

## COMPETITIVENESS OF DEFENSE INDUSTRY IN TURKEY

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### Abstract

*Turkey has created some opportunities for the organisations in the defense industry to generate a suitable business and to ensure its sustainability. The domestic coverage ratio of defense system need in 2010 is aimed as 50%. To achieve this target depends on the defense industry competitiveness. In this study, the development plans, strategies and foreign trade are examined. Its contribution which has an important place in the research and development investment, is not at the level expected in Turkey's economy. Turkey occupies 47<sup>th</sup> position in World Competitiveness Scoreboard, and 61<sup>st</sup> position in Global Competitiveness Index in 2009. The index factors are investigated to understand the competitiveness according to the Porter's diamond model, applied in Turkey for the first time. As a result, the competitiveness analysis of Turkish defense industry is carried out and its global place and competitive advantage are exposed. Therefore, a framework is made to introduce a guide for decision-making by using a widely-accepted model, and to contribute to the plans and strategies.*

**Key Words:** *Competitiveness, Defense Industry, Diamond Model*

**JEL Classification:** N7

### 1. INTRODUCTION

Turkey has created some opportunities for the organisations in defense industry to generate a suitable business and to ensure its sustainability. The government support is clarified with the development plans and investment programmes of the State Planning Organisation (DPT). The defense industry, including procurement, is tried to be improved with the coordination of the Undersecretariat for Defense Industries (SSM). The domestic coverage ratio of defense system need in 2010 is aimed as 50%. To achieve this target depends on the competitiveness. The competitiveness analysis of Turkish defense industry has not been carried out yet, although such analysis are available for some related sectors.

In this study, the investment plans between 1990-2010 and the foreign trade are examined according to Porter's diamond model that is applied in defense industry in Turkey for the first time. Its contribution which has an important place in the research and development (R&D) investment, is not at the level expected in Turkey's economy; and this also indicates the level of competitiveness. Besides, there are some studies carried out by the sector-related organisations.

According to Porter, all sectors are formed by five forces: Supplier power, buyer power, entry barriers and substitute threats. And, one of the tools used to analyse the competitive power is the diamond model. Its four components consist of factor conditions, demand conditions, firm strategy, structure and rivalry, and related and supported industries with government and chance as side-factors.

Turkey occupies 47<sup>th</sup> position in World Competitiveness Scoreboard (WCS), and 61<sup>st</sup> position in Global Competitiveness Index (GCI) in 2009. In this study, the factors used in the diamond model are determined in accordance with WCS and GCI. As a result, the competitiveness analysis of Turkish defense industry is carried out, and its global place and competitive advantage are exposed. Therefore, a framework is made to introduce a guide for decision-making by using a widely-accepted model, and to contribute to the plans and strategies.

## 2. COMPETITIVENESS INDEX

The GCI is developed by World Economic Forum (WEF) and is used in the Global Competitiveness Report (GCR) that measures 133 countries on the basis of 110 criteria (GCR, 2009). The WCS is published by International Institute for Management Development (IMD) as part of World Competitiveness Yearbook (WCY) that measures 57 countries on the basis of 329 criteria. (WCY, 2009).

Switzerland is in the 1<sup>st</sup> rank in GCI and in the 3<sup>rd</sup> in each of the sub-indexes for basic requirements, efficiency enhancers and innovation factors. USA is in the 2<sup>nd</sup> rank in GCI and in the 1<sup>st</sup> for efficiency enhancers and 1<sup>st</sup> for innovation factors (GCR, 2009). It can be stated that the institutions, infrastructure, higher education and training, labour market efficiency, business sophistication and innovation factors are very important for GCI. According to WCY, Singapore in 1<sup>st</sup> rank in government efficiency; Hong Kong in business efficiency; and USA in economic performance, infrastructure, and in overall efficiency (WCY, 2009). It is clear that the economy and infrastructure factors are very important for the overall efficiency. As a common result on two indexes, the factors related with the economical performance, labour market efficiency, innovation and infrastructure including education are considered as the main determining variables of competitiveness.

Turkey is in the 61<sup>st</sup> rank in the GCI, and in the 47<sup>th</sup> rank in the overall efficiency of WCY. The best GCI score is the market size; and, the worst is the labour market efficiency. The best WCY score is the management practices; and, the worst is the societal framework. Turkey benefits from its large market with GCI rank is 15. However, the employment conditions are the most severe subject to handle as it is obvious from its 120<sup>th</sup> place in the rank for the labour market efficiency. It is also helpful to look at the historical data about Turkey's GCI ranking between 2000 and 2009 in order to see the change. Turkey's place does not considerably change while the number of the countries increase (Table-1).

**Table-1: GCI Ranking of Turkey, 2000-2009**

| Year              | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 |
|-------------------|------|------|------|------|------|------|------|------|------|------|
| Ranking, GCI      | 40   | 54   | 69   | 65   | 66   | 66   | 59   | 53   | 63   | 61   |
| Number of Country | 59   | 75   | 80   | 102  | 104  | 117  | 125  | 131  | 134  | 133  |

## 3. TURKEY'S STRATEGY AND PLANS

DPT prepared the 9<sup>th</sup> Development Plan (DP) with the vision of "Turkey, a country ..., globally competitive ..." and a strategic objective of "increasing competitiveness". The other objectives are "increasing employment, strengthening human development and social solidarity, ensuring regional development, increasing quality and effectiveness in public services" (DPT, 2006:12) that are directly or indirectly related with the competitiveness objective. There are 28 sub-factors in the economic and social development axes for the vision that can be considered as compatible with the

factors used to determine the competitiveness index developed by WEF and IMD. This proves that Turkey has already had strategy and plans for increasing its competitiveness in the world. In 6<sup>th</sup> DP, the domestic production of defense systems and the communication investments on national defense and security; in 7<sup>th</sup> DP, improving the national R&D competence in the field of defense and energy; and in 8<sup>th</sup> DP, increase in competitiveness by using advanced technologies in defense and space industries are highlighted.

The strategic initiative is the Vision 2023 technology foresight conducted by the Scientific & Technological Research Council of Turkey to build a science and technology strategy with its technology roadmaps. A part of its vision is related with becoming competent on science, technology and innovation in the field of defense, aviation and space.

#### **4. DEFENSE INDUSTRY IN TURKEY**

SSM is responsible to provide solutions within international competition like procurement, reconstruction and cooperation. And one of the most important data provider is the Defense Industry Manufacturers Association which gathers the defense industry in a network. There are 88 organisations settled in 17 provinces, Adana, Ankara, Balıkesir, Bursa, Düzce, Eskişehir, Giresun, İstanbul, İzmir, Kayseri, Kırıkkale, Kocaeli, Niğde, Sakarya, Samsun, Tekirdağ, Trabzon (TOBB, 2009). There is a specific concentration of companies for informatics sector, mainly in Ankara and İstanbul. But, it is so unexpected that there is no in the highly industrialised provinces like Bolu, Denizli, Gaziantep, Mersin and Konya.

#### **5. GLOBAL COMPARISON**

To determine the level of defense industry of the countries, it is necessary to compare the data about the subject-related indicators to find the qualification. The most updated international information can be obtained from the sources like Software Engineering Institute (SEI), NATO, the Stockholm International Peace Research Institute (SIPRI); and, the national data from SSM.

##### **5.1. Capability Maturity Model Integration**

CMMI level of companies and the number of certificates are good indicators. CMMI is a process improvement approach that provides organisations with the essential elements of effective processes. Although there are 33 companies in electronics and software field, out of 88, only 6 of them operating in defense industry (Cybersoft, TAI, Koç Savunma, Koç Sistem, Ulusal CAD-GIS, Siemens, Karel, Milsoft Bilişim ve Yazılım, Tübitak MAM ve UEKAE) hold CMMI certificate, besides globally 3.064 companies (CMMI, 2010).

##### **5.2. NAMSAs contract awards**

The number of NATO Maintenance and Supply Agency (NAMSAs) contract awards owner might show the capacity and activity of Turkish companies in the supply of spare parts and arranging maintenance and repair services. According to the purchase orders awarded by NAMSAs with a value of 75.200 € and above between 01 July and 30 December, 2009, the total order value to the Turkish contractors is 71.617.604,72 €. But there are only 2 companies (construction: Ahmet Aydeniz, FEKA, Metag, Yenigün, Yüksel, Zafer, and Gemaş, Heliavias, TAI, ALA) operating in the defense industry in this list (NAMSAs, 2010).

### 5.3. Military expenditure

The military expenditure and the share of gross domestic product (GDP) can be used to compare the military activities of the countries. SIPRI produces the data of 173 countries with military expenditure on the armed forces, peacekeeping forces, defense ministries and other government agencies engaged in defense projects, the paramilitary forces and the military space activities. (SIPRI, 2009). The military expenditure and share of GDP of Turkey are given in Table-2 (SIPRI DB, 2010).

**Table-2: Military Expenditure of Turkey, [ ]=SIPRI Estimates**

| Year | \$x10 <sup>6</sup> | % of GDP | Year | \$x10 <sup>6</sup> | % of GDP | Year | \$x10 <sup>6</sup> | % of GDP | Year | \$x10 <sup>6</sup> | % of GDP |
|------|--------------------|----------|------|--------------------|----------|------|--------------------|----------|------|--------------------|----------|
| 1988 | 7.246              | 2,9      | 1994 | 11.840             | 4,1      | 2000 | 15.885             | 3,7      | 2006 | [13.016]           | [2,5]    |
| 1989 | 8.385              | 3,1      | 1995 | 12.162             | 3,9      | 2001 | 14.562             | 3,7      | 2007 | [11.155]           | [2,1]    |
| 1990 | 10.129             | 3,5      | 1996 | 13.618             | 4,1      | 2002 | 15.494             | 3,9      | 2008 | [11.663]           | N/A      |
| 1991 | 10.405             | 3,8      | 1997 | 14.188             | 4,1      | 2003 | 13.984             | 3,4      |      |                    |          |
| 1992 | 10.957             | 3,9      | 1998 | 14.866             | 3,3      | 2004 | 12.762             | 2,8      |      |                    |          |
| 1993 | 12.107             | 3,9      | 1999 | 16.413             | 4,0      | 2005 | 12.055             | 2,5      |      |                    |          |

The world's top 15 military spenders in 2008 (USA, China, France, UK, Russia, Germany, Japan, Italy, Saudi Arabia, India, South Korea, Brazil, Canada, Spain, Australia), accounted for 81,4% of world military spending. USA, with 607 billion \$ and 41,5% of world share (SIPRI, 2009:182,183). The 10 largest arms-producing companies are Boeing, BAE Systems, Lockheed Martin, Northrop Grumman, General Dynamics, Raytheon, EADS, L-3 Communications, Finmeccanica, Thales in the order of their arms sales in 2007 (SIPRI, 2009:12). USA and Russia are the largest exporters, 31% and 25% global share, respectively. Turkey is the biggest exporter from Germany (SIPRI, 2009:14).

The defense industry volume of Turkey, increases from 2001 and reaches 2,3 billion \$ in 2008, more than 15% annual growth. This value covers only the revenue of the companies. Considering the export performance, 37% of increase is observed from 2007 to 2008. R&D expenditure from equities realised as 120,19 million \$ in 2007 and 228,23 million \$ in 2008, with an increase of 90%.

**Table-3: Turkish Defense Industry (TOBB, 2009:22), \*(SSM, 2010), \$x10<sup>6</sup>**

| Year | Revenue  | Exports | R&D from Equities | Year | Revenue    | Exports  | R&D from Equities |
|------|----------|---------|-------------------|------|------------|----------|-------------------|
| 1997 | 1.205,00 | 138,00  | 34,00             | 2003 | 1.301,00   | 331,14   | 58,43             |
| 1998 | 968,40   | 80,03   | 40,79             | 2004 | 1.337,12   | 196,34   | 63,86             |
| 1999 | 1.074,61 | 84,41   | 41,63             | 2005 | 1.591,16   | 337,42   | 78,51             |
| 2000 | 851,85   | 123,44  | 43,08             | 2006 | 1.720,41   | 351,99   | 90,09             |
| 2001 | 848,90   | 134,06  | 24,41             | 2007 | 2.010,60   | 420,41   | 120,19            |
| 2002 | 1.062,38 | 247,73  | 48,91             | 2008 | 2.317,82 * | 576,34 * | 228,23 *          |

### 5.4. European technology platforms

EU 7<sup>th</sup> Framework Program aims at strengthening the scientific and technological foundation of Europe, supporting the industrial competition and encouraging the collaboration based on 4

specific programmes; Cooperation, People, Ideas and Capacities. Most of the subject areas of Cooperation are directly related with defense industry like IT, nanotechnology, energy, transport, security and space. One of the supports to trans-national cooperation is the European Technology Platforms (ETP) and there were 36 ETPs in 2008. Turkish companies should participate ETPs at least as an associate. There are 211 partnership proposals made by Turkish companies in 2009 (CORDIS, 2010). Among them, only 6 of them, Tübitak MAM (6), UEKAE (1), Mikes (1), Havelsan (2), Koç Sav (1) and Milsoft (1), are interested in totally 12 projects as given in paranthesis.

## **6. COMPETITIVENESS ANALYSIS**

The five competitive forces and the diamond models developed by Porter are widely used to determine the competitiveness of a country and a sectoral cluster. In any industry, whether it is domestic or international or produces a product or a service, the rules of competition are embodied in five competitive forces: the entry of new competitors, the threat of substitutes, the bargaining power of buyers, the bargaining power of suppliers, and the rivalry among the existing competitors (Porter, 1998). The buyer power influences the prices, as does the threat of substitution, and can also influence cost and investment, because they demand costly service. The bargaining power of suppliers determines the costs of raw materials and other inputs. The intensity of rivalry influences prices as well as the costs of competing in areas such as plant, product development, advertising, and sales force. The threat of entry places a limit on prices, and shapes the investment required to deter entrants.

Porter's theory of national competitive advantage is based upon an analysis of the characteristics of the national environment which identifies four sets of variables which influence firms' ability to establish and sustain competitive advantage within international markets. These interacting determinants form Porter's diamond. "Factor (input) conditions" are analysed as the characteristics of production, processes and their relationship to competitiveness. In detail; basic factors such as natural resources, climate, location and demographics and advanced factors such as communication infrastructure, sophisticated skills and research facilities. Basic factors can provide initial advantages, conversely, disadvantages in basic factors can create pressures to invest in advanced factors. "Demand conditions" are essential to understand the features of the national environment which are conducive to investment in advanced factors. Firms are typically most sensitive to the needs of their closest customers, hence it is important in shaping the differentiation in domestically-made products and in creating pressures for innovation and quality. "Related and supporting industries" are about the availability of the firms in related fields. There is a tendency for the successful industries to be grouped into clusters. "Firm strategy, structure and rivalry" are related with systematic differences in strategies, structures, goals, managerial practices, individual attitudes and intensity of rivalry. Rivalry is critically important in pressuring firms to cut costs, improve quality and innovate. For "diamond" to positively impact competitive performance usually requires that all four sets of influences are present (Grant, 1991).

## **7. TURKEY'S ANALYSIS**

### **7.1. Factor (input) conditions**

Capital availability: Military expenditure is 11,2 billion \$, less than that of Australia in the 15<sup>th</sup> place with 18,4 billion \$ (SIPRI, 2009), and the share of GDP is 2,1% (Table-2). The revenues are 2 billion \$ in 2007 and 2,3 billion \$ in 2008.

Human resources: The skilled and educated labour force is only 17.841 (TOBB, 2009:37). There is a big pool of university graduates. For 2008 and 2009 respectively, 3.508.954 / 4.320.813 graduate, 247.544 / 279.268 master, and 73.244 / 95.502 PhD degrees (TUIK DB, 2010).

Physical infrastructure: There is a noticeable transportation advantages as most of the companies are located along the highway between Ankara and İstanbul and there are international ports in İstanbul and İzmit.

Scientific and technological infrastructure: Most of the 88 companies are settled in Ankara and İstanbul like most of the reputable universities and the fully active technology development regions and centers, providing an opportunity for easy access and hence, better knowledge sharing.

Administrative infrastructure: The business registration, rules, licensing, property rights are efficiently applied.

Information infrastructure: All sort of communication facilities are available in the country. All the companies in the sector try to use them to disseminate their data as transparent as possible. But the statistical surveys to discover the sectoral level are not periodically repeated.

Natural endowments: The climate is seasonally variable, and the geography is different. But, the geographical location is suitable for its neighborhood to both Europe and Middle East. The electricity and water supplies are at the desired level despite observable electricity cuts. The conventional energy sources like oil and natural gas are exported. For example, 44,44% of the gross electricity generation in the last quarter of 2006 depends on natural gas (TUIK, 2007). In 2008, the crude oil production and import are 2.160.067 ton and 21.724.235 ton (PIGM, 2010), respectively, resulting in 10,06% domestic coverage ratio.

## **7.2. Demand conditions**

Local customers: There is very demanding local customer, Turkish Armed Forces and Security Directorate. Their needs are so complicated that they are mostly met in global market. Hence, it is vital essential to understand the needs and desires of the customers. As for all the sectors, there is an increasing sophistication due to adoption of EU standards.

Market: There is a large and continuous local market because of the Turkish Armed Forces capacity. The global market is very competitive environment. The export volume of Turkey as a whole country, 420,41 million \$ (Table-3), is less than the volume of Thales, 9,35 billion \$ in 2007 (SIPRI, 2009).

Innovation: The products made by domestic partnerships create a pressure for innovation and quality. Also, the sophisticated customers make the industry to innovate and grow sustainably and force to produce high quality products.

## **7.3. Firm strategy, structure and rivalry**

Competition: There is an open competition among locally based rivals that improve their competitiveness. It is also open to foreign companies due to the characteristics of the defense industry. It causes an increase in foreign direct investment; but, the local companies have difficulty to compete the global ones.

Laws: The procurement law offers equal opportunities for local and foreign companies. In addition, Law No:5746 on the support of R&D and the Amendment No:112 to Law No:5228 on

the tax exemption encourage the investment and productivity. Besides, EU accession expedites the economic reforms.

Structure: Almost all the companies in the sector are big-sized and most of them apply corporate governance standards; so that they have long-term corporate vision and strategy that bring success. Their management structures are composed of personnel with highly qualified background.

R&D: SSM supports technology intensive R&D, compatible with the needs and objectives of main system projects, with collaboration of industries, universities and research organisations. There are also supports by DPT, Turkey Technology Development Foundation (TTGV), Small and Medium Enterprises Development Organisation (KOSGEB), the Ministry of National Defense and 7<sup>th</sup> FP.

#### **7.4. Related and supporting industries**

Clusters: There are well established clusters in ICT, electronics, automotive with well relationships to universities.

Suppliers: It is easy to access to the qualified local companies in related fields.

Technology development centers: In places where the defense industry locates most of the well organised centers are established with direct connection to universities in Ankara and İstanbul.

#### **7.5. Government**

Privatisation: Privatisation caused the government to decrease its intervention.

Support: There are supports like ICT infrastructure improvement, establishment of new technology development centers like Teknoparkİstanbul.

### **8. CONCLUSION**

As a result, the analysis according to the diamond model reveals that the competitiveness level of Turkey in the defense industry is moderate.

The revenue of the country is 2 billion \$ which is less than the arms sales of 9,35 billion \$ of Thales (SIPRI, 2009) that is the 10<sup>th</sup> largest arms producing company in 2007. The military expenditure is 11,6 billion \$ while the expenditure of USA at the 1<sup>st</sup> rank is 607 billion \$. This indicates that the capital availability is very low when compared globally. In addition, the expenditure as the share of GDP decreases from 4,0 to 2,1 between 1999 and 2007; and the expenditure itself decreases from 16,4 to 11,1 billion \$.

The companies are located mostly in the technology corridor between Ankara and İstanbul. This concentration brings the advantage of a close network and a strong relationships to the technology development centers and universities.

The government provides a considerable support by means of strategies, incentives and regulations. On the other hand, in an open competition environment, the local companies have some difficulties. But those companies are not active in other related fields like NATO construction projects, and do not seem volunteer to receive certificates advantageous in international projects like CMMI, and to apply for EU projects like ETPs.

All these information show consistency with the general competitiveness level. The GCI of Turkey decreases as being ranked at the 53<sup>rd</sup>, 63<sup>rd</sup> and 61<sup>st</sup> place among 131, 134 and 133 countries, respectively, between 2007 and 2009.

It is necessary for Turkey to specify an appropriate competitiveness strategy. As Porter defined, it is possible to prefer one or any combination from the differentiation, focus or cost leadership strategies. Differentiation is not quite conceivable because the sectoral economic capacity is not sufficient. It requires a strong capability in basic research and in connection, technological leadership, and strong export potential besides partnership activities. Focus strategy may be desirable; but there is no particular target in this sector well applied although some roadmaps have already been created. In short-term, cost leadership strategy may be more suitable in order to move upper levels. The cost of related fields like manufacturing, transportation or communication, and for the labour provide relative advantage whereas the access to capital is inevitable for the sustainability.

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