

**FINANCIAL GROWTH OF THE TURKISH DEFENSE  
INDUSTRY:  
AN EXPLANATORY ANALYSIS**

**A Master Thesis**

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September 2003**

**FINANCIAL GROWTH OF THE TURKISH DEFENSE INDUSTRY:**

**AN EXPLANATORY ANALYSIS**

The Institute of Economics and Social Sciences  
of  
Bilkent University

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September 2003

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## **ABSTRACT**

### **FINANCIAL GROWTH OF THE TURKISH DEFENSE**

#### **INDUSTRY:**

#### **AN EXPLANATORY ANALYSIS**

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The importance of the Turkish defense firms that sell various products to the Turkish Armed Forces has been gradually increasing in the last decade, especially after the September 11, 2001. Turkey has to pay more attention to the national defense industry, because of the threats and serial crisis in the region. The companies in defense industry have very important role in economy however; decreasing the defense expenditures will accelerate the rate of economic growth. As a result, the strategies for the financial growth of defense firms are very crucial. The purpose of this study is to identify how Turkish Defense Industry financed growth in sales and assets during the five-year period and how they should finance growth in order to realize a respectable sustainable growth rate.

**Keywords:** Defense Industry, Turkish Defense Industry, And Sustainable Corporate Growth

# ÖZET

## TÜRK SAVUNMA SANAYİİNİN FİNANSAL BÜYÜMESİ:

### AÇIKLAYICI BİR ANALİZ

M. Umut ÇAKIR

YÜKSEK LİSANS TEZİ, İŞLETME FAKÜLTESİ

Tez Danışmanı: Doç. Dr. Can Şınga-Muğan

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Ülkemizde Türk Silahlı Kuvvetlerinin çeşitli ihtiyaçlarına yönelik üretim yapmakta olan savunma sanayii şirketlerinin önemi gün geçtikçe artmaktadır. Özellikle 11 Eylül 2001'den sonraki gelişmeler bu önemi daha da arttırmıştır. Bölgesindeki tehditler ve seri krizler sebebiyle, Türkiye'nin ulusal savunma sanayiine çok daha fazla önem vermesi gerekmektedir. Savunma sanayii şirketleri ülke ekonomisinde çok önemli bir role sahip olmakla birlikte aslında savunma harcamalarının azaltılması ekonomik büyümeyi hızlandırmaktadır. Bu yüzden savunma sanayii şirketlerinin finansal büyümelerine yönelik stratejiler büyük önem arz etmektedir. Bu çalışmanın amacı Türk Savunma Sanayiinin 1997-2001 yılları arasındaki reel ve sürdürülebilir büyümesini ve etki eden faktörlerini tespit etmek ve büyümenin nasıl finanse edilmesi gerektiğini incelemektir.

**Anahtar Kelimeler:** Savunma Sanayii, Türk Savunma Sanayii,  
Sürdürülebilir Büyüme

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## TABLE OF CONTENTS

Abstract .....	i
Özet .....	ii
Table of Contents .....	iv
List of Tables .....	vi
List of Figures .....	vii
CHAPTER 1: Introduction .....	1
CHAPTER 2: Turkish Defense Industry .....	6
2.1 Turkey's National Defense Policy .....	6
2.2 Resources of Defense Expenses.....	8
2.3 Characteristics of Turkish Defense Industry.....	9
2.4 Defense Research and Technology Projects.....	12
CHAPTER 3: Literature Review .....	15
3.1 Business Firm Growth .....	15
3.2 Sustainable Growth.....	17
3.3 Higgins Model.....	19
CHAPTER 4: Data and Methodology .....	24
4.1 Data.....	24
4.2 Methodology .....	27
CHAPTER 5: Results .....	31
5.1 Return On Asset Performance .....	31
5.2 Return On Equity Performance .....	34
5.3 Sustainable Growth.....	38
5.4 Panel (Pool) Data Analysis.....	42

CHAPTER 6: Conclusion and Discussions.....	47
APPENDIX.....	56
BIBLIOGRAPY .....	57



## LIST OF TABLES

Table 1	Sales of Defense Firms (Unadjusted Percentage Change).....	25
Table 2	Sales of Defense Firms (Inflation Adjusted Percentage Change).....	25
Table 3	Total Assets of Defense Firms (Unadjusted Percentage Change).....	26
Table 4	Total Assets of Defense Firms (Unadjusted Percentage Change).....	26
Table 5	Mean and Median of Net Sales and Total Asset (Unadjusted).....	27
Table 6	Mean and Median of Net Sales and Total Asset (Inflation Adjusted).....	27
Table 7	Annual ROA Performance of Defense Industry.....	31
Table 8	ROA Performance of Defense Industry (No Outliers Eliminated).....	33
Table 9	ROA Performance of Defense Industry (Outliers Eliminated).....	33
Table 10	ROE Performance of Defense Industry (No Outliers Eliminated).....	34
Table 11	ROE Performance of Defense Industry (Outliers Eliminated).....	35
Table 12	Annual Earnings of Defense Firms .....	37
Table 13	Vertical Analysis.....	37
Table 14	Horizontal Analysis.....	37
Table 15	Annual Growth Rate for The Five-Year Period (No Outliers Eliminated).....	39
Table 16	Annual Growth Rate for The Five-Year Period (Outliers Eliminated).....	39
Table 17	Descriptive Statistics of Variables .....	43
Table 18	Fixed-Effects (within) Regression.....	44

Table 19	Fixed-Effects (within) Regression .....	45
Table 20	Fixed-Effects (within) Regression .....	46
Table 21	Fixed-Effects (within) Regression .....	46
Table 22	Top Defense Firms in 2000 by Defense Sales .....	48
Table 23	Procurement and Employment Levels of Turkish Defense Sector.....	51
Table 24	Arms Procurement and R&D Budgets of Western Countries.....	52

**LIST OF FIGURES**

Figure 1      Share of Defense Sales by Top 100 Defense Firms Worldwide  
by National Origin of Company..... 49

## **CHAPTER 1**

### **INTRODUCTION**

Defense industry, which produces strategic and tactical, offensive and defensive weapon systems, military accessories and plans related services that are needed to defend a country, is an organization with a group of public and private companies (Alniak, 2003).

The geographical position of Turkey, at the heart of the most unstable “Bermuda Triangle” in the world—the Balkans, Caucasus and the Middle East—makes it imperative to maintain a strong and modern military. Turkey is expanding its national defense industry to support its armed forces. Turkey is a member of the United Nations (UN), North Atlantic Treaty Organization (NATO), Organization for Security and Cooperation in Europe (OSCE), the Euro-Atlantic Partnership Council (EAPC) and the Western European Union (WEU) (White Book 2002, p. IV). Being a strength and balance element in the region, Turkey pays more attention to defense than some other countries.

The Ministry of National Defense, which plans to modernize the Turkish Armed Forces, is financed mainly by the national budget and the Defense Industry Support Fund and partly by foreign military loans and contributions in connection with the Conventional Forces in Europe Treaty. The budget of The Ministry of National Defense is approximately 3.6 percent of the GNP on average and around 12 percent in the Consolidated Budget, which is the highest percentage among NATO

nations. The average allocation of the Ministry of National Defense's budget is as follows (The Ministry of National Defense, 2000):

• Turkish General Staff	7.7 %
• Ministry of National Defense	7.3 %
• Land Forces Command	49.5 %
• Naval Forces Command	13.9 %
• Air Forces Command	21.6 %

The roots of current defense enterprises can be traced back to the transfer of the limited arms manufacturing capability of the Ottoman Empire to Ankara during the War of Independence. In the 1920s and 1930s, the defense industry expanded to meet the internal security requirements of the new Republic. Turkey's entry into the Western military alliance system after The World War II brought these developments to a sudden stop. Massive amounts of US arms were poured into the country. The embryonic aircraft industry was dismantled in 1959, and plans for the manufacture of up-to-date infantry weapons were postponed. This massive injection of military aid also ended the policy of diversified arms suppliers. Almost all of the front-line equipment of the armed forces was of US origin. Some Western aid went into military workshops and shipyards to produce spare parts and maintain imported equipment (Karasapan, 1987).

The first shock to Turkish confidence in the US came during the 1960 Cuban missile crisis. Washington's readiness, to trade its missiles in Turkey for Soviet missiles in Cuba, showed that Turkey was no trusted ally but a mere pawn in the Cold War. Turkish government was even more affronted in 1964, when Lyndon Johnson

informed Prime Minister Ismet İnönü about the impossibility of the usage of the US-supplied arms in Cyprus (Karasapan, 1987).

These challenges to the Turkish state's esteem and the modernization requirements of World War II old-model weapons, which were no longer sufficient to meet the country's needs, created a Re-modernization Plan (REMO I) in 1970 (White Book 2002, Part XI). The plan reflected not only the political decision to expand arms production but also the economic reality that foreign grants and concessionary loans could no longer meet the high-tech, high-cost weaponry needs of the Turkish army.

The US arms embargo following the 1974 Turkish intervention in Cyprus and later the embargo by some Western powers following the 1980 military coup gave greater impetus to these moves. Turkish decision-makers saw little choice but to expand the country's defense industry, to diversify and lessen its dependence on the outside sources.

Turkish Defense Industry was given a big boost with the establishment of the Undersecretariat for Defense Industries in 1985 (SSM), which is responsible for the development and modernization of the Turkish defense industry. Turkey began its defense-related modernization program in 1986 with co-production of F16 fighter aircraft, armored infantry fighting vehicles and light transport aircraft. Even though the development of the Turkish defense industry has not reached the desired level as of yet, Turkey has been able to export her products to every corner of the earth in the fields of defense electronics, rockets, aviation and armored vehicles. Turkish frequency radiotelegraphy and radar are way ahead of their giant competitors in the Far East. There is now a vast market for Turkish armored vehicles in North Africa and in the Middle East, which had been previously taken by Turkey's competitors in this field (Undersecretariat of Defense Industry, 2000).

Being an important part of the economic structure of a country, defense industry has some differences from other industries as follows (Şimşek, 1997):

- It requires trained manpower
- It needs special quality standards
- It always uses the newest technology, and therefore R&D activities are crucial
- Defense companies generally do not have the flexibility to transform the production to civilian products
- More attention is paid to safety and secrecy
- Since there are a few buyers, it requires limited production
- It requires large amount of investment
- The defense firms need to enter to international markets in order to survive

Generally, the defense sector makes use of state-of-the-art-technology and is a sector often described as the “locomotive power” of the industry (Burçak, 1997). Besides its strategic importance, defense companies play a major role in the economy. Therefore, the purpose of this study is to identify, using Higgins’ concept<sup>1</sup>, how defense firms financed growth in sales and assets between the years 1997-2001 and how they should finance growth in order to realize an acceptable sustainable growth rate. Since understanding a firm’s sustainable growth rate provides information whether the firm is likely to encounter financial distress in the future, it will be helpful in order to make projections about the financial future of the Turkish Defense Industry.

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<sup>1</sup> Higgins’ concept is the most referenced sustainable growth model. Higgins (1970) defines sustainable growth as the annual percentage increase in sales that is consistent with the firm’s established financial policies. The firm’s established financial policies include the dividend payout ratio and use of debt financing. The model will be explained in more detail in Chapter 3 on page 17.

Turkey's National Defense Policy and the Characteristics of Turkish Defense Industry are explained in Chapter 2. Then brief information about sustainable growth is given in Chapter 3. Chapter 4 explains data and methodology. Chapter 5 contains the results of the studies. Finally conclusion and discussions appear in Chapter 6.



## **CHAPTER 2**

### **TURKISH DEFENSE INDUSTRY**

This chapter starts with a brief review of Turkey's National Defense Policy and resources of defense expenses. The rest of the discussion focuses on the Characteristics of The Turkish Defense Industry and the defense research and technology projects.

#### **2.1 Turkey's National Defense Policy**

The threats and risks that Turkey has confronted with in the post-Cold War period are rather different from those in the past. At the end of the Cold War, there was a search for a new world system by the effect of globalization, which also changed the concepts of threat. The traditional concept of threat has now started to contain new threats and risks emerging in the form of (White Book 2002, Part IV):

- Regional and ethnic conflicts
- Political and economic instabilities and uncertainties in the countries
- Proliferation of weapons of mass destruction and long-range missiles
- Religious fundamentalism
- Smuggling of drugs and all kinds of weapons
- International terrorism

Turkey is located at the center of the triangle formed by the Balkans, Caucasus and the Middle East, where new threats and risks are concentrated. Turkey is placed in a region where the interests of the global powers and formations intersect. This situation, stemming from Turkey's geostrategic location, has not

changed until now and will not change in the twenty-first century. It is evaluated that the importance of Turkey in the new world system will become even more strengthened. Turkey's Defense Policy is prepared to protect and preserve national independence, sovereignty, territorial integrity and vital interests of the country. For that reason, the following are the targets of Turkey in her National Defense Policy at the beginning of the twenty-first century as a requirement of the period (White Book 2002, Part IV):

- To contribute to peace and security in the region and to spread this to large areas
- To become a country producing strategy and security that could influence all strategies aimed at the region and beyond
- To become an element of power and balance in the region
- To make use of every opportunity and to take initiatives for cooperation, becoming closer and developing positive relations with global and regional powers.

The basic principles of the Defense policy determined in the framework of the principle, "Peace at Home, Peace in the World", set forth by Atatürk, are as follows:

- To make a maximum contribution to reduce all kinds of international tensions and provision of just and lasting peace,
- To preserve and protect independence, territorial integrity and the republic,
- To take all measures to prevent crises and conflicts
- To take an active part in collective defense systems and to fulfill the responsibilities entrusted to it.

## **2.2 Resources of Defense Expenses**

The determination of defense expenses and resources are carried out within the framework of the Planning, Programming and Budgeting System (PPBS) (White Book 2002, Part IX). When making an evaluation of the probable resources to be allocated to the Turkish Armed Forces (TAF), the possible amount, magnitude of resources that could be allocated for defense expenses during the planning period within the framework of factors such as general economic indicators, growth rate, foreign trade balance, price and cost increases, foreign aid and loan possibilities, development plans, government program and the programs and obligations in effect is determined.

The resources of defense expenses are composed of (Undersecretariat of Defense Industry, 2002):

- Allocated Resources from the National Defense Budget,
- Resources from the Defense Industry Support Fund (DISF),
- Resources from the TAF Strengthening Foundation (SF),
- Budget of the Gendarmerie General Command,
- Budget of the Coast Guard Command,
- Foreign State or Company Loans Repaid from the Budget of the Undersecretariat of The Treasury
- Revenues based on the Special Laws of the Ministry of National Defense.

The most important portion of the resources allocated to defense is constituted by the budget of the Ministry of National Defense. The budget is composed of four parts according to main service groups (White Book 2002, Part IX):

- Personnel Expenses

- Other Current Expenses
- Investments and Transfers.

Personnel expenses reflect all costs that are directly related to personnel and are determined according to the legislation. Other Current Expenses comprise the most significant part of the budget. The modernization projects, which are included in the Strategic Target Plans (STP), allocations of funds for food and clothing of military personnel as set in by laws, construction, building repairs, duty travel expenses, fuel, electricity, water, natural gas, treatment and medication needs, fixed assets, stationery needs, cargo and transportation services, procurement of spare parts, are provided for in this main service group. Investments are composed of vehicles procurement, some construction projects and various renovation projects. Transfers include membership due to international organizations, nationalization, payment of debts from previous years and social assistance to be made to various associations, unions, institutions and organizations.

The share of the Ministry of National Defense budget in the Gross National Product (GNP) is on average 2.5 percent and around 9.7 percent of the Consolidated Budget. On the other hand, about 30 percent of the Ministry of National Defense budget is allocated for personnel expenses, 68.9 percent for other current expenses and the balance for investment and transfer expenses (White Book 2002, Part IX).

### **2.3 Characteristics of Turkish Defense Industry**

The requirements of the Turkish Armed Forces (TAF) are met by direct purchase from the domestic and foreign markets or by participation in joint production programs. Direct purchases from the domestic market are the products

developed by the domestic producers or manufactured under license (technology transfer) from foreign countries. There are also products that are obtained as the result of the joint activities through research and development (R&D) of the TAF and the domestic producers.

Turkey, which aims to become a self-sufficient country in the field of defense equipment, has accelerated its activities and concentrated its efforts on this field. The Turkish Defense Industry, in order to be able to reach the advanced level necessary in the production of the modern defense equipment, is trying to develop its production resources and capabilities, either by means of its own resources or by participating in joint production projects together with the Allied Countries or by means of technology transfer. In this framework, the cooperation programs carried out with the Allied Countries in the structure of NATO or the European Union (EU) have a significant place in Turkey's defense industry activities. As a result, the development of the Turkish Defense Industry has further accelerated and its sectoral infrastructure has been completed to a great extent.

On the basis of main weapons systems, 80 percent of the defense equipment is presently procured from abroad (Undersecretariat of Defense Industry, 2002). It is targeted to change this ratio and to increase the domestic procurement ratio to levels that will make Turkey's defense industry sufficient and independent.

Providing all kinds of weapons, vehicles, equipment and materials needed by the TAF from national resources is very crucial from the aspect of preserving and strengthening the existing defense industry foundation and of creating employment. The Main Sectors of the Turkish Defense Industry are classified as follows (Undersecretariat of Defense Industry, 2002):

- Aviation and Space Industry,

- Rocket and Missile Industry,
- Electronics Industry,
- Weapons and Ammunition Industry,
- Military Shipbuilding Industry,
- Military Automotive and Armored Vehicle Industry
- Military Clothing Industry.

A major portion of the companies related to the Turkish Defense Industry is collected under the roofs of the Defense Industry Manufacturers Association (DIMA) and the Defense Industrialists Association (DIA). The DIMA and DIA constitute a bridge between the producers and customers. They analyze and interpret the information collected and send them to their members and other related parties. DIMA is also a member of the European Defense Industry Group (EDIG).

Turkey generally faces the same problems of the developing countries while generating her own defense industry. These problems are (Ministry of National Defense 2001, p. XII-XIII):

- Defense spendings occupy a major part of GNP but because of low GNP these spendings are not enough
- Problems in transferring new technology to Turkey
- Insufficiency of current production technology
- High production costs
- Financing problems
- Lack of trained workforce
- Economies of scale
- Dependency on foreign industries
- Regulatory policies

- Price has primary importance more than technology and human resources
- Firms concentrate on production, however; there are major problems in maintenance

The production of high technology war weapons and vehicles in Turkey with the objective of meeting the needs of the Armed Forces constitutes the foundation of the Turkish Defense Industry Strategy. Turkey's National Military Strategy (TNMS) and the Planning and Programming Directive (PPD) are used as a source in the determination of the Defense Industry Strategy.

The Defense Industry policy envisages the formation of a defense industry that (White Book 2002, Part IX):

- Is open to the foreign sector as well as the domestic sector,
- Has an export potential and capability to compete internationally,
- Can produce new technology and has a dynamic structure,
- Makes it possible to have balanced defense industry cooperation between Turkey and other countries and is influenced to a minimum extent by the changing political conditions
- Can also engage in production for civilian purposes.

## **2.4 Defense Research and Technology Projects**

The defense research and technology projects are collected under the three main groups specified below (Undersecretariat of Defense Industry, 2002):

- System development projects that are carried out for the development of the existing systems of the TAF. These projects are in the categories of "Must Be National" and "Critical".
- Technological infrastructure formation projects related to the technologies on which these systems are based.
- Basic research projects directed to these technologies.

The system development projects are carried out by industrial organizations, technological infrastructure formation projects are carried out by industrial organizations and the Scientific and Technical Research Institution of Turkey (TUBITAK), and basic research projects are carried out by the universities.

Approximately 2 percent of the defense budget is allocated for the financing of defense research activities in Turkey. Furthermore, the defense industry organizations allocate 2-10 percent of their annual budgets for research and development activities (Ministry of National Defense, 2001). However, due to the defense budget cuts, every country cannot form an adequate infrastructure in all technological fields and because of the advantages of carrying out joint projects with other countries, great importance is placed on carrying out joint R&D projects with the friendly and allied countries.

Turkey participates in the joint research and technology activities in the structure of NATO and the Western European Union (WEU). Western European Armament Group (WEAG), which is connected to the European Union, develops cooperation on the subjects of defense equipment in Europe. Turkey maintains a close cooperation with Belgium, Denmark, France, Germany, Greece, Italy, Luxembourg, the Netherlands, Norway, Portugal, Spain and The United Kingdom, which are the members of WEAG, along with Turkey.



The projects in which Turkey participates along with the other WEAG countries are given below:

- STINGER,
- M483/M864 155 mm Advanced Artillery Ammunition and
- Future Large Aircraft (FLA)

Turkey also participates in the Conference of National Armaments Directors (CNAD), which is an organization connected to NATO Council and established in 1966 with the objective of coordinating the armaments cooperation among NATO member countries and takes an active part in both the concept activities and in some of the joint production and procurement projects. The projects in which Turkey is presently participating in the scope of the CNAD are specified below (Undersecretariat of Defense Industry, 2002):

- Alliance Ground Surveillance (AGS) System,
- Theatre Missile Defense (TMD) System,
- Continuous Acquisition and Lifelong Support (CALS) System,
- Battlefield Information Systems (BICES),
- Tactical Communications Systems (TACOMS-POST 2000) and
- NATO Friend or Foe Identification System (NIS)

In parallel with the rapidly developing defense industry resources and capabilities, it is aimed for Turkey to engage in cooperation connections based on the principle of reciprocity with friendly and allied countries and to make concrete cooperation on the subjects of technology and R&D and also on the joint production and procurement of defense equipment.

## **CHAPTER 3**

### **LITERATURE REVIEW**

In this chapter, business firm growth is covered first as a background. Next, a brief discussion of sustainable growth literature is presented. The Higgins Model on sustainable growth concludes the chapter.

#### **3.1 Business Firm Growth**

All the managers of firms wish to maximize their profits from investment in the enterprise itself. They always have great desire to grow and to make profits. That is why, the main strategies in the firm are related with the growth of the firm.

The term “growth” is often used vaguely, or with a variety of meanings. People talk of “growth firms”-and of paying more for a growth firm- but their meaning is not always clear. It sometimes denotes merely increase in amount, output, exports, sales etc. “At other times, it is used in primary meaning implying an increase in size or an improvement in quality as a result of a process of development, that is similar to natural biological processes in which an interacting series of internal changes lead to increases in size accompanied by changes in the characteristic of growing object” (Penrose 1995, p.1). However, in most of the academic studies, a firm’s growth is decomposed into two parts: the growth resulting from the growth in the markets in which the firm sells its products and the growth that is achieved as a result of an increased market share. The source of the sales growth, market growth,

or share growth may influence the firm's operating and financial targets, as well as its stock price relative to other firms in the industry (Clark, Thomas and Gerard, 1989).

Why do firms grow? It is an important question. Yet, economists and management people have so far failed to answer it convincingly. There are three main competing theories: The traditional explanation is that firms grow to reap economies of scale, and to increase their market power. They stop growing once they reach an optimum size, when they run out of profitable investment opportunities or become too big and bureaucratic to manage. Secondly, life-cycle theories, which became popular in the 1970s and 1980s, identify several stages in the growth of firms, including an entrepreneurial phase, maturity and finally a period of decline. A third view, currently fashionable, attributes firms' growth to their "core competencies". Admittedly, this is a somewhat nebulous concept. But in essence, it means that a firm's performance is determined by building on a set of key skills that distinguish it from its rivals. These might include better technology, a trusted brand name, or the experience of its employees (The Economist, 1999).

Geroski (1999) determined that companies of different sizes' growth largely follow a "random walk"--an erratic and unpredictable course. There is in fact some evidence that smaller firms grow faster than larger ones. In particular, very small, very new firms tend to grow much faster than established ones. More surprisingly, firms' growth rates are only weakly correlated with that of the economy as a whole or, indeed, with that of their own industry. Recessions seem to hit only a few firms badly; most are largely unaffected, while some actually prosper. Geroski's finding is also consistent with the finding that firms are unlikely to respond to a shock

immediately if they plan to restructure soon. They will respond only after enough pressure has built up to convince them that the shock is permanent and important.

There is an interesting implication for the relation between desire to grow and the desire to make profits. If profits are a condition of successful growth, but profits are sought primarily for the sake of the firm that is, to reinvest in the firm rather than to pay to the owners for the use of their capital, then from the point of investment policy, growth and profits become equivalent as the criteria for the selection of investment programs (Penrose, 1995).

There are also other objectives that are often important for the firm such as power, prestige, public approval or the mere love of the game (Penrose, 1995). It should be recognized that the attainment of these usually are not associated directly with the ability to make profits. Firms will never invest in expansion for the sake of the growth if the return on the investment is negative. Firms will never invest outside the firm except eventually to increase the funds available for investment in the firm. Therefore, increasing the total long run profits of the enterprise is equivalent to increasing the long run rate of growth (Penrose, 1995).

### **3.2 Sustainable Growth**

The concept of "sustainable growth" is well documented in both academic and practitioner journals, and goes back at least to David Packard explaining how Hewlett-Packard grew (Klein and Belt, 1994). Specifically, given the firm's target dividend payout ratio and financial structure (debt to equity), sustainable growth rate is the percentage increase in sales that can be maintained without necessitating a change in financial policy. Understanding a firm's sustainable growth rate provides

information whether the firm is likely to encounter financial distress in the future. Some writers also have used terms such as "supportable growth" (Kisor, 1964) or "affordable growth" (Kyd, 1981). The notion of sustainable growth that is, perhaps, the most referenced version is associated with Higgins. Higgins (1970) defines sustainable growth as the annual percentage increase in sales "that is consistent with the firm's established financial policies." The firm's established financial policies include the dividend payout ratio and use of debt financing. Within Higgins' framework, a firm experiencing growth has four ways in which to raise the additional funds needed to finance that growth.

- Issue more equity
- Reduce the dividend payout ratio
- Increase the firm's debt position
- Improve the firm's operating performance

The debt Higgins refers to include both short and long term liabilities since both are typically used to finance the assets of the firm. Also, an improvement in the firm's operating performance should be reflected in an increase in the firm's net income and greater availability of the retained earnings.

A number of researchers have studied the issue of sustainable growth and all have basically arrived at the idea that growth beyond the sustainable level forces firm management to make important operating and financing decisions. Sustainable growth can be defined (see Kisor (1964), Kyd (1981) and Higgins (1989)) as

$$\text{SUSG} = \text{ROE} * (1 - \text{DPR})$$

where SUSG is the sustainable growth rate, ROE is the return on equity and DPR is the dividend payout ratio. Thus, (1-DPR) represents the percentage of net income retained by a company. Actual growth beyond the sustainable level must be financed

in some way, and possibly in a way that requires management to change their set dividend and leverage policies.

Higgins (1977) states that if a firm's sales are growing at a rate faster than sustainable growth rate, and if management chooses not to issue new equity, then a move away from set financial policies will be required to sustain the chosen level of growth. Typically, the financing method of choice for these faster growing firms is an increase in leverage. Gupta (1969) provides empirical evidence that supports Higgins' notions, as does Gup (1980). Furthermore, the presence of inflation will affect the amount of additional financing needed (Higgins (1977) and (1981); and Johnson, (1981)) and, thus, the ability of a company to grow. While some researchers have found that increased borrowing is the typical financing choice employed to increase growth, others indicate that it is not always the best way to increase growth. Ellsworth (1983) agrees with Higgins that firms can grow faster by using proportionately more debt, but he recommends that firms issue new equity from time to time to relieve financing constraints. Spraakman (1979) finds that a change in return on investment impacts growth more so than does a change in leverage, at least for certain lines of business. Pruitt and Gitman (1991), in a survey of financial managers of the 1000 largest U.S. firms, find that the choice of external financing (i.e., the issuance of debt or equity) is driven by the level of current investment expenditures, the degree of financial leverage, interest rate levels, and liquidity.

### **3.3 Higgins Model**

In 1977 and 1981 Higgins demonstrated that the financial policies of many corporations may be at variance with their growth objective. As a guide for setting

compatible financial policies and growth objectives, Higgins developed a formula to calculate a rate of sustainable growth. In deriving his formula Higgins made the following assumptions (Clark, Chiang and Olson 1989, p.28):

- Book depreciation is adequate to recapture the value of existing assets;
- Profit margin (P) on new sales (S') corresponds to that of existing sales (S); hence, the change in sales ( $\Delta S$ ) equals  $S' - S$ ;
- Firm has an established financial structure goal that is debt to equity ratio (L) without the sale of new common stock;
- Firm has an established dividend payout rate (D); thus, the target retention ratio is  $(1 - D)$ ;
- New fixed assets at book value (F) represent a stated proportion of the change in physical volume of output (real sales);
- New current assets (C) are a stated proportion of sales in nominal dollars;
- Initial level of sales at the beginning of the period is represented by (S) and the projected sales during the period by (S');
- T denotes the ratio of total assets to net sales, and the ratio is constant for new and existing sales;
- J denotes the annual inflation rate;
- Firm will rely on retained earnings for equity financing, and new common stock will not be issued.

Based upon these assumptions, Higgins describes the derivation of the basic formula as cited in (Clark, Chiang and Olson 1989, p. 29):

“Assuming  $P$  and  $T$  are the same for new sales as for existing sales, the new assets required to support increased sales are forecast to be  $\Delta S(T)$  ... On the other side of the balance sheet, total profits for the year are expected to be  $(S + \Delta S)P$  and additions to retained earnings to be  $(S + \Delta S)P(1-D)$  ... because every \$1 added to retained earnings enables the company to borrow \$ $L$  without increasing its debt to equity ratio.”

Since assets must equal liabilities plus equity, additions to assets must be covered by an increase in retained earnings and new debt. Setting the two quantities equal and solving for  $\Delta S / S$  yields Expression 1 (Higgins, 1981, p. 37):

$$g^* = \frac{\Delta S}{S} = \frac{P(1-D)(1+L)}{T - [P(1-D)(1+L)]} \quad (1)$$

Unless the actual growth rate ( $g$ ) equals the sustainable growth rate ( $g^*$ ), the profit margin, dividend payout ratio, debt/equity ratio or total assets/sales ratio must change or the firm will be compelled to issue new equities. As subsequently illustrated, the basic formula allows for modifications to assess the effects on sustainable growth of changes in prices, tax rates, and business combinations.

Optimal growth is not simply the product of accepting all investments with a positive net-present value or an internal rate of return greater than a stipulated rate. Management has to reflect explicitly upon the implications of higher growth rates on established financial policies, such as dividend payouts, leveraging, and the sale of equities. These decisions have both financial and managerial control significance (Clark, Chiang and Olson, 1989).



Expression 1 can be modified to allow for price increases or decreases (inflation).

This yields the following equation (Higgins, 1981, p. 38):

(2)

$$g^* = \frac{[(1 + J)P(1 - D)(1 + L) - JC]}{[(1 + J)C + F] - [(1 + J)P(1 - D)(1 + L)]}$$

Overall, given the assumptions of the model, an upward trend in prices acts to reduce real sustainable growth unless it is offset by operating efficiencies. In the extreme case, inflation induced increases in retained earnings and borrowing are more than offset by required increases in working capital investment. Higgins estimates, for example, that real sustainable growth declines by 2.2 percent for every 5 percent increase in the rate of inflation. He further notes:

“To the extent that depreciation is insufficient to maintain the value of assets . . . sustainable growth is reduced. . . . If newly acquired assets are more profitable than existing assets in the sense of producing sales with a higher profit margin, offering a more rapid depreciation rate or generating more sales per dollar of assets . . . sustainable growth will rise” (Higgins, 1981, p. 36-40).

Similarly the sustainable growth rate ( $g^*$ ) may rise if the firm intensifies asset utilization by reducing the assets required to support a given level of sales. Otherwise, the firm can restore its sustainable rate of growth ( $g^*$ ) in an inflationary environment only by altering accepted financial policies (reducing dividend payout, increasing leverage, or by selling new equity shares). All things considered, therefore, inflation has inimical effects on the sustainable rate of growth ( $g^*$ ). A growth rate higher than ( $g^*$ ) is inconsistent with established financial targets.

Long term planning frequently incorporates growth projections on a five- or ten-year basis. The objective should be to calculate a growth rate which can be sustained over the planning period and in the process identify the corporate adjustments necessary to maintain it. These may include changes in the debt/equity ratio, the dividend payout ratio, asset and manpower productivity, and so forth. These considerations loom larger in the case of business combinations where synergistic effects become the measure of success.

The Higgins model provides a starting point to attack these issues. It also clearly delineates the effects of price changes and tax ratios on sustainable growth calculated from a given price level. The difficulty with the Higgins model is its heavy reliance on accounting numbers, which are subject to the exercise of a variety of options and which have an uncertain link to the market value of the firm's common stock. Also, accounting numbers are historic in nature and reflect transactions executed at different price levels. Accounting data lags price trends, on both the upside and downside (Clark, 1985).

## **CHAPTER 4**

### **DATA AND METHODOLOGY**

#### **4.1 Data**

In this study, using Higgins' concept, the real and sustainable growth rate of defense firms are identified between the years 1997-2001. How defense firms financed growth in sales and assets during the period is examined. The factors that affect the growth rate of the defense firms are clarified and the issue of how they should finance growth in accordance with the sustainable growth rate is discussed.

The sample contains 17 defense companies (annual balance sheets, Income statements and cash flow statements) during the period 1997 and 2001. Data of 14 defense companies are obtained from The Turkish Armed Forces Foundation and the other three from ISE. The statistical calculations are made using 85 data points for the five-year period. Although the sample size seems to be small, it generally reflects the financial situation of the defense industry since the sample includes major leading defense companies that Turkish Armed Forces Foundation has shares in. The sample has 2 firms in weapon and ammunition sector, 3 firms in aircraft manufacturing, 6 firms in electronic, 5 firms in machine manufacturing and 1 firm in oil shipping sector. According to Defense Industry Association, about 40% of the sales of defense firms in Turkey are directly related to defense products. Unadjusted and inflation adjusted percentage change of the net sales and total assets of defense firms are given in Table-1, 2 and Table-3, 4. Unadjusted and adjusted mean and median of sales and total assets of defense firms are shown in Table-5 and Table-6.

Table 1: Sales of Defense Firms (Unadjusted Percentage Change)

COMPANIES	1997	1998	1999	2000	2001
ALCATEL	100%	204,42%	285,80%	434,35%	873,01%
ASELSAN	100%	173,60%	313,15%	536,56%	997,98%
ASPILSAN	100%	145,79%	161,85%	276,33%	297,51%
ÇANSAŞ	100%	228,93%	516,04%	532,24%	417,57%
DITAS	100%	157,50%	194,38%	400,19%	756,63%
HAVELSAN RADAR	100%	118,44%	374,59%	405,06%	971,48%
HAVELSAN TEKNOLOJİ	100%	324,31%	244,40%	490,81%	576,49%
İŞBİR	100%	159,09%	301,98%	529,22%	525,24%
MERCEDES-BENZ	100%	134,71%	147,50%	345,60%	360,10%
NETAŞ	100%	135,35%	236,38%	368,54%	393,02%
OTOKAR	100%	243,50%	439,88%	661,58%	646,58%
PARSAN	100%	147,94%	168,02%	333,40%	343,97%
PETLAS	100%	194,33%	317,59%	407,80%	498,30%
ROKETSAN	100%	685,76%	590,62%	1458,19%	5216,46%
TAİ	100%	132,12%	188,94%	178,78%	713,98%
TEİ	100%	183,87%	387,80%	832,49%	1989,60%
TUSAŞ	-	100%	261,75%	454,87%	937,76%
<b>TOTAL</b>	<b>100%</b>	<b>160,13%</b>	<b>221,89%</b>	<b>408,95%</b>	<b>622,87%</b>

Table 2: Sales of Defense Firms (Inflation Adjusted Percentage Change)

COMPANIES	1997	1998	1999	2000	2001
ALCATEL	100%	118,97%	108,57%	109,18%	135,77%
ASELSAN	100%	101,04%	118,96%	134,87%	155,20%
ASPILSAN	100%	84,85%	61,48%	69,46%	46,27%
ÇANSAŞ	100%	133,24%	196,03%	68,25%	64,94%
DITAS	100%	91,66%	73,84%	100,59%	117,67%
HAVELSAN RADAR	100%	68,93%	142,30%	101,82%	151,08%
HAVELSAN TEKNOLOJİ	100%	188,75%	92,84%	123,37%	89,65%
İŞBİR	100%	92,59%	114,71%	133,02%	81,68%
MERCEDES-BENZ	100%	78,40%	56,03%	86,87%	56,00%
NETAŞ	100%	78,77%	89,79%	92,64%	61,12%
OTOKAR	100%	141,72%	167,10%	166,29%	100,55%
PARSAN	100%	86,10%	63,83%	83,80%	53,49%
PETLAS	100%	113,10%	120,64%	102,51%	77,49%
ROKETSAN	100%	399,11%	224,36%	366,53%	811,25%
TAİ	100%	76,89%	71,77%	44,94%	111,04%
TEİ	100%	107,01%	147,32%	209,26%	309,42%
TUSAŞ	-	100%	170,85%	196,45%	250,58%
<b>TOTAL</b>	<b>100%</b>	<b>92,90%</b>	<b>84,29%</b>	<b>102,79%</b>	<b>96,87%</b>

Table 3: Total Assets of Defense Firms (Unadjusted Percentage Change)

COMPANIES	1997	1998	1999	2000	2001
ALCATEL	100%	222,53%	396,88%	443,54%	923,01%
ASELSAN	100%	179,44%	328,70%	561,87%	910,23%
ASPILSAN	100%	154,51%	210,77%	251,06%	337,50%
ÇANSAŞ	100%	195,24%	235,04%	319,70%	526,88%
DITAS	100%	121,45%	305,60%	324,30%	1666,30%
HAVELSAN RADAR	100%	274,88%	359,87%	230,97%	442,64%
HAVELSAN TEKNOLOJİ	100%	39,92%	80,67%	56,06%	119,01%
İŞBİR	100%	167,61%	448,77%	833,50%	788,99%
MERCEDES-BENZ	100%	149,07%	218,26%	308,70%	459,35%
NETAŞ	100%	146,89%	296,20%	379,92%	583,31%
OTOKAR	100%	313,46%	622,74%	805,78%	1503,63%
PARSAN	100%	217,85%	278,48%	507,29%	670,49%
PETLAS	100%	172,51%	245,72%	351,68%	490,62%
ROKETSAN	100%	138,95%	482,05%	837,85%	1615,12%
TAİ	100%	193,55%	493,65%	446,40%	842,52%
TEİ	100%	176,35%	291,43%	506,12%	944,46%
TUSAŞ	100%	521,35%	676,65%	751,48%	939,83%
<b>TOTAL</b>	<b>100%</b>	<b>169,65%</b>	<b>351,32%</b>	<b>500,10%</b>	<b>880,69%</b>

Table 4: Total Assets of Defense Firms (Inflation Adjusted Percentage Change)

COMPANIES	1997	1998	1999	2000	2001
ALCATEL	100%	129,51%	150,77%	111,49%	143,54%
ASELSAN	100%	104,43%	124,87%	141,23%	141,56%
ASPILSAN	100%	89,93%	80,07%	63,11%	52,49%
ÇANSAŞ	100%	113,63%	89,29%	80,36%	81,94%
DITAS	100%	70,68%	116,09%	81,52%	259,14%
HAVELSAN RADAR	100%	159,98%	136,71%	58,06%	68,84%
HAVELSAN TEKNOLOJİ	100%	23,24%	30,64%	14,09%	18,51%
İŞBİR	100%	97,55%	170,48%	209,51%	122,70%
MERCEDES-BENZ	100%	86,76%	82,91%	77,59%	71,44%
NETAŞ	100%	85,49%	112,52%	95,50%	90,71%
OTOKAR	100%	182,43%	236,57%	202,54%	233,84%
PARSAN	100%	126,79%	105,79%	127,51%	104,27%
PETLAS	100%	100,40%	93,35%	88,40%	76,30%
ROKETSAN	100%	80,87%	183,12%	210,60%	251,18%
TAİ	100%	112,65%	187,52%	112,21%	131,03%
TEİ	100%	102,64%	110,71%	127,22%	146,88%
TUSAŞ	100%	303,43%	257,04%	188,89%	146,16%
<b>TOTAL</b>	<b>100%</b>	<b>98,74%</b>	<b>133,46%</b>	<b>125,70%</b>	<b>136,96%</b>

Table 5: Mean and Median of Net Sales and Total Assets  
(TL millions, Unadjusted)

	Net Sales		Total Assets	
	Mean	Median	Mean	Median
<b>1997</b>	16.752.732	5.260.607	16.950.548	6.185.830
<b>1998</b>	26.825.677	10.935.458	28.757.076	15.925.309
<b>1999</b>	37.172.032	21.807.016	59.550.814	26.316.963
<b>2000</b>	68.510.066	29.493.337	84.769.286	45.704.354
<b>2001</b>	104.348.203	74.092.618	149.281.526	85.287.654

Table 6: Mean and Median of Net Sales and Total Assets  
(TL millions, Inflation Adjusted)

	Net Sales		Total Assets	
	Mean	Median	Mean	Median
<b>1997</b>	28.118	8.829	28.450	10.382
<b>1998</b>	26.205	10.682	28.091	15.557
<b>1999</b>	23.701	13.904	37.969	16.779
<b>2000</b>	28.904	12.443	35.763	19.282
<b>2001</b>	27.237	19.340	38.966	22.262

## 4.2 Methodology

In this study, first some common ratios in the literature are used and a trend analysis is made to identify the financial performance of the defense firms for the five-year period. Then, using Higgins' concept, the actual and sustainable growth rate of defense firms are determined and how defense firms financed that growth is examined. Finally, panel data analysis is used to clarify the determinants of growth of Turkish Defense Industry. The analysis contains:

- Return-on-asset (ROA) performance of the defense industry for the five-year period
- Return-on-equity (ROE) performance of the defense industry for the five-year period

- Trend Analysis
- Percentage change in sales for the five-year period
- Percentage change in total assets for the five-year period
- Percentage change in short-term debt for the five-year period
- Percentage change in long-term debt for the five-year period
- Percentage change in total debt for the five-year period
- Percentage change in equity for the five-year period
- Sustainable Growth Rate (without inflation effect) for the five-year period
- Sustainable Growth Rate (with inflation effect) for the five-year period
- Panel Data analysis to clarify the determinants of growth of defense industry

***ROA Performance:*** In this section, first the ratio of operating return on sales is calculated to understand the profitability of sales in defense industry. Then, net assets (total assets less accounts payable and accruals) to net sales and asset turnover ratios are calculated to determine how efficiently assets are managed by relating asset items to sales. Finally, the two analyses are tied together into a return-on-asset measure to clarify how well management has deployed the assets.

***ROE Performance:*** Initially, the operating income effect that is, operating return less interest expense and taxes divided by equity, is determined. The analysis focuses solely on operating activities and excludes all financing factors to gain an understanding of the profitability of operations; the revenues and costs involved in the core business of the industry. Second, non-operating income effect that is, gains and losses from non-operating activities and extraordinary activities, are determined. Then, return-on-equity ratio and financial leverage ratios (short-term debt to equity

and long-term debt to equity) are calculated to clarify the effect of debt financing on common equity. Finally, a trend analysis is made and the percentage change in sales, operating and non-operating income are examined between the years 1997-2001. Wholesale price index (total-general) is used as deflator in the calculations. The formulas of the selected ratios are given in the appendix.

***The Actual and Sustainable Growth:*** In this section, sustainable growth rate of defense industry is calculated and the effect of inflation on the sustainable growth rate is determined first. Then, the actual growth rate on sales, assets, debt and equity are calculated. The first two items, sales and assets, are used to assess growth. The next two items, debt and equity, are used to see how defense firms decided to finance growth that is either higher or lower than the sustainable growth rate. If the sustainable growth rate is bracketed by actual growth rates for sales and assets, it is assumed that the defense firms can sustain their actual growth rate without encountering financial difficulties. If the sustainable rate is less than both the actual growth rates for sales and assets, it is concluded that without access to new capital, the defense firms will probably face financial difficulties in the near future. If capital suppliers dry up, the firms must slow their actual growth, increase their sustainable growth, or a combination of these two approaches (Gallinger, 2000). If sustainable growth exceeds both actual growth in sales and assets over two or three consecutive years, then maybe managers are missing opportunities in the defense firm's markets to capture more sales, profits and cash flows. The firms are possibly losing market share to the competitors. If this situation is not corrected, the firms may become the target of a takeover or merger.



***Panel (Pool) Data Analysis:*** A Firm-level panel data analysis (fixed effect model) is used for assessing the impact of some financial ratios, GNP growth and inflation on actual growth rate of defense firms.

*Outliers:* In the study, the financial ratios and growth rates are shown in tables with/out outliers eliminated. Outliers are detected in SPSS and measurements that fall beyond a distance of 1,5 interquartile ranges from the hinges are considered to be outliers. Some companies' ratios in the sample are considered to be outliers because of their high losses in changing years.

In the calculations of some ratios and growth rates, the number of data used is less than 85. For example, in the calculations of sales growth, 83 data points are used since one company in the sample does not have any sales in 1997. Also, while calculating the growth in long-term debt, 84 data points are used since an other company in the sample used TL47 trillion long-term debts in 2001 although it had used only TL1,7 billion in 2000, so it is considered to be outlier to prevent the whole sample average being affected by this specific high growth rate in long term-debts.

## CHAPTER 5

### RESULTS

This chapter discusses the results of some common ratios and the sustainable growth mentioned in the previous chapter. Initially, ROA and ROE performance of Turkish Defense Firms are examined. Then, a trend analysis is made to identify the financial performance of the defense firms for the five-year period. Furthermore, using Higgins' concept, the actual and sustainable growth rate of defense firms is determined and how defense firms financed that growth is examined. Consequently, panel data analysis is used to clarify the determinants of growth of Turkish Defense Industry.

#### 5.1 Return On Asset Performance

The results of profitability and efficiency in managing assets of defense firms are given in Table-7.

**Table 7: ROA Performance of Defense Industry**

<b>YEARS</b>		<b>1997</b>	<b>1998</b>	<b>1999</b>	<b>2000</b>	<b>2001</b>
<b>OPERATING RETURN ON SALES</b>	<b>Mean</b>	0,076	-0,045	0,114	0,038	0,073
	<b>Median</b>	0,189	0,131	0,105	0,082	0,107
<b>NET ASSETS TO NET SALES</b>	<b>Mean</b>	2,057	1,447	1,961	1,612	1,397
	<b>Median</b>	1,099	1,085	0,972	0,797	0,971
<b>ASSET TURNOVER RATIO</b>	<b>Mean</b>	1,427	1,675	1,684	1,890	1,284
	<b>Median</b>	0,910	0,926	1,033	1,260	1,056
<b>RETURN ON ASSETS BEFORE TAXES</b>	<b>Mean</b>	0,150	0,092	0,180	0,097	0,098
	<b>Median</b>	0,198	0,171	0,136	0,156	0,114

The net result of the analysis is that it reveals fluctuating trend in the operating profitability of defense industry between 1997-2000 and a slightly downward trend in 2001 compared with 1997- going from an average profit of 0,076 liras per sales TL in 1997 to an average profit of 0,073 liras per sales TL in 2001 (Table-4). This performance is consistent with the net sales (deflated) by defense firms. In 1997, deflated net sales were TL 478007 million and had declined to 463031 million by 2001.

Defense firms have reduced their investments in net assets-total assets less accounts payable and accruals- by TL0,66; going from TL2,057 per sales TL in 1997 to TL1,397 per sales TL in 2001. Asset turnover ratio improved between 1997-2000 and declined in 2001. The generally accepted standard for this ratio varies between businesses and industries. For manufacturing firms, a value between two and four is acceptable (Bektöre, 1998). Since most of the firms in the sample are manufacturing ones, their ratios are expected to be between two and four but all the ratios are below two. So it indicates that defense firms' assets are not fully employed.

The profit generated by the use of the assets of the business is measured by ROA ratio. A high ROA ratio indicates good performance or effective use of firm's assets by management. Then, a low ROA ratio will indicate poor performance or ineffective employment of the assets by management (Gill, 1990). While the defense firms were making a profit of 15% on invested net assets in 1997, it declined to 9,8% in 2001. Although the decline on operating return on sales is only 0,3% between 1997-2001, the relatively high decline of 5,2% on ROA resulted from the decline of 14% on asset turnover ratio.

The overall annual results of defense firms using all data for the five-year period are given in Table-8 and the results with outliers eliminated are given in Table-9.

**Table 8: ROA Performance of Defense Industry**

	<b>Max.</b>	<b>Min.</b>	<b>Mean</b>	<b>Median</b>	<b>Mode</b>	<b>Std. dev.</b>
<b>OPERATING RETURN ON SALES</b>	0,364	-2,273	-0,018	0,108	-0,040	0,460
<b>NET ASSETS TO NET SALES</b>	76,66	0,116	3,443	1,023	0,490	9,692
<b>ASSET TURNOVER RATIO</b>	8,647	0,013	1,517	0,977	0,350	1,609
<b>RETURN ON ASSETS BEFORE TAXES</b>	0,857	-0,761	0,115	0,143	-0,030	0,237

(no outliers eliminated)

**Table 9: ROA Performance of Defense Industry**

	<b>Max.</b>	<b>Min.</b>	<b>Mean</b>	<b>Median</b>	<b>Mode</b>	<b>Std. dev.</b>
<b>OPERATING RETURN ON SALES</b>	0,36	-0,19	0,128	0,122	-0,040	0,122
<b>NET ASSETS TO NET SALES</b>	1,94	0,116	0,816	0,699	0,490	0,479
<b>ASSET TURNOVER RATIO</b>	3,07	0,013	1,040	0,879	0,350	0,781
<b>RETURN ON ASSETS BEFORE TAXES</b>	0,51	-0,32	0,144	0,167	-0,030	0,158

(outliers eliminated)

When the whole data is used in the calculations, the range between the calculated means and medians are so wide, the standard deviations are so high, and therefore there are outliers because of the some extreme results of different defense firms in changing years. Eliminating the outliers, it is seen that the annual return of defense firms on sales is 12,8%, the annual asset turnover ratio is 1,040 times and the annual ROA before taxes is 14,4% for the five-year period. Defense firms would have been better off to turnover the assets more than twice a year. Doing so would have resulted in a higher return on assets.

## 5.2 Return On Equity Performance

The overall annual results of defense firms using all data for the five-year period are given in Table-10 and the results with outliers eliminated are given in Table-11.

**Table 10: ROE Performance of Defense Industry**

	<b>Max.</b>	<b>Min.</b>	<b>Mean</b>	<b>Median</b>	<b>Mode</b>	<b>Std. dev.</b>
<b>OPERATING INCOME EFFECT</b>	5,960	-14,550	-0,413	-0,011	0,110	2,408
<b>NON-OPERATING INCOME EFFECT</b>	3,800	-12,520	-0,031	0,155	0,070	1,812
<b>RETURN ON COMMON EQUITY</b>	0,740	-16,770	-0,445	0,223	0,240	2,780
<b>SHORT TERM DEBT TO EQUITY</b>	20,850	0,010	2,060	1,101	0,010	3,264
<b>LONG TERM DEBT TO EQUITY</b>	15,200	0	0,994	0,190	0	2,604
<b>TOTAL DEBT TO EQUITY</b>	31,220	0,040	3,054	1,512	0,040	5,201

(no outliers eliminated)

**Table 11: ROE Performance of Defense Industry**

	<b>Max.</b>	<b>Min.</b>	<b>Mean</b>	<b>Median</b>	<b>Mode</b>	<b>Std. dev.</b>
<b>OPERATING INCOME EFFECT</b>	0,42	-0,4	0,022	0,050	0,110	0,182
<b>NON-OPERATING INCOME EFFECT</b>	0,83	-0,33	0,205	0,155	0,070	0,242
<b>RETURN ON COMMON EQUITY</b>	0,74	-0,3	0,234	0,247	0,240	0,214
<b>SHORT TERM DEBT TO EQUITY</b>	5,04	0,01	1,334	0,943	0,010	1,260
<b>LONG TERM DEBT TO EQUITY</b>	0,48	0	0,151	0,119	0,000	0,136
<b>TOTAL DEBT TO EQUITY</b>	4,95	0,04	1,479	1,070	0,040	1,278

(outliers eliminated)

ROE is a comprehensive indicator of a firm's performance because it provides an indication of how well managers are employing the funds invested by the firm's shareholders to generate returns (Palepu, 1996).

In an effort to gain as much insight as possible into the industry's performance, the non-operating effects are separated from normal activities. The operating income effect is the operating return less interest expense and taxes divided by equity. The non-operating income effect includes the gain and losses from non-operating and extraordinary activities.

In the test period, ROE ratios, calculated by using whole data, display a wide range from -1600,77% to 74% since two of the defense firms in the sample had high losses in 1998 as a result of large increases in their interest expenses. The maximum debt to equity ratios also belong to both firms.

Eliminating the outliers, over the five-year period the sample had an average annual ROE of 23,4% and 20,5% of the return resulted from non-operating activities.

The operating return on equity of 2,2% was too low since the high interest expenses used in operating activities affected the return unfavorably.

Debt to equity ratio, indicating the firm's capital structure, is also a measure of the financial risk associated with the common stocks. This ratio with some shortcomings is widely used as an indicator of lenders' risks (Lev, 1974). In general accepted standard for this ratio is one (Sevilengül, 1993). If the ratio is high, it means that lenders are having greater risk and firm's ability to obtain money from outside resources is limited. On the contrary, if the ratio is low it can be assumed that the firm has flexibility to get credit and lenders' have less risk, but still the firm is not reaching its full profit potential.

The sample had an average annual total debt to equity ratio of 1,479 that is higher than the general accepted standard of 1 and this resulted from the high level of short-term debt to equity ratio of 1,334. The average annual long-term debt to equity ratio over the five-year period is only 0,151. This indicates that the defense firms, as the other firms in different industries in Turkey, have difficulties in finding long-term debts and they have to rely on short-term debts heavily to finance their activities and to be compatible in the market, but this financing strategy make the defense firms face with financing problems in the following years.

Making an analysis to understand the effect of sole operating activities, a trend analysis is shown in Table-13 and Table-14. The percentage change in sales, operating and non-operating income are examined between the years 1997-2001. In this analysis, earnings from operating activities include sole earnings from operating activities and earnings from non-operating activities include gains and losses from non-operating activities and interest expenses. Wholesale price index (total-general) is used as the deflator in the calculations.

Table-12: Annual Earnings (million TL)

<b>INDUSTRY</b>	<b>1997</b>	<b>1998</b>	<b>1999</b>	<b>2000</b>	<b>2001</b>
NET SALES	478007	444084	402910	491360	463031
COST OF GOODS SOLD	-340369	-323542	-289165	-375326	-340886
OPERATING EXPENSES	-47437	-57451	-69344	-75663	-63935
EARNINGS FROM OPERATING ACT.	90201	63091	44401	40371	58210
EARNINGS FROM NON-OPER. ACT.	10191	23537	31248	4678	-27737
EXTRAORDINARY EARNINGS	-3579	-5375	-4897	-2363	-8992
TAXES	-45773	-33485	-25013	-18471	-12618
NET EARNINGS AFTER TAXES	51040	47769	45739	24215	8863

Data is deflated by using wholesale price index (1994)

Table-13: Vertical Analysis

<b>INDUSTRY</b>	<b>1997</b>	<b>1998</b>	<b>1999</b>	<b>2000</b>	<b>2001</b>
NET SALES	100%	100%	100%	100%	100%
COST OF GOODS SOLD	-71,21%	-72,86%	-71,77%	-76,39%	-73,62%
OPERATING EXPENSES	-9,92%	-12,94%	-17,21%	-15,40%	-13,81%
EARNINGS FROM OPERATING ACT.	18,87%	14,21%	11,02%	8,22%	12,57%
EARNINGS FROM NON-OPER. ACT.	2,13%	5,30%	7,76%	0,95%	-5,99%
EXTRAORDINARY EARNINGS	-0,75%	-1,21%	-1,22%	-0,48%	-1,94%
TAXES	-9,58%	-7,54%	-6,21%	-3,76%	-2,73%
NET EARNINGS AFTER TAXES	10,68%	10,76%	11,35%	4,93%	1,91%

Table-14: Horizontal Analysis

<b>INDUSTRY</b>	<b>1997</b>	<b>1998</b>	<b>1999</b>	<b>2000</b>	<b>2001</b>
NET SALES	100%	92,90%	84,29%	102,79%	96,87%
COST OF GOODS SOLD	100%	95,06%	84,96%	110,27%	100,15%
OPERATING EXPENSES	100%	121,11%	146,18%	159,50%	134,78%
EARNINGS FROM OPER. ACT.	100%	69,95%	49,22%	44,76%	64,53%
EARNINGS FROM NON-OPER. ACT.	100%	230,96%	306,61%	45,90%	-272,16%
EXTRAORDINARY EARNINGS	-100%	-150,19%	-136,84%	-66,03%	-251,27%
TAXES	100%	73,15%	54,65%	40,35%	27,57%
NET EARNINGS AFTER TAXES	100%	93,59%	89,61%	47,44%	17,36%



In the test period, sales of defense firms had a fluctuating trend. Although the highest sales level of 102,79% occurred in 2000, the least earnings level of 44,76% from operating activities also occurred in the same year because of the highest costs of goods sold and operating expenses during the period. Since the defense firms, especially electronics firms, import raw materials and machines from abroad, the increase in exchange rates also caused an increase in total costs of the defense firms and resulted as a decline in profit margins. Although the earnings from operating activities, with the level of 64,53%, increased slightly in 2001, the net earnings after taxes had a declining trend over the test period since the earnings from non-operating activities declined to the negative level of -272,16%. In fact, until 1999, earnings from non-operating activities had a positive and increasing trend but, after the 1999 crisis, it dropped dramatically to negative levels. This is mainly because of high interest expenses as a result of short-term debt financing strategy that defense firms had used before the crisis. The high increase in exchange rates doubled the short-term debts and interest expenses, therefore, the defense firms could not cover the interest expenses and found themselves in financial distress. The extraordinary earnings were in negative values during the five-year period and it declined to the negative level of -251,27% in 2001. The lowest level of earnings after taxes also occurred in 2001 with the level of 17,36%.

### **5.3 Sustainable Growth**

The sustainable growth rate of defense industry is calculated and the effect of inflation on the sustainable growth rate is determined first. Then, the actual growth rate on sales, assets, debt and equity are calculated. The first two items, sales and

assets, are used to assess growth. The next two items, debt and equity, are used to see how defense firms decided to finance growth that is either higher or lower than the sustainable growth rate. The sustainable growth rate of defense industry with/out inflation effect and the actual growth rate on sales, assets, debt and equity are shown in Table-15 and Table-16.

**Table-15: Annual Growth Rate for The Five-Year Period**

<b>INDUSTRY</b>	<b>Max.</b>	<b>Min.</b>	<b>Mean</b>	<b>Median</b>	<b>Mode</b>	<b>Std. Dev.</b>
<b>SUSTAINABLE GROWTH (without inflation effect)</b>	<b>2,812</b>	<b>-0,944</b>	<b>0,184</b>	<b>0,183</b>	<b>-0,080</b>	<b>0,526</b>
<b>SUSTAINABLE GROWTH (with inflation effect)</b>	<b>2,264</b>	<b>-0,967</b>	<b>-0,112</b>	<b>-0,127</b>	<b>-0,130</b>	<b>0,439</b>
<b>ACTUAL GROWTH IN SALES*</b>	2,991	-0,515	0,118	0,083	0,240	0,504
<b>ACTUAL GROWTH IN ASSETS*</b>	4,130	-0,770	0,156	0,020	0,160	0,631
<b>ACTUAL GROWTH IN SHORT-TERM DEBT*</b>	5,110	-0,870	0,261	-0,003	-0,870	0,948
<b>ACTUAL GROWTH IN LONG-TERM DEBT*</b>	4,710	-1	0,187	0,142	0	0,733
<b>ACTUAL GROWTH IN TOTAL DEBT*</b>	6,190	-0,900	0,268	0,049	-0,900	0,943
<b>ACTUAL GROWTH IN EQUITY*</b>	2,400	-0,630	0,102	-0,00291	-0,180	0,519

(no outliers eliminated)

\* Data is deflated by using wholesale price index

**Table-16: Annual Growth Rate for The Five-Year Period**

<b>INDUSTRY</b>	<b>Max.</b>	<b>Min.</b>	<b>Mean</b>	<b>Median</b>	<b>Mode</b>	<b>Std. dev.</b>
<b>SUSTAINABLE GROWTH (without inflation effect)</b>	<b>0,680</b>	<b>-0,390</b>	<b>0,191</b>	<b>0,188</b>	<b>-0,080</b>	<b>0,238</b>
<b>SUSTAINABLE GROWTH (with inflation effect)</b>	<b>0,280</b>	<b>-0,560</b>	<b>-0,112</b>	<b>-0,123</b>	<b>-0,130</b>	<b>0,171</b>
<b>ACTUAL GROWTH IN SALES*</b>	1,064	-0,515	0,051	0,068	0,240	0,341
<b>ACTUAL GROWTH IN ASSETS*</b>	0,670	-0,570	0,017	-0,003	0,160	0,255
<b>ACTUAL GROWTH IN SHORT-TERM DEBT*</b>	1,330	-0,870	0,062	-0,045	-0,870	0,519
<b>ACTUAL GROWTH IN LONG-TERM DEBT*</b>	0,520	-0,310	0,099	0,142	0	0,183
<b>ACTUAL GROWTH IN TOTAL DEBT*</b>	1,340	-0,900	0,107	0,043	-0,900	0,463
<b>ACTUAL GROWTH IN EQUITY*</b>	0,430	-0,470	-0,038	-0,032	-0,180	0,200

(outliers eliminated)

\* Data is deflated by using wholesale price index

The financial definition of sustainable growth is the rate of growth in sales, assets, debt and equity that can be sustained indefinitely without management altering the debt-to-equity relationship, the return-on-equity performance or the dividend payout rate (Gallinger, 2000). Understanding a firm's sustainable growth rate provides a peek into whether the firm is likely to encounter financial distress in the future. Firms that file bankruptcy are the ones, with minor exceptions, which grow too quickly. The primary reason for these companies' troubles is that their profits and cash flows failed to follow their strong sales growth.

According to Higgins' estimation that is based on his research on U.S. manufacturing in 1974, the real sustainable growth declines by 2.2 percent for every 5 percent increase in the rate of inflation. Higgins concluded that:

“Roughly speaking, the real sustainable growth rate declines by 2,2% for every 5% increase in the inflation rate. With approximate 10% inflation rate in 1974, real sustainable growth falls from an inflation-free 10,5% to 6,1%. For comparison, the actual real growth in manufacturing sales in 1974 was 3,8%, while figures for the prior two years were 8,2% and 8,4%” (Higgins 1981, p. 38).

Using Higgins' Formulation (Expression 1), the annual sustainable growth rate (without inflation effect) of defense industry for the five-year period is 18,4%. When we consider the effect of inflation on sustainable growth rate, using Higgins' Formulation (Expression 2), as it is expected, the inflation has an unfavorable effect on growth and the annual sustainable growth rate of the defense industry declines to -11,2%. Since the annual inflation rate for the five-year period is 64%, according to Higgins' estimation, it should create a decline of 28,2% on sustainable growth rate. The real decline on the sustainable growth rate of defense firms is 29,6% and that is approximately consistent with Higgins estimation. Although the real sustainable

growth rate of defense industry without inflation effect is acceptable, the high inflation rate diminishes the real sustainable growth rate of defense industry and defense firms financially get in trouble to survive.

The real sustainable growth rate of defense industry is less than both the actual growth for sales and assets in the test period that is, defense industry has grown faster than its annual sustainable growth rate during the five-year period. Defense industry could sustain a negative annual growth rate of 11,2% far into the future without encountering financial difficulties. Actual growth rates exceeded the -11,2% sustainable rate. This indicates that, without access to new capital, the defense firms will probably face financial difficulties in the near future. If capital suppliers dry up, the firms must slow their actual growth, increase their sustainable growth, or a combination of these two approaches.

The next two items, debt and equity, are used to see how management decided to finance growth that is either higher or lower than the sustainable growth rate. Defense firms' primary source of financing is debt, specifically short-term debt, to support the higher than sustainable growth rate. The annual actual growth rate in excess of sustainable growth was supported by a 10,7% annual increase in debt financing. The annual increase in equity financing of defense firms for the five-year period is -3,8% that is, defense firms reduced the level of equity financing and used a large dose of debt financing, compared to equity financing, to support the growth in sales and assets.

The overall conclusion to draw from the sustainable growth analysis is that most of the defense firms are facing serious financial distress today and will probably continue to face financial difficulties in the near future. The firms must slow their actual growth or increase their sustainable growth and should reduce the level of debt

financing; especially short-term debt financing and should increase their equity financing. Government should also support national defense firms by providing long-term debt to make them survive in an inflationary environment.

#### 5.4 Panel (Pool) Data Analysis

A Firm-level panel data analysis is used for assessing the impact of some financial ratios, GNP growth and inflation on actual growth rate of defense firms. The model to be estimated is:

$$Y_{it} = \alpha + X_{it}\beta + \upsilon_i + \varepsilon_{it} \quad (3)$$

for  $i$  units,  $i=1,\dots,n$  and for each  $i$ ,  $t=1,\dots,T$  of which  $T_i$  periods are actually observed. Since we would like to utilize the information that certain sets of observations came from certain units, the fixed-effects model is used that we are interested in the coefficients  $\beta$  and  $\alpha$ . We also assume that the  $\upsilon_i$  are fixed quantities. In other words, we model

$$Y_{it} = (\alpha + \upsilon_i) + X_{it}\beta + \varepsilon_{it} \quad (4)$$

allowing for different intercepts for our units, but constraining the slopes to be the same across units.

For assessing the impact of financial ratios, GNP growth and inflation on growth, the following pooled models are specified. Dummy variables are used to determine the yearly effect on growth:

$$GRit = \alpha + OPIit \beta_1 + NOPIit \beta_2 + SDERit \beta_3 + LDERit \beta_4 + TAGit \beta_5 + \varepsilon_{it} \quad (5)$$

$$GRit = \alpha + Y97\beta_1 + Y98\beta_2 + Y99\beta_3 + Y00\beta_4 + Y01\beta_5 + \varepsilon_{it}$$

$$GRit = \alpha + GNP\beta_1 + INF\beta_2 + \varepsilon_{it}$$

- GRit represents the real sale growth, the dependent variable,
- OPit is the increase in operating income,
- NOPIit is the increase in non-operating income,
- SDERit is the short-term debt to equity ratio,
- LDERit is the long term debt to equity ratio,
- TAGit is the total asset growth,
- GNPit is the increase in GNP
- INFit is the annual Whole Sale Price Index rate of inflation.

Y98,...,Y01 are the dummy variables used to determine the yearly effect on growth. The defense firms in the sample are divided into four groups according to their sales volume: Group-1: sales greater than TL200 trillion; Group-2: between TL100 and TL200 trillion; Group-3: between TL20 and TL100 trillion; Group-4: less than TL20 trillion. There are three outliers in sales growth rates of the whole sample that adversely affect the analysis and thus are dropped. The Stata outputs for the descriptive statistics of the variables are in Table-17 and test results using fixed effects model are in Table-18.

**Table-17: Descriptive Statistics of Variables**

Variable	Obs.	Mean	Std. dev.	Min.	Max.
GR	80	0,051	0,341	-0,515	1,064
OPI	80	-0,614	4,659	-26,423	13,812
NOPI	80	0,320	2,079	-6,597	8,155
SDER	80	2,113	3,342	0,014	20,847
LDER	80	0,994	2,669	0	15,196
TAG	80	0,137	0,613	-0,768	4,131
GNP	80	0,006	0,071	-0,094	0,083
INF	80	0,640	0,117	0,511	0,821

**Table 18: Fixed-effects (within) regression**  
Group variable (i) : id

Number of obs = 80  
Number of groups = 4

R-sq: within = 0,2236  
between = 0,0007  
overall = 0,2072

Obs per group: min = 15  
avg = 20  
max = 23

F(5,71) = 4,09  
Prob > F = 0,0025

GR	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
OPI	<b>0,0319</b>	0,0081	3,95	<b>0,000</b>	0,0158 0,0481
NOPI	0,0237	0,0192	1,23	0,222	-0,0146 0,0620
SDER	<b>-0,0291</b>	0,0137	-2,12	<b>0,037</b>	-0,0565 -0,0018
LDER	0,0167	0,0184	0,91	0,366	-0,0199 0,0534
TAG	0,0013	0,0626	0,02	0,983	-0,1236 0,1263
cons	0,1081	0,0430	2,51	0,014	0,0222 0,1940

In terms of goodness to fit, it is the R-sq within that is directly relevant; our R-sq is 0,2236. If we use these estimates to fit the overall data, our R-sq is 0,2072.

As it is expected, the operating income has a positive effect on defense firms' growth with the coefficient of 0,0319 that is statistically significant. The coefficient is small since the high interest expense reduces the positive effect of operating income on growth. The non-operating income also has a positive effect on growth with the coefficient of 0,0237, however this positive effect is not statistically significant.

The short-term debt to equity ratio has a negative effect on defense firms' growth with the coefficient of  $-0,0291$  that is statistically significant ( $p=0,037$ ). The defense firms relied on short-debt financing and reduced the level of equity financing; therefore they suffered from the high interest expenses that diminished the defense firms' growth in the test period.

The long-term debt to equity ratio and total asset growth have positive effects on growth, however these effects are not statistically significant. We also wanted to look at yearly effect by using dummy variables (Table-19). Except the year 2000, other three years have negative effects on growth, however these effects are not statistically significant, either. For assessing the impact of both GNP growth and inflation on defense firms' growth, we built a regression model and we found that both items do not have significant effects on growth (Table-20). Since the operating income has positive effect on growth that is statistically significant, the operating income of defense firms is used as the dependent variable in a regression model to examine the effect of GNP growth and inflation on operating income. The Stata output for the regression model is in Table-21.

<b>Table 19: Fixed-effects (within) regression</b>		<b>Number of obs</b>	=	80
<b>Group variable (i) : id</b>		<b>Number of groups</b>	=	4
<b>R-sq:</b>	<b>within</b>	=	0,0475	<b>Obs per group:</b> min = 15 avg = 20 max = 23
	<b>between</b>	=	0,1223	
	<b>overall</b>	=	0,0480	
		<b>F(4,72)</b>	=	0,90
		<b>Prob &gt; F</b>	=	0,4700

GR	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
Y98	-0,0509	0,1246	-0,41	0,684	-0,2993 0,1975
Y99	-0,0182	0,1207	-0,15	0,880	-0,2589 0,2225
Y00	0,0276	0,1207	0,23	0,820	-0,2131 0,2683
Y01	-0,1864	0,1249	-1,49	0,140	-0,4355 0,0627
cons	0,0939	0,0867	1,08	0,282	-0,0789 0,2668



**Table 20: Fixed-effects (within) regression**  
**Group variable (i) : id**

**Number of obs** = 80  
**Number of groups** = 4

**R-sq:**      **within** = 0.0343  
               **between** = 0.1081  
               **overall** = 0.0346

**Obs per group:** **min** = 15  
                          **avg** = 20  
                          **max** = 23

**F(2,74)** = 1,32  
**Prob > F** = 0,2746

GR	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
<b>GNP</b>	0,9974	0,6160	1,62	0,110	-0,2300 2,2248
<b>INF</b>	-0,2977	0,3669	-0,81	0,420	-1,0288 0,4333
<b>cons</b>	0,2340	0,2346	1	0,322	-0,2335 0,7017

**Table 21: Fixed-effects (within) regression**  
**Group variable (i) : id**

**Number of obs** = 80  
**Number of groups** = 4

**R-sq:**      **within** = 0,1149  
               **between** = 0,0863  
               **overall** = 0,1097

**Obs per group:** **min** = 15  
                          **avg** = 20  
                          **max** = 23

**F(2,74)** = 4,80  
**Prob > F** = 0,0109

OPI	Coef.	Std. Err	t	P>t	[95% Conf. Interval]
<b>GNP</b>	<b>24,0098</b>	7,8305	3,07	<b>0,003</b>	8,4071 39,6125
<b>INF</b>	-4,5269	4,6639	-0,97	0,335	-13,8201 4,7661
<b>cons</b>	2,1036	2,9832	0,71	0,483	-3,8406 8,0479

In terms of interpretation, GNP had a positive effect on operating income in the test period with the coefficient of 24,0098 that is statistically significant. The inflation had a negative effect on operating income, however that is not statistically significant.

## **CHAPTER 6**

### **CONCLUSION AND DISCUSSIONS**

During the last 50 years, the single largest category of spending for many Western governments was the national defense. That allocation came about in the course of the Cold War, which rapid technical development and immediate preparedness were considered more important than economic efficiency. Redundant capabilities and inefficient practices were tolerated. The analysis of efficient defense production was not intensively pursued.

In the very different circumstances that now prevail, the industrial infrastructure that currently builds the systems used by Western military establishments is in a transition period. The U.S. defense industry saw so many mergers and acquisitions during the 1990s. This consolidation process was actively encouraged by the U.S. Government with the aim of reducing procurement costs and sustaining a viable defense industrial base during a period of declining defense budgets. In response, companies either specialized in defense or exited the business altogether (James, 2000). The consolidation process has led to major changes in the structure of the U.S. defense industry and the industry structure that has emerged is characterized by considerable concentration. Thus, consolidation has seen the emergence of three giant defense companies—Lockheed-Martin, Boeing, and Raytheon—whose overall size and breadth of business activities dwarf their competitors in the United States and Europe (Table- 22).

**Table-22: Top Defense Firms in 2000 by Defense Sales**

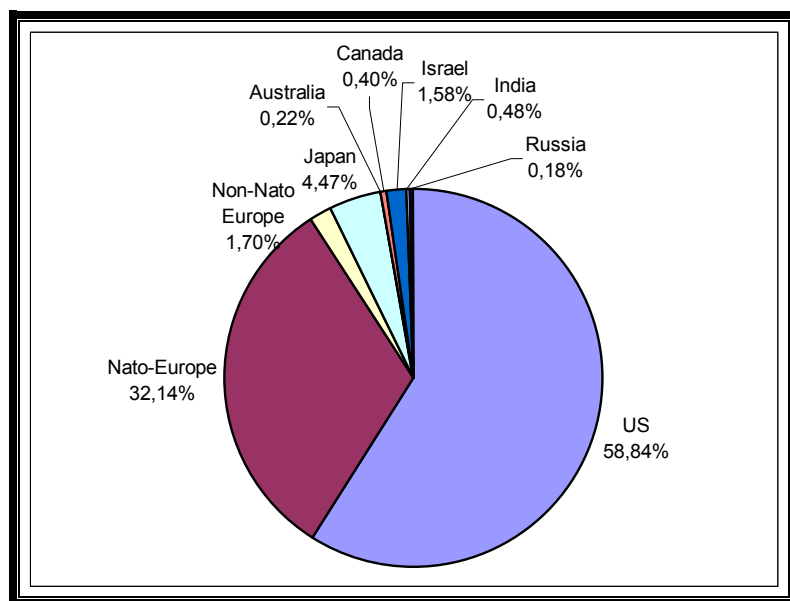
<b>COMPANY</b>	<b>DEFENSE SALES IN 2000 (\$ Billion)</b>
Lockheed Martin (US)	18.00
Boeing (US)	17.00
Raytheon (US)	14.00
BAE Systems (UK)	13.2
General Dynamics (US)	6.5
Northrop Grumman (US)	5.6
(EADS) (France, Germany & Spain)	4.6
THALES (FR)	4.3

Source: *Defense News* (2001)

The emergence of the U.S. industry giants has affected European defense firms to consolidate in an effort to create firms of a size thought necessary to compete in the new industry structure. The year 1999 saw consolidation in Europe leading to the emergence of two companies that will rival the leading U.S. companies in terms of defense sales. The creation of BAE Systems from the merger of British Aerospace and GEC Marconi Electronic Systems created a UK company with defense sales of more than \$13 billion, making it the fourth largest defense contractor in the world after Raytheon. Equally, the planned merger of U.S.-German DASA with Aerospatiale-Matra of France and CASA of Spain to form European Aeronautics Defence and Space (EADS) will create a company with defense sales of almost \$4,6 billion. These recent consolidation moves mean that three of the eight largest defense companies in the world are now European. However, the U.S. defense industry is still the premier global producer of a variety of defense systems, the clear world leader in key systems integration skills and specialized technologies

(Flamm, 2000). It accounts for roughly half of world exports of military equipment. The United States' weapons procurement budget exceeds the combined total of all its European NATO allies (Markusen, 2000). Despite large cutbacks in U.S. military spending, the U.S. defense industry dominates the global market. American industrial hegemony in armaments is easily visible in 2000 defense sales data compiled for the 100 largest defense suppliers worldwide, shown in Figure 1. U.S. suppliers accounted for almost 60 percent of \$141 billion in global sales within this elite set of companies, compared to roughly one-third for European suppliers, 4.5 percent for Japanese companies, 2.0 percent for Israeli firms, and about 0.2 percent for Russia.

**Figure 1: Share of Defense Sales by Top 100 Defense Firms Worldwide by National Origin of Company**



Source: *Defense Week* (2001)

Today the Turkish defense industry, if allocated enough funds, is capable of meeting a significant part of the requirements of the Turkish Armed Forces. Both systems produced for the Turkish Armed Forces and the success of Turkish companies on the international market reveal that Turkish defense technology is advanced and can compete in the international markets. However, development of the Turkish defense industry has not reached to the desired level as of yet and has still crucial problems.

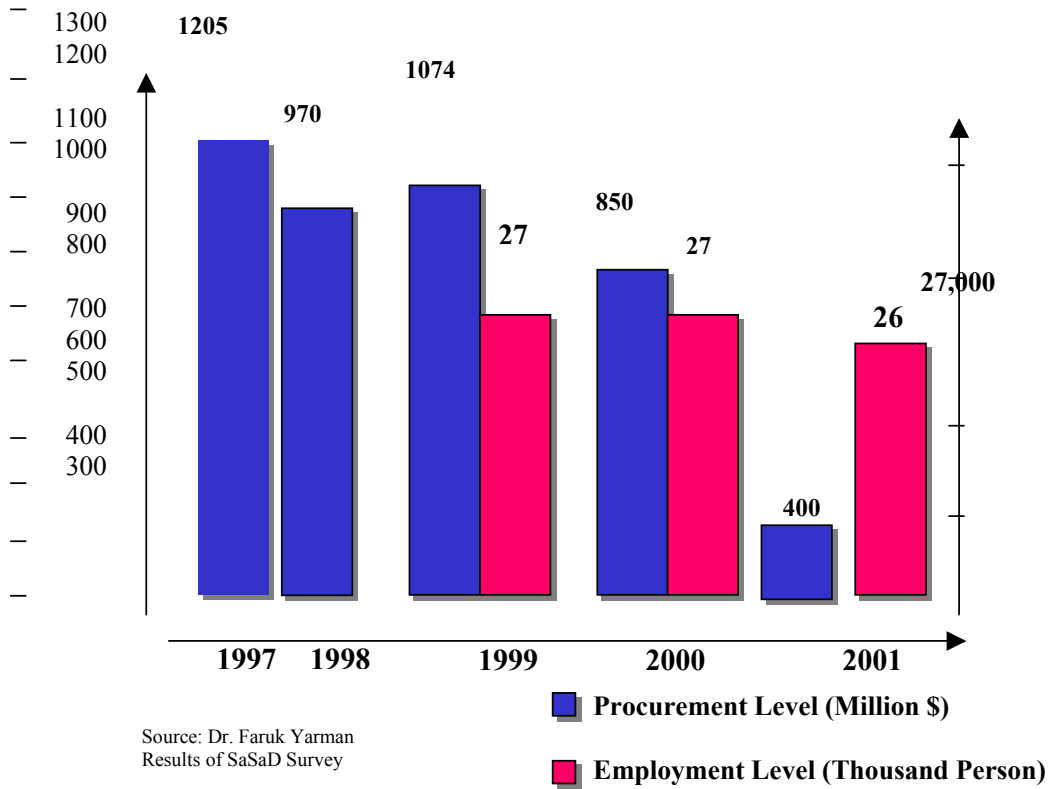
The level of employment in the Turkish Defense Industry is not proportional with the size of the defense market. When the defense procurement levels are examined between 1997 and 2001, it is seen that it drops dramatically from \$1,2 billion to one third of it, \$400 million. However, there is approximately no change in the employment level (Table-23). Although there is a huge decline in domestic procurement levels in the five-year period, that is similar to the decline in world defense market ten years ago, the employment level has a slight change of  $\pm 4\%$  and it is approximately stable with 25000 personnel in the five-year period. This unreactive behavior in the employment level of defense industry to the defense market shrinkage shows that while the national defense industry is trying to be protected, it becomes like a public sector with its high employment levels.

When the employment groups are examined, the number of Engineers is only 1/6 of total employment that is our defense industry does not give importance to the research and development activities, but it mainly focuses on production-oriented activities.

**Table-23: Procurement and Employment Levels of Turkish Defense Sector**

**Turkey**  
**Defense Sector Employment**  
*(Personnel Changes in The Last Three Years)*

<b>Engineer</b>	<b>: 4270 ± 85 (%2)</b>
<b>Technician</b>	<b>: 4400 ± 200 (%2)</b>
<b>Management</b>	<b>: 4250 ± 50 (%3)</b>
<b>Worker</b>	<b>:12000 ± 650 (%5)</b>
<b>TOTAL</b>	<b>24900 ± 985 (%4)</b>



Thus, R&D budget of defense industry is only \$40 million that is less than 1/20 of western countries' expenses. This indicates that R&D activities of Turkish defense products are mainly done abroad by the allied countries and as a result, the basic principle in our defense policies of meeting the defense requirements of Turkey with domestic equipment whenever possible is not succeeded.

Another indication that can be made from Table-23 is, the number of management level personnel is approximately equal to the number of engineers. That reveals another serious question about the management systems efficiency of Turkish Defense Firms.

When we look at the Table-24, we can see that the R&D budgets of world defense industries change in a range of  $\frac{1}{4}$  and  $\frac{3}{4}$  of their arms procurement budgets.

**Table-24: Arms Procurement and R&D Budgets of Western Countries**

<b>Country</b>	<b>Arms Procurement (Billion \$)</b>	<b>R&amp;D</b>	<b>%</b>
<b>US</b>	<b>47</b>	<b>35</b>	<b>74</b>
<b>UK</b>	<b>8.2</b>	<b>3.9</b>	<b>48</b>
<b>France</b>	<b>5.2</b>	<b>3.1</b>	<b>60</b>
<b>Germany</b>	<b>3.7</b>	<b>1.2</b>	<b>32</b>
<b>Italy</b>	<b>1.9</b>	<b>0.5</b>	<b>26</b>
<b>Turkey</b>	<b>0.36</b>	<b>0.012</b>	<b>3</b>

*Source: Defense News (2002)*

This result also indicates that Turkey is protecting its production-based defense industry structure against the fluctuations on national and international demands but in fact, it should build, improve and protect R&D activities that are based on national science and technology.

Consequently, national defense sector seems to be production based, dependent on western countries and inefficient as the public sector. However, it is possible to change this situation in a short period of time by improving R&D based activities insistently in a coordination of university-industry cooperation. Only in this way, the national defense sector can produce the technologies that our defense strategy needs.

Having a strong defense industry is an important necessity of Turkey. Moreover, being a strong industry requires an adequate financial performance. Defense firms could be forced to have good financial performance and this will develop the national defense industry. Therefore, this study analyzed the financial performance of defense firms and identified the real and sustainable growth rate of defense firms by using Higgins' model between the years 1997-2001. The study also examined how defense firms financed growth in sales and assets and how they should finance growth in accordance with the sustainable growth rate. The factors that affect the growth rate of the defense firms were also clarified.

The financial performance of defense industry had a declining trend in the five-year period. While the net earnings after taxes was slightly declining by 10,39% between 1997-1999, it dramatically declined by 52,56% in 2000 and by 82,64% in 2001. This is mainly because of the high interest expenses as a result of short-term debt financing strategy that defense firms had used heavily before the 1999 crisis. Although the earnings from operating activities increased in 2001, the net earnings



after taxes had declined to its minimum value because of high increases in the interest expenses. Defense industry has grown faster than its annual sustainable growth rate during the five-year period. Defense firms' primary source of financing is debt, specifically short-term debt, to support the higher than sustainable growth rate. They reduced the level of equity financing and used a large dose of debt financing, compared to equity financing, to support the growth in sales and assets.

The defense firms are facing serious financial distress today and will probably continue to face financial difficulties in the near future. As a result of this added debt load, some companies now face a declining interest expense coverage ratio. In order to sustain the business, the defense firms must slow their actual growth or increase their sustainable growth and should reduce the level of debt financing; especially short-term debt financing and should increase their equity financing. Although the real sustainable growth rate of defense industry without inflation effect is acceptable, the high inflation rate diminishes the real sustainable growth rate of defense industry to negative values and reduced the sustainable growth rate by 29,6%.

The operating income had a positive effect on defense firms' growth that is statistically significant. The short-term debt to equity ratio had a negative effect on defense firms' growth that is statistically significant ( $p=0,037$ ). The defense firms relied on short-debt financing and reduced the level of equity financing; therefore they suffered from the high interest expenses that diminished the defense firms' growth in the test period. Except the year 2000, other three years had negative effects on growth, however these effects are not statistically significant. GNP growth and inflation did not have significant effects on growth. Nevertheless, GNP growth had a positive effect on operating income of the defense firms that is statistically

significant in the test period. The inflation had a negative effect on operating income that is not statistically significant. Therefore, these facts are collectively a warning primarily for the industry but also for the Government. It is imperative that both industry and the Government customer work cooperatively to create a healthier environment and a more stable industrial base. It is essential for both economic and national security reasons.

## APPENDIX

(a) Ratios used in ROA Analysis:

$$\text{Operating Return On Sales} = \frac{\text{Operating Income}}{\text{Net Sales}}$$

$$\text{Net Assets to Net Sales} = \frac{\text{Total Assets} - \text{Accounts Payable} - \text{Accruals}}{\text{Net Sales}}$$

$$\text{Asset Turnover Ratio} = \frac{\text{Net Sales}}{\text{Net Assets}}$$

$$\text{Return On Assets Before Taxes} = \text{Operating Return On Sales} * \text{Asset Turnover Ratio}$$

(b) Ratios Used in ROE Analysis

$$\text{Operating Income Effect} = \frac{\text{Operating Income} - \text{Taxes} - \text{Interest Expense}}{\text{Equity}}$$

$$\begin{aligned} \text{Non Operating Income Effect} &= \frac{(\text{Earnings} - \text{Expenses From Non Operating Activities})}{\text{Equity}} \\ &+ \frac{(\text{Extraordinary Earnings} - \text{Expenses})}{\text{Equity}} \end{aligned}$$

$$\text{Return On Common Equity} = \frac{\text{Net Earnings}}{\text{Equity}}$$

## TC MERKEZ BANKASI ELEKTRONİK VERİ DAĞITIM SİSTEMİ

Fiyat Endeksi(Toptan Eşya) (1994=100) (DİE) (Aylık)

YILLIK,SABİT,Orijinal Gözlem

TP.FG.T01.TOP.1

1994	100.2612
1995	186.0358
1996	327.2252
1997	595.8134
1998	1023.7080
1999	1568.4452
2000	2370.3869
2001	3831.1092
2002	5751.1280
2003	6840.7000

SEÇİLEN SERİLERİN AÇIKLAMALARI

TP.FG.T01.TOP.1: (Toplam)1.GENEL

COMPANIES	YEARS	SALES GROWTH	OPR. INCOME	NON-OPR.INCOME	SH.T.DEBT/EQ.	LG.T. DEBT/EQ.	T.ASSETGROWTH	GNPGROWTH	INFLATION
ALCATEL	1997	0,083	1,313	0,412	0,743	0,078	0,069	0,083	0,821
ALCATEL	1998	0,190	-0,466	-0,077	1,258	0,107	0,295	0,039	0,718
ALCATEL	1999	-0,087	-2,568	0,914	2,046	0,297	0,164	-0,061	0,532
ALCATEL	2000	0,006	-0,387	-0,499	2,530	0,480	-0,261	0,063	0,511
ALCATEL	2001	0,244	-1,408	2,220	11,402	1,358	0,288	-0,094	0,616
ASELSAN	1997	0,144	-0,472	4,582	1,537	0,402	0,086	0,083	0,821
ASELSAN	1998	0,010	-0,152	0,003	1,211	0,721	0,044	0,039	0,718
ASELSAN	1999	0,177	0,078	0,247	1,683	0,688	0,196	-0,061	0,532
ASELSAN	2000	0,134	0,167	-1,362	2,436	0,503	0,131	0,063	0,511
ASELSAN	2001	0,151	-1,661	-0,446	2,722	1,855	0,002	-0,094	0,616
ASPILSAN	1997	0,817	7,758	0,412	0,320	0,087	0,563	0,083	0,821
ASPILSAN	1998	-0,151	-1,749	0,520	0,357	0,126	-0,101	0,039	0,718
ASPILSAN	1999	-0,275	-0,080	0,096	0,222	0,141	-0,110	-0,061	0,532
ASPILSAN	2000	0,130	1,673	-0,692	0,176	0,211	-0,212	0,063	0,511
ASPILSAN	2001	-0,334	-2,478	0,515	0,185	0,296	-0,168	-0,094	0,616
ÇANSAŞ	1997	-0,164	-1,065	1,337	1,709	0,448	-0,008	0,083	0,821
ÇANSAŞ	1998	0,332	-0,383	3,433	4,064	1,740	0,136	0,039	0,718
ÇANSAŞ	1999	0,471	0,535	0,639	2,278	0,382	-0,214	-0,061	0,532
ÇANSAŞ	2000	-0,318	-0,451	-1,188	2,282	0,027	-0,100	0,063	0,511
ÇANSAŞ	2001	-0,515	-0,058	-2,339	2,700	0,025	0,020	-0,094	0,616
DITAS	1997	0,039	-3,888	0,840	0,509	0,000	0,775	0,083	0,821
DITAS	1998	-0,083	2,634	-0,341	0,187	0,000	-0,293	0,039	0,718
DITAS	1999	-0,194	-1,659	1,584	0,902	0,000	0,642	-0,061	0,532
DITAS	2000	0,362	2,795	-0,924	0,564	0,000	-0,298	0,063	0,511
DITAS	2001	0,170	2,318	-4,086	0,368	4,039	2,179	-0,094	0,616
HAV.RAD.	1997	-0,403	0,543	-0,230	16,160	13,198	-0,178	0,083	0,821
HAV.RAD.	1998	-0,311	-1,630	-6,597	2,013	15,196	0,600	0,039	0,718
HAV.RAD.	1999	1,064	0,657	1,102	0,352	8,772	-0,146	-0,061	0,532
HAV.RAD.	2000	-0,284	0,749	-0,388	0,076	0,190	-0,575	0,063	0,511
HAV.RAD.	2001	0,484	1,944	0,695	0,100	0,197	0,186	-0,094	0,616
HAV.TEK.	1997	-0,368	-0,307	0,358	20,847	10,376	-0,394	0,083	0,821
HAV.TEK.	1998	0,888	-1,078	-0,016	5,787	3,329	-0,768	0,039	0,718
HAV.TEK.	1999	-0,508	4,119	0,837	10,175	0,841	0,319	-0,061	0,532
HAV.TEK.	2000	0,329	0,022	1,289	0,426	0,320	-0,540	0,063	0,511
HAV.TEK.	2001	-0,273	-1,478	1,972	1,050	0,449	0,313	-0,094	0,616
İŞBİR	1997	0,204	1,596	-0,300	2,933	0,126	0,794	0,083	0,821
İŞBİR	1998	-0,074	-0,928	-0,422	2,844	0,142	-0,025	0,039	0,718
İŞBİR	1999	0,239	13,812	4,130	2,766	0,092	0,748	-0,061	0,532
İŞBİR	2000	0,160	-0,821	-0,369	4,795	0,153	0,229	0,063	0,511
İŞBİR	2001	-0,386	-15,052	8,155	5,295	0,254	-0,414	-0,094	0,616

COMPANIES	YEARS	SALESGROWTH	OPR. INCOME	NON-OPR.INCOME	SH.T.DEBT/EQ	LG.T.DEBT/EQ	T.ASSETGROWTH	GNPGROWTH	INFLATION
Mercedes-Benz	1997	0,215	-0,132	1,986	3,152	0,165	0,202	0,083	0,821
Mercedes-Benz	1998	-0,216	-1,171	0,420	2,235	0,172	-0,132	0,039	0,718
Mercedes-Benz	1999	-0,285	-9,996	-0,127	2,443	0,221	-0,044	-0,061	0,532
Mercedes-Benz	2000	0,550	1,046	-0,092	1,556	0,212	-0,064	0,063	0,511
Mercedes-Benz	2001	-0,355	-26,423	-0,523	2,302	0,280	-0,079	-0,094	0,616
NETAŞ	1997	0,167	0,373	-0,876	0,611	0,119	-0,148	0,083	0,821
NETAŞ	1998	-0,212	-0,582	-4,399	0,532	0,108	-0,145	0,039	0,718
NETAŞ	1999	0,140	-0,749	3,146	1,197	0,162	0,316	-0,061	0,532
NETAŞ	2000	0,032	2,787	-0,252	0,889	0,128	-0,151	0,063	0,511
NETAŞ	2001	-0,340	-0,390	-0,689	1,101	0,093	-0,050	-0,094	0,616
OTOKAR	1997	-0,289	-0,535	-0,611	1,411	0,676	-0,060	0,083	0,821
OTOKAR	1998	0,417	4,862	-2,769	2,650	0,580	0,824	0,039	0,718
OTOKAR	1999	0,179	-0,834	7,345	2,504	0,087	0,297	-0,061	0,532
OTOKAR	2000	-0,005	0,537	0,167	1,547	0,093	-0,144	0,063	0,511
OTOKAR	2001	-0,395	-15,728	2,512	2,201	0,105	0,155	-0,094	0,616
PARSAN	1997	0,239	1,467	0,577	0,418	0,213	0,207	0,083	0,821
PARSAN	1998	-0,139	-0,398	-0,087	0,641	0,215	0,268	0,039	0,718
PARSAN	1999	-0,259	-2,053	1,625	0,597	0,120	-0,166	-0,061	0,532
PARSAN	2000	0,313	1,366	-0,894	0,943	0,107	0,205	0,063	0,511
PARSAN	2001	-0,362	-6,580	1,179	0,933	1,114	-0,182	-0,094	0,616
PETLAS	1997	0,027	-0,527	0,208	0,121	0,000	-0,051	0,083	0,821
PETLAS	1998	0,131	-0,260	0,388	0,049	0,000	0,004	0,039	0,718
PETLAS	1999	0,067	0,806	-1,079	0,055	0,000	-0,070	-0,061	0,532
PETLAS	2000	-0,150	-1,870	-0,099	0,067	0,000	-0,053	0,063	0,511
PETLAS	2001	-0,244	0,285	0,031	0,058	0,000	-0,137	-0,094	0,616
ROKETSAN	1997	0,088	0,881	-0,188	3,896	0,991	4,131	0,083	0,821
ROKETSAN	1998	2,991	31,100	-1,472	1,327	1,646	-0,191	0,039	0,718
ROKETSAN	1999	-0,438	-0,760	1,383	4,665	1,891	1,264	-0,061	0,532
ROKETSAN	2000	0,634	1,028	-2,986	5,036	2,337	0,150	0,063	0,511
ROKETSAN	2001	1,213	-2,230	3,569	3,529	2,982	0,193	-0,094	0,616
TAİ	1997	0,580	3,583	-0,195	1,298	0,214	0,520	0,083	0,821
TAİ	1998	-0,231	-2,765	3,711	0,622	0,448	0,126	0,039	0,718
TAİ	1999	-0,067	-1,961	0,683	1,200	0,431	0,665	-0,061	0,532
TAİ	2000	-0,374	0,271	-0,627	0,539	0,339	-0,402	0,063	0,511
TAİ	2001	1,471	0,708	-0,232	1,082	0,304	0,168	-0,094	0,616
TEİ	1997	0,117	0,709	-0,198	0,302	0,029	0,014	0,083	0,821
TEİ	1998	0,070	-0,082	-0,155	0,247	0,064	0,026	0,039	0,718
TEİ	1999	0,377	-0,177	0,427	0,296	0,042	0,079	-0,061	0,532
TEİ	2000	0,420	1,890	-0,814	0,369	0,046	0,149	0,063	0,511
TEİ	2001	0,479	0,798	2,301	0,283	0,054	0,155	-0,094	0,616

COMPANIES	YEARS	SALES GROWTH	OPR. INCOME	NON-OPR.INCOME	SH.T.DEBT/EQ.	LG.T. DEBT/EQ.	T.ASSETGROWTH	GNPGROWTH	INFLATION
TUSAŞ	1997	-	0,341	-0,301	0,024	0,021	0,029	0,083	0,821
TUSAŞ	1998	-	-0,462	1,966	0,026	0,008	2,034	0,039	0,718
TUSAŞ	1999	0,708	-0,618	-0,224	0,050	0,013	-0,153	-0,061	0,532
TUSAŞ	2000	0,150	0,406	-0,398	0,014	0,021	-0,265	0,063	0,511
TUSAŞ	2001	0,276	-0,135	-0,217	0,036	0,033	-0,226	-0,094	0,616

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