulamaları ile en son teknolojilerin ticarileştirilmesi ve diğer sektörlerde kullanımı savunma ve sivil sanayilerin ortak çıkarınadır.

Bölüm 4: Savunma Sanayiini Güçlendirmenin Diğer Sanayiler Üzerinde Etkileri

Savunma ve sanayi ortamının değişmekte olduğu ve ülkelerin bu değişime ayak uydurmasının hayati önemde olduğu bilinmektedir. Bu sebeple, savunma sanayiinin sivil alandaki teknolojik, ekonomik ve endüstriyel gelişmelere etkisinin

değerlendirilmesi ve ilgili otoritelerce doğru mekanizmalarla yönetilmesi elzemdir. Günümüzde, iyi planlama kapasitesi ve önemli ölçüde teknolojik, ekonomik ve endüstriyel üretim kabiliyetlerini haiz gelişmiş ülkelerin savunma sanayiinde geldikleri nokta itibariyle de diğer ülkelerin önünde oldukları görülmektedir. Savunma harcamaları GSYİH içinde nispeten düşük bir paya sahip olsa da, ülkelerin politik pozisyonu ve stratejik gücüne olan nispi etkisinin çok daha fazla olduğu söylenebilir.

Savunma sanayiinin diğer sanayiler üzerindeki etkisi açısından iki zıt görüş literatürü domine etmektedir. İlk görüşe göre, savunma sanayii ulusal ekonomiyi beslemekte ve endüstriyel gelişimi tetiklemektedir ve bu yönüyle sivil sanayiler üzerinde olumlu etkiye sahiptir. Öte yandan zıt görüşe göre savunma sanayi ülkelerin yüksek teknolojili Ar-Ge faaliyetlerine ayrılan fonlar ve kalifiye insan kaynağı gibi kaynakları tükettiğinden sivil sanayilere fayda sağlamamaktadır.

Savunma sanayii, en ileri ve özgün buluşları teşvik ederek ve öğrenme süreçlerini hızlandırarak ülkelerin özümseme kapasitesinin (absorptive capacity) gelişimine katkıda bulunmaktadır. Savunma sanayii, büyük ölçüde yüksek teknolojili ürünlerle ve büyük ve özgün altyapı yatırımlarıyla ilintili olduğundan bir ülkenin sadece ekonomik değil, teknolojik ve stratejik gücüyle ilişkilendirilebilir.

Birçok ülke savunma sanayii altyapısı açısından yüksek yerliliği hedefler. Tam da bu sebeple, teknolojik gelişimin yanı sıra ödemeler dengesi ve istihdam gibi makroekonomik politikalar, ve yerli üretim kapasitesi (yurt içi girdiler ve tedarik güvenliği) açısından savunma sanayiinde yurt içi tedarik oldukça önemlidir. Tedarik yöntemi, savunma ve sivil sanayilerin yurt içi gelişimi ve sanayileşme açısından büyük önemi haizdir. Savunma sanayii açısından kamu kurumları sadece savunma tedarikinden değil, yurt içindeki altyapının geliştirilmesinden de sorumludur. Yurt içi geliştirme ve Ar-Ge projeleri, savunma ve sivil alandaki yerli firmaların potansiyelini ortaya çıkarmaları bakımından en verimli tedarik yöntemleri olarak bilinir.

Bu bölümde, savunma sanayiinin öncelikli etki alanı olarak teknolojik çıktılar ve insan ve sermaye kaynakları incelenmiştir. Yanı sıra, Türkiye'nin savunma sanayiindeki tarihsel gelişimi özetlenmiştir. Zorlayıcı jeopolitik şartların tetiklemesi ve artık dış askeri yardım almaması sebebiyle Türkiye savunma harcamalarını arttırmak

durumundadır. Bu koşullar, hükümetin ulusal ekonomi ve sanayiler açısından potansiyel kazanımları ortaya çıkaracak şekilde savunma harcamalarının efektif yönetimi için farkındalığını arttırmıştır.

Teknolojik etkinin ve yeniliğin bir alandan diğerine yayılması savunma ve sivil sanayilerin ortak çıkarınadır. Bu bölümde, hem savunma hem sivil alanda hizmet gösteren firmalar ve çift kullanım uygulamaları gibi ikincil (spin-off) etkilere dair birçok işbirliği ve sektörel genişleme örneği yer almaktadır.

Bölüm 5: Metodoloji

Nitel yaklaşımı benimseyen bu tez çalışmasında araştırma başlangıcında belirlenen temel sorulardan birinin literatürde karşılığının zayıf olması araştırmanın seyrini değiştirmiş, yukarıda ifade edildiği gibi, duyulan ihtiyaç üzerine dört yeni tanımlama yapılmıştır. Sanayiler arası ilişki türlerine dair yapılan bu özgün tanımlar çalışmanın teorik çerçevesini çizmiş, sonraki aşamada yapılan mülakatlarda kabul edilebilir oldukları nitel şekilde kabul görmüştür.

Araştırma verileri, belirlenen üç hedef grupta 21 kişiyle yapılan yarı yapılandırılmış mülakatlarda toplanmıştır. Örnekleme metodu olarak seçilen kota örneklemesi metodu ve hedef grupların seçimi (Türkiye'de, alanında tecrübe sahibi akademisyenler ile kamu ve özel sektörde yönetici pozisyonundaki profesyoneller), iletişim metodu, mülakatlara dair kayıt alma ve diğer etik konular da dahil olmak üzere, araştırma metoduna dair yapılan tüm seçimler ve sebepleri bu bölümde detaylıca ifade edilmiştir. Veri analizi aşamasında, bu mülakatlarda toplanan tüm veriler, veri güdümlü kodlama metoduyla üç aşamada (ön kodlar, gruplanmış kodlar ve finalize edilmiş kodlar) analiz edilmiş ve sonraki bölümde sunulmuştur. Bu süreçlerde literatürde altı çizilen hata kaynaklarından kaçınılmıştır.

Bölüm 6: Veriler ve Bulgular

Bu bölümde mülakatlar aracılığıyla toplanan ve analiz edilen veriler yer almaktadır. Tablo 16'da toplu şekilde yer alan değişkenler A, B ve C olarak üç bölüme ayrılmış

olan mülakat sorularında aşağıdaki şekilde özetlenmiş ve üç aşamada analiz edilerek finalize edilmiş kodlarla birlikte Tablo 13, 14 ve 15'te sunulmuştur.

- A.1: Savunma ve sivil sanayilerin tanımlanması
- A.2: Savunma sanayii, karakteristik özellikleriyle ayrışır mı?
- A.3: Savunma sanayiinin karakteristik özellikleri
- A.4: Bu özellikler diğer sanayilerle ilişkileri zorlaştırır mı?
- A.5: İlişkileri zorlaştıran karakteristikler
- A.6: Savunma sanayii ile güçlü ilişkileri olan sanayiler
- B.1: Sanayiler arası ilişkiler
- B.2: Yeni ilişki tanımlarına dair görüşler
- B.3: Yeni tanımlar ayırt edilebilir mi?
- B.4: En faydalı ilişki türleri nelerdir?
- B.5: "Bağımlılık" tanımına dair görüşler
- B.6: "Entegrasyon" tanımına dair görüşler
- B.7: Küresel ölçekte sanayiler arası ilişkilerin durumu
- B.8: Türkiye'de sanayiler arası işbirliğinin güncel durumu
- B.9: Savunma ve sivil sanayilerin işbirliğine dair örnekler
- B.10: Türkiye'de savunma ve sivil sanayilerin ilişkilerine dair öneriler
- B.11: Çift kullanım terimine aşinalık
- B.12: En çok bilinen çift kullanım uygulamaları
- B.13: Çift kullanım uygulamalarının geleceği
- B.14: Sanayiler arası işbirliği modeli/aracı olarak çift kullanım
- B.15: Savunma sanayiinin sivil sanayiler üzerindeki etkileri

- B.16: Gelişmekte olan ülkelerde savunma sanayiinin kaldıraç rolü
- B.17: Günümüzde liderlik eden teknolojiler
- C.1: Savunma ve sivil sanayiler arasında işbirliğine dair iyi uygulama örnekleri
- C.2: Savunma ve sivil sanayiler arası ilişkilere dair politika önerileri
- C.3: Savunma sanayii (ve ilgili sivil sanayilerin) altyapısı için politika önerileri
- C.4: Savunma sanayiinde sektöre giriş kararı

Mülakatların detaylı analizi, bu çalışma sonuçlarının sanayiler arası ilişkilere dair küresel ölçekte ve Türkiye'ye özgü mevcut literatür verileri ile kıyaslanabilmesine imkan sağlamıştır. Son aşamada daha ölçekli önerilerde bulunabilmek adına ardışık sorularda mülakat yapılan kişilerin hem ulusal hem de küresel perspektifte görüşleri alınmıştır. Bu çalışma için tercih edilen araştırma yöntemiyle, mülakatlar ile veri toplama sürecinde yazarın nötr pozisyonu korunmuş, son bölüme kadar sonuçlara dair tahminler veya subjektif öneriler zikredilmemiştir. Bu çalışma özelinde hazırlanan ve uygulanan yarı yapılandırılmış mülakat verileri haricinde, konumuzla alakalı yayımlanmış ve yayımlanmamış birçok kaynak incelenmiş ve kullanılmıştır. Literatür çıktıları tek bir bölüm altında toplanmamış, konunun alakasına göre ilgili bölüm ve kısımlarda ele alınmıştır.

Bu bölümde araştırma sonuçları ile literatürdeki bulgular karşılaştırılmış ve tartışma sonuçları üç ana başlık altında toplanmıştır. İlk gruptakiler literatür araştırması ile uyumlu olan tez sonuçlarını, ikinci gruptakiler literatüre yeni yapılan katkıları ve üçüncü grup da literatürle örtüşmeyen sonuçları içermektedir. Yapılan analizlerde savunma sanayiinin aşağıdaki karakteristik özellikleri mevcut literatür ile örtüşmektedir:

- Hükümetlerin sınırlı şekilde tek müşteri oluşu
- Hükümetlerin yaptırım gücü yanında güçlü sektörel desteği
- Yüksek askeri standartlar/gereksinimler ve küresel ölçekte kabul görmüş düzenlemeler

- Zorlu giriş ve çıkış süreçleri olan kendine özgü piyasa yapısı
- Zorlayıcı gizlilik süreçleri ve bunların işbirliği ve pazarlama üstündeki etkileri

Bölüm 7: Sonuçlar ve Politika Önerileri

Günümüzün iç içe geçmiş ekonomik ve politik ortamında savunma ve sivil sanayiler arasındaki kontrastın yeni mekanizmalarla azaltılması mümkündür. Savunma ve/veya sivil sektörlere hizmet eden sanayilerin bu iki taraf arasındaki ilişkilerin gelişimi ile birçok yeni fırsat yakalayabileceği değerlendirilmektedir. Araştırma sonuçlarının literatür ile kıyası akabinde tezin bu son bölümünde nihai sonuçlar ve politika önerileri ele alınmıştır. Politika önerilerinin ülke özelinde yapılması ve diğer ülkelerin önceki tecrübelerinden faydalanılması esastır.

Tezin başında ifade edilen üç araştırma sorusu bizi aşağıda sırasıyla ifade edilen şu cevaplara yönlendirmiştir:

- Savunma sanayiinin ayırt edici karakteristikleri onun sivil sanayilerle ilişkilerini zorlaştırmaktadır. Savunma sanayi geniş bir çerçevede sivil sanayilerle ilişki halinde olmakla birlikte bu ilişkilerin seviyeleri alt sektörlere ve ülkelere göre değişiklik göstermektedir. Küresel ölçekte bu ilişkilerin çok güçlü olduğu söylenemez ve ilişkileri güçlendirmek aında atılabilecek adımlar mevcuttur.

  Türkiye açısından, bu ilişkiler bağlamında son zamanlarda ciddi bir ilerleme kaydedilmiştir, ancak daha geniş fırsatların önündeki psikolojik ve yapısal engellerin belirgin destekleme mekanizmaları ile kaldırılması gerekmektedir. Şaşırtıcı olmayan biçimde, karşılaşılan zorluklar ve silah (ve teknoloji) ambargoları potansiyel olarak sanayiler arasındaki ilişkileri ve işbirliğini arttıracaktır.

- Savunma sanayiinin diğer sanayiler üzerindeki olumlu etkilerinin altını çizmek adına, bu çalışma, savunma sanayii aktivitelerinin ve yüksek teknolojili ve iyi fonlanmış ortamının diğer ana sanayileri ve yan sanayileri beslediği görüşünü savunmaktadır. Savunma sanayiinde yerlilik konusunun önemine dair farkındalık

seviyesi diğer sanayilere göre daha fazladır ve bu durum savunma ve sivil sanayilere ölçülemeyecek bir fayda sağlamaktadır. Bunun yanı sıra, savunma sanayii, piyasa büyüklüğü açısından sivil sanayilere göre daha küçüktür ve GSYİH'ye oranla düşük miktarda olduğu değerlendirilen savunma harcamaları sebebiyle diğer sanayilere bir yük getirmemektedir.

Öte yandan, olumsuz etkilerinden bahisle, savunma sanayii çalışanların aldıkları ücretlerin yüksekliği ve güçlü devlet desteği, sivil sanayilerin rahatsızlık duydukları konuların başında gelmektedir. Devlet destekli firmalar veya kamu payına sahip vakıf şirketlerinin, kamu dışı satışları veya ihracatı arttırarak gelirlerini dengelemediği durumda, piyasada fırsat eşitliği ve rekabetçilik açısından savunma ve sivil sanayilere zarar verebileceği değerlendirilmektedir. Benzer şekilde, devlet fonları ve destek mekanizmalarının savunma özelinde değil, diğer sivil sanayileri de gözetecek şekilde dengeli ve hassas biçimde planlanması (veya planlandığının gösterilmesi) piyasa psikolojisi açısından önemlidir.

- Savunma ve sivil sanayilerin ilişkilerine ve işbirliğine dair iyi uygulama örnekleri 6. Bölüm'de; ürün-bazlı, proje-bazlı, teknoloji- bazlı, organizasyonel ve iki tarafa hizmet eden kurumlara dair örnekler olarak sınıflandırılmıştır. Sanayiler arası en faydalı ilişki türünün ne olduğu, kısa ve uzun vadeli olmasına veya finansal ve stratejik açıdan bakışa göre değişmektedir. Örneğin, sanayiler arası bağımlılığın uzun ölçekli işbirliklerinin faydasına olduğu; savunma ve sivil sanayilerin entegrasyonunun maliyet etkin çözümleri beraberinde getirdiği ve kümülatif kalkınmaya yardımcı olduğu değerlendirilmektedir.

  Çift kullanım teknoloji/ürün uygulamalarının savunma ve sivil sanayiler arasındaki ilişkilerin faydası için doğru bir model olduğuna inanılmaktadır. Bu uygulamaların maliyet etkinlik ve sivil teknolojilerin daha hızlı gelişmesi gibi sebeplerle ileride daha da artacağı öngörülmektedir. Sivil teknolojilerin, genel ölçüde ve sürpriz olmayan bir biçimde günümüz teknolojik gelişmelerine liderlik ettiği kabul edilmektedir.

  Son olarak, gelişmekte olan ülkelerin, inovasyon için kamu alımı yöntemini hayata geçirmeleri ve yurt içi üretim olanaklarını harekete geçirme öncelikli ve stratejik

bir savunma tedarik planı yapmalarının, bu ülkelerde ekonomik ve teknolojik başarıyı tetikleyeceği düşünülmektedir. Bununla birlikte, savunma projeleri açısından potansiyel ortak üretim ve ortak geliştirme olanaklarının bilgi yayınımı ve teknolojik öğrenme açısından bir fırsat olarak görülmesi önem arz etmektedir.

Türkiye özelinde yapılan politika önerileri iki ayrı başlıkta toplanmıştır. İlk başlıkta savunma ve sivil sanayiler arasında ilişki mekanizmaları geliştirmek üzere beş öneri, ikinci başlıkta ise savunma sanayii altyapısını geliştirmek ve öğrenme kapasitesini arttırmak üzere yedi öneri bulunmaktadır.

Savunma ve sivil sanayiler arasında ilişki mekanizmaları geliştirmek üzere sunulan beş öneri aşağıdaki tabloda (Tablo 17'nin Türkçe çevirisi) listelenmiştir:

Tablo D.1: Sanayiler Arası İlişki Mekanizmaları Geliştirilmesine Dair Politika Önerilerinin Özeti

#	POLİTİKA SEVİYESİ	POLİTİKA HEDEFİ	POLİTİKA ÖNERİSİ	POLİTİKA ARACI
R.1	Mikro	Savunma ve sanayi politikalarını henüz erken planlama aşamasında senkronize edebilmek amacıyla	Yetkilendirilmiş tek bir otorite tarafından kamu kurumlarının oluşturduğu politikaların kesişim alanları denetlenerek politika düzensizlikleri önlemelidir	Bir devlet organı bu vazife için görevlendirilebilir (veya yeni bir devlet organı oluşturulabilir)
R.2	Mezo	Teknik ve idari kadroların tecrübelerini arttırmak ve endüstriler arası ortak bir anlayış geliştirmek amacıyla	Personel rotasyonuna imkan veren resmi kanallar oluşturmak sanayiler arası işbirliği ve karşılıklı anlayış geliştirilmelidir	Belirlenmiş sürelerle savunma ve sivil sanayiler (ve özel ve kamu sektörleri) arasında personel rotasyonu sağlamaya imkan veren yeni istihdam kanunları oluşturulabilir

Tablo D.1: Sanayiler Arası İlişki Mekanizmaları Geliştirilmesine Dair Politika Önerilerinin Özeti (devamı)

R.3	Mezo	Akademi ve sanayi arasında uzun soluklu ve organik bağlar kurarak ortak çalışma imkanlarını arttırabilmek amacıyla	Akademik ve iş fırsatları ile daha fazla profesyonelin üniversitelerle ilişkisini sürdürebilmek için daha sistematik bir bakış açısı gerekmektedir	YÖK tarafından sistematik bir planlama ile sadece profesyonellere yönelik özel akademik programlar dizayn edilebilir ve bu kişilere akademideki bilimsel araştırmalara ve işbirliği projelerine katılım için daha geniş fırsatlar sunulabilir
R.4	Makro	Sanayiler arası işbirliği imkanlarını arttırmak amacıyla	İlgili kamu kurumları ülke çapında oluşturulacak destek mekanizmaları ile sektöre rehberlik edecek liderliği sergilemelidir	Kamu kurumları, özel sektörü stratejik projeler ve daha verimli aktiviteler açısından sanayiler arası işbirliğine teşvik edecek çeşitli ödüllendirme mekanizmaları kurabilir
R.5	Makro	Sanayiler açısından ithalatın olumsuz etkilerini azaltmak amacıyla	Savunma sanayiinde sıklıkla kullanılan off-set mekanizmaları sivil sanayilere uyarlanmalıdır	İlgili devlet organları, savunma sanayiindeki off-set mekanizmalarını sivil sanayilere adapte etmek üzere görevlendirilebilir

Savunma sanayii altyapısını geliştirmek ve öğrenme kapasitesini arttırmak üzere sunulan yedi öneri aşağıdaki tabloda (Tablo 18'in Türkçe çevirisi) listelenmiştir:

Tablo D.2: Savunma Sanayii Altyapısını Geliştirmeye Yönelik Politika Önerilerinin Özeti

#	POLİTİKA SEVİYESİ	POLİTİKA HEDEFİ	POLİTİKA ÖNERİSİ	POLİTİKA ARACI
P.1	Mikro	Tüm savunma Ar-Ge faaliyetlerini daha verimli ve kolay bir şekilde yönetmek amacıyla	Kamu sektörünce gerçekleştirilen tüm savunma Ar-Ge ve inovasyon faaliyetlerinin tek bir çatı altında yönetilmesini sağlayacak bir kamu organı oluşturulmalıdır	SSB altında DARPA benzeri bir enstitü/ajans oluşturulmasıyla tüm savunma Ar-Ge faaliyetlerinin tek elden yönetilmesi, mükerrer maliyetlerin ve ilgili kurumların koordinasyon problemlerinin önüne geçilmesi mümkün olabilir

Tablo D.2: Savunma Sanayii Altyapısını Geliştirmeye Yönelik Politika Önerilerinin Özeti (devamı)

P.2	Mezo	Savunma ve sivil sanayilerin ihtiyaç duydukları yeterli seviyede Ar-Ge faaliyetleriyle desteklenmesi	Temel seviyeden üst seviyeye (bireysel, start-up, vb.) her türlü Ar-Ge faaliyetinin kamu tarafından en üst seviyede desteklenmesi gerekir	Kamu otoritelerince Ar-Ge faaliyetleri için ayrılan bütçe ve imkanlar ile bunlara erişimle ilgili resmi prosedürlerin geliştirilmesi, teknolojik ve ekonomik çıktıların hızını arttıracaktır
P.3	Mezo	Malzeme teknolojileri bakımından stratejik odak alanların belirlenmesi amacıyla	Barış ve savaş zamanlarında hangi malzeme ve malzeme teknolojilerinin erişilemez veya daha zor erişilebilir olduğu analiz edilmelidir	Kendi kendine yeterliliği sağlayabilme adına daha iyi planlama için ilgili kamu otoritelerince savunma malzemelerinin tedarik zinciri ve savunma teknolojileri araştırılabilir
P.4	Mezo	Çift kullanım ürün ve teknolojilerinin potansiyel faydalarından daha fazla yararlanmak amacıyla	Resmi süreçlerin kolaylaştırılması suretiyle çift kullanım ürün/teknolojilere dair fırsatlar ilgili mevzuatın yeniden düzenlenmesi ve yeni mekanizmalar vasıtasıyla ön plana çıkarılmalıdır	Ülke menfaatlerine zarar getirmeyecek çift kullanım ürünlere dair ihracat lisansı işlem süreleri kısaltılabilir ve firmalar yeni teşvik mekanizmalarıyla çift kullanım ürün/teknoloji üretimine yönlendirilebilir
P.5	Makro	Yurt içindeki firmalar arasındaki rekabetin stratejik yönetimini sağlamak amacıyla	Yurt içi aktörler arasındaki yıkıcı rekabetin önlenmesi amacıyla sanayiler ilgili kamu otoriteleri tarafından izlenmelidir	Çeşitli kamu organları yıkıcı rekabet ve mükerrer maliyetleri önlemek amacıyla stratejik sanayi alanlarındaki aktör sayısını gözlemek üzere yetkilendirilebilir (Örnek: SSB)
P.6	Makro	Sanayilerin ihtiyaç duyduğu yurt içi kaynakların daha dikkatli planlaması ve kullanılması amacıyla	Büyük çaplı yatırımlar, ülkenin sanayi altyapısını güçlendirecek ve atıl kapasiteyi kullanıma alacak şekilde yetkili organlar arasında daha iyi entegrasyon sağlanarak planlanmalıdır	Büyük çaplı yatırımlar, ulusal kaynakların doğru şekilde planlanmasını sağlamak üzere yetkilendirilecek kamu organlarının onayına tabi tutulabilir

Tablo D.2: Savunma Sanayii Altyapısını Geliştirmeye Yönelik Politika Önerilerinin Özeti (devamı)

P.7	Makro	Ülkedeki teknoloji gelişimi ve sanayileşmeyi hızlandırmak amacıyla	İnovasyon için kamu alımı modeli sivil sanayileri de kapsayacak şekilde genişletilmelidir	Kamu kurumları, inovasyon için kamu alımı modelini savunma sanayii tecrübelerini göz önüne alarak daha geniş bir alanda kullanabilir

Bu çalışmanın kısıtlamalarından bahsetmek gerekirse; tez çalışması sınırlı zamanda ve sınırlı kaynaklarla gerçekleştirilmiştir. Bu sebeple, mülakatlar sınırlı sayıdaki organizasyondan sayılı kişi ile gerçekleştirilmiş, nadir görülen bir durum olan küresel pandemi koşulları da mülakat takvimi ve tarzını etkilenmiştir. Savunma sanayii, popüler bir alan olarak kamu ve özel sektör ile akademik açıdan birçok araştırmaya çeşitli yönlerden konu olduğundan, ilgili tüm araştırmaları derleyerek bu teze girdi sağlamak mümkün olmamıştır. Kalitatif yaklaşımın doğası gereği, bu çalışmanın kişisel ve kültürel bakış açısı içerebileceği ve kesin sonuç sunma iddiasında olmadığı göz önünde bulundurulmalıdır. Benzer şekilde, kullanılan metodoloji genelleme yapmaya uygun olsa dahi, mülakat verisinin büyük kısmı ülke özelinde olduğundan çalışma sonuç ve önerilerinin diğer ülkeler açısından kısıtlı şekilde genellemeye uygun olacağı kabul edilmelidir.

Bu alanda sonraki çalışmalar için tavsiyede bulunmak gerekirse; sanayiler arası ilişkinin kısıtlı başlıklarda ele alındığı ve büyük anlamda ilave araştırmaya açık bir konu olduğu, savunma sanayiinin insan kaynağı ve dijitalleşme ve sunduğu fırsatlar açısından ele alınabileceği düşünülmektedir. Gelişmekte olan ülkelerin savunma sanayii serüveninde karşılaştığı zorluklara dair yeni araştırmalar ile bu tez konusunun diğer ülkeler açısından çalışılması da orijinal çıktılar ve öneriler sağlayabilecektir.

Bu tez hakkındaki son ifadeler olarak; sanayiler arasındaki ilişkiyi mutlak şekilde ifade edecek tek bir tanımlama yöntemi bulunmamaktadır. Bu sebeple, bu çalışma kapsamında sanayiler arasındaki ilişkiyi tanımlamak üzere türetilen dört yeni ilişki türünün böyle bir iddiası bulunmamaktadır. Buna rağmen, literatüre yeni bir katkı ve bu çalışmaya teorik bir çerçeve oluşturan bu tanımlar daha önce açıklanan şekilde özgünlük sağlamıştır. Politika önerileri ülkelere özgü yapıldığından, bu çalışma

kapsamında sunulan öneriler Türkiye'ye odaklanmıştır. Bununla birlikte, çalışma sonuçlarının ve politika önerilerinin savunma sanayii açısından benzer yapısal koşullara sahip gelişmekte olan ülkeler için de uygulanabilir olması beklenebilir.

E. THESIS PERMISSION FORM/TEZ İZİN FORMU

ENSTİTÜ / INSTITUTE

Fen Bilimleri Enstitüsü / Graduate School of Natural and Applied Sciences ☐

Sosyal Bilimler Enstitüsü / Graduate School of Social Sciences ☒

Uygulamalı Matematik Enstitüsü / Graduate School of Applied Mathematics ☐

Enformatik Enstitüsü / Graduate School of Informatics ☐

Deniz Bilimleri Enstitüsü / Graduate School of Marine Sciences ☐

YAZARIN / AUTHOR

Soyadı / Surname : Erdoğan
Adı / Name : Feridüddin Emre
Bölümü / Department : Bilim ve Teknoloji Politikası Çalışmaları / Science and Technology Policy Studies

TEZİN ADI / TITLE OF THE THESIS (**İngilizce** / English): ANALYSIS OF THE RELATIONSHIP BETWEEN DEFENCE AND CIVIL INDUSTRIES: POLICY RECOMMENDATIONS FOR TURKEY

TEZİN TÜRÜ / DEGREE**:** **Yüksek Lisans** / Master ☒ **Doktora** / PhD ☐

1. **Tezin tamamı dünya çapında erişime açılacaktır. /** Release the entire work immediately for access worldwide. ☒
2. **Tez iki yıl süreyle erişime kapalı olacaktır.** / Secure the entire work for patent and/or proprietary purposes for a period of **two years. *** ☐
3. **Tez altı ay süreyle erişime kapalı olacaktır.** / Secure the entire work for period of **six months**. ***** ☐

***** *Enstitü Yönetim Kurulu kararının basılı kopyası tezle birlikte kütüphaneye teslim edilecektir. / A copy of the decision of the Institute Administrative Committee will be delivered to the library together with the printed thesis.*

Yazarın imzası / Signature ..... **Tarih** / Date .....
(Kütüphaneye teslim ettiğiniz tarih. Elle doldurulacaktır.)
(Library submission date. Please fill out by hand.)

Tezin son sayfasıdır. / This is the last page of the thesis/dissertation.