Challenges of the Israeli Defense Industry in the Global Security Market

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The size, development, and ownership structure of the Israeli defense industry depend on Israel's defense needs, geopolitical changes in the Middle East, the size and power of the Israeli economy, and various aspects of Israeli society. Developments in the global defense industries and market also have a direct impact on the industry in Israel.

While most of the world's large defense companies are privately owned, a number of large Israeli defense companies are owned fully or partially by the government (Israel Aerospace Industries [IAI] and Rafael Advanced Weapons Systems, for example). Furthermore, the Israeli government is the Israeli defense industry's main customer, procuring various platforms and many types of weapons systems for the different branches of the IDF. This procurement is usually an essential condition for exporting Israeli military weapon systems and platforms to other countries around the world. The long-term close relationship between Israel's defense companies and its defense establishment has furthered the development of high-quality, effective, and unique weapons systems tailored to the IDF's needs, and has greatly contributed to improving production processes for these systems by both reducing development and production times and cutting production costs.[1]

The technological development of the Israeli defense industry took place simultaneously with similar developments in the global defense industry in a wide variety of technological spheres. It encompassed computer and

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communications systems, electronic systems, electro-optics, mechanical and chemical engineering, software engineering, special materials, etc. The acceleration of technological development in Israel and worldwide enabled the Israeli defense companies to develop and manufacture unique and advanced weapons systems and military platforms of various types, such as unmanned aerial vehicles, tanks (variants of the Merkava), armored fighting vehicles (Namer and Eitan), active air defense systems (variants of Iron Dome, David's Sling, and different versions of the Arrow), defense systems against land-based kinetic threats (Trophy, Iron Fist), communications systems, satellites, precision-guided armaments, cyber systems, sensors in various sectors, and more.[2]

This article reviews the main developments in the global defense market and the Israeli defense industries in the past three decades. It addresses the uniqueness of the Israeli defense industry, with an emphasis on its size and structure in comparison with the global defense industry, and takes note of present and future challenges. The final part of the article presents the results of a study analyzing the size and structure of the Israeli defense industry.

The Global Security Market

Figure 1 shows that global defense spending in 2016 totaled $1.7 trillion (in 2015 prices). Of this, 40 percent was spent in America, 28 percent in Asia, 20 percent in Europe, 10 percent in the Middle East, and 2 percent in Africa. Global defense spending grew 17 percent in real terms in 1998-2016, and a material change occurred in its composition as a result of the following geopolitical, economic, and technological changes:

1. The end of the Cold War in the 1980s was the main catalyst for a substantial reduction in defense spending by the Eastern and Western bloc countries.
2. Concentration increased in the defense sector in the United States and Western Europe in the 1990s as a result of rapid technological progress, which led to a steep rise in the quality, complexity, and cost of weapons platforms and systems during this period. A small number of huge companies now have a significant share of global arms sales. The world's 10 largest defense companies accounted for 50 percent of the sales of the world's 100 largest defense companies in 2017.[3]
3. Terrorism events throughout the world at the beginning of the first decade of the 21st century (including the 9/11 attacks in the US in 2001

and later terrorist attacks in Madrid, London, and Mumbai) accelerated development of state-initiated home front defense systems, remotely piloted aerial vehicles, guided and precision armaments, and intelligence and communications systems. These events resulted in a striking increase in demand for security products throughout the world, and particularly in Western countries.

4. The involvement of the United States in wars in Iraq and Afghanistan in 2001-2011 sharply increased US defense spending during these years.
5. China's accelerated economic growth was also accompanied by an accelerated increase in Chinese defense spending over the past decade.
6. Concern about growing Russian intervention in its neighboring countries and the results of the crisis between Russia and Ukraine boosted the demand for weapons systems in the countries bordering Russia.
7. Terrorist attacks in various places around the world and the growing threat of terrorist activities by ISIS and other extremist Islamic organizations in Western countries in recent years have greatly increased sales of homeland security goods and services.

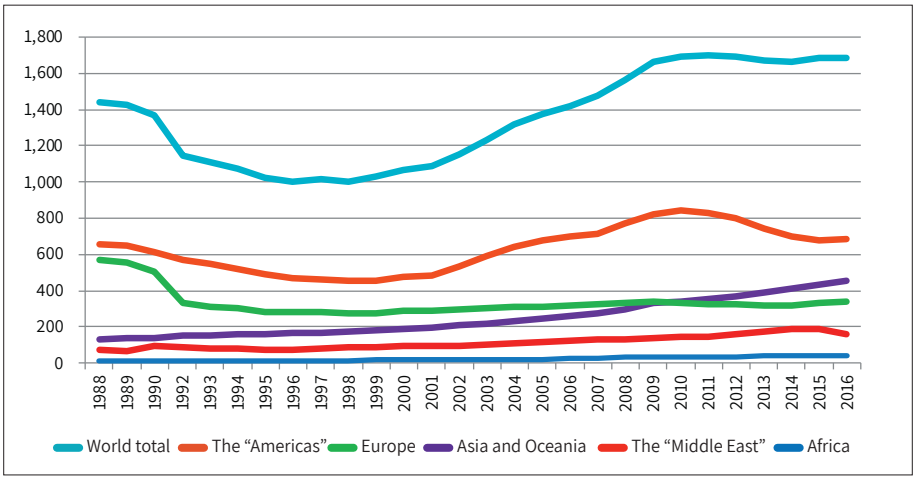

Figure 1: Total defense spending according to geographic regions: 1988-2016 (US$ billions, 2015 prices)[4]

Agreements for the sale and transfer of weapons systems between countries and exports of arms to various customers are quantitively and qualitatively dominated by the United States and a small number of Western European

countries. For example, exports of weapons systems by the US and Western European countries accounted for approximately 70 percent of global arms exports in 2017.[5] At the same time, the proportion of global defense exports accounted for by China and Russia has increased in recent years, although the dimensions of this increase are not threatening American hegemony in defense exports. An examination of the composition of exports in 2018 shows that 47 percent of defense exports consisted of aircraft, 18 percent ships, 16 percent armaments and missiles, and 11 percent armored vehicles. The rest consisted of communications, computer, and intelligence systems, air defense systems, etc. While exports of weapons systems are dominated by a small number of countries, a large number of countries (over 100 in 2017) import these systems. The main customers for weapons systems are Asian countries (37 percent) and Middle Eastern countries (36 percent), with Saudi Arabia and India being the biggest importers of weapons systems and military platforms at this time.

Simultaneously with changes in the volume of defense spending and changes in the global demand for weapons systems, the world's defense companies have been facing many structural, cultural, and technological changes in recent decades that have affected their economic performance, as listed here:

1. Concentration and globalization increased – the volume of defense sales by the world's 100 largest defense companies totaled $400 billion in 2017, with the nine largest companies accounting for half of this sum.
2. The prices of weapons systems and products have greatly risen in the past two decades. This trend is a result of technological improvements all over the world, especially in weapons systems. For example, the price of an F-35 aircraft in 2019 was over 530 percent higher than the price of an F-16 aircraft two or three decades ago (in 2019 prices). Figure 2 shows that the rise in the prices of weapons systems is a broad phenomenon that extends to a large proportion of the different types of military platforms and weapons systems.
3. The demand for military technologies in civilian systems rose. For example, the use of drones, which were initially produced solely for military use, has recently expanded to the civilian sector. Drones are now used for both security and civilian purposes. This is illustrated by the fact that 110,000 drones were sold for commercial use in 2016.[6]

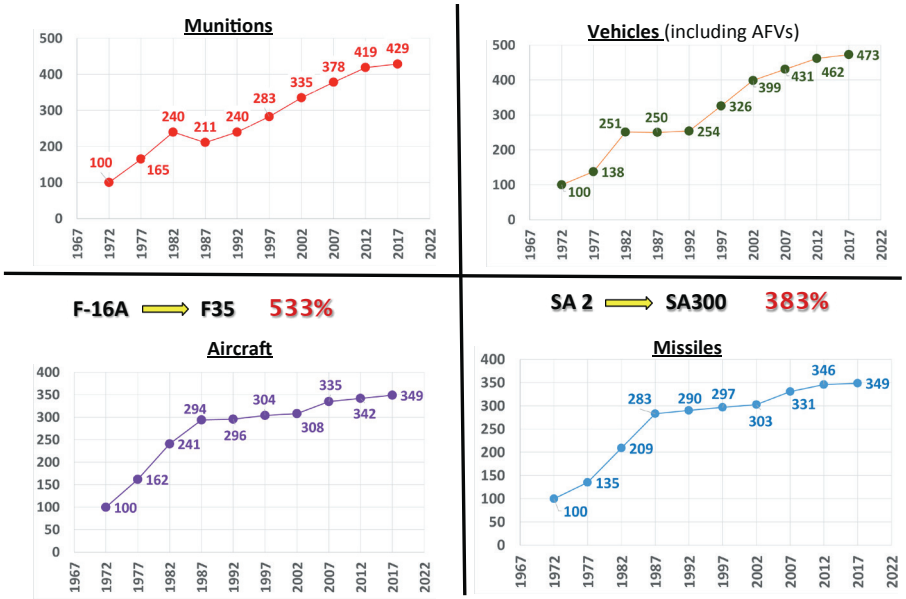

Figure 2: Development of the price indices of selected defense products in the past 45 years[7]

4. Commercialization and privatization – in recent years, many armies around the world have civilianized and privatized military activities for which military establishments were previously responsible, and which they previously operated. The American army is leading this change for economic cost-benefit reasons. In recent years, it has privatized and civilianized many activities, including those supporting trans-border military operations in Afghanistan and Iraq and combat forces in various locations, mainly in logistics, educational, and training missions.[8] The trend towards civilianizing activities supporting the army and in other security agencies is taking place at a slower pace in other armies. It is important to note that while all of the defense companies in the United States are private, there are still a number of large fully or partly government-owned defense companies in Europe and the rest of the world. For example, the Russian government controls the country's large defense companies (91 percent of the national aerospace industry and 100 percent of the national warship building industry). The Italian government holds 30 percent of the shares in Italian defense company Leonardo, the French

government holds 26 percent of the shares in French defense company Thales, and the Indian government wholly controls the shares in the Indian aerospace industry.

The Israeli Defense Industry

The Israeli defense industry currently includes about 600 companies, some of them subcontractors taking part in the production chain of Israeli weapons systems. Over 45,000 workers are employed in the industry, and sales totaled $10.3 billion in 2017, with sales of defense equipment and services accounting for approximately 90 percent of this total. Approximately 95 percent of the Israeli defense industry's sales are by the four largest Israeli defense companies (IAI, Rafael, Elbit Systems, and IMI Systems [formerly Israel Military Industries]). Part of IMI Systems was privatized in 2018 and sold to Elbit Systems; another part, Tomer Systems, remained under government ownership. The Israeli defense industry exports over 70 percent of its output to overseas customers, as shown in Figure 3. This phenomenon is unique to the Israeli defense industry. For the sake of comparison, the American defense industry exports approximately 24 percent of its output, and the Russian defense industry exports approximately 55 percent of its total sales.

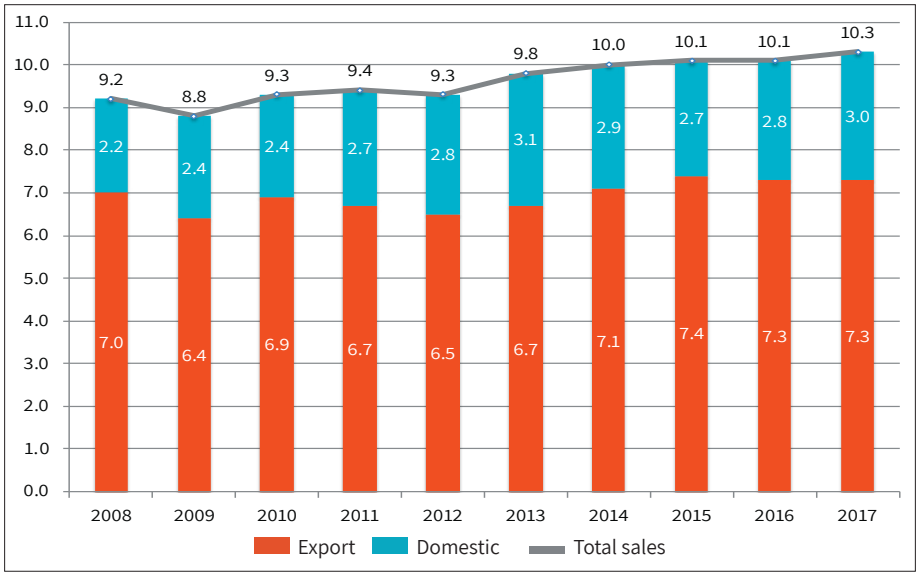

Figure 3: Sales by the Israeli defense industry to the domestic market and for export (2008-2017, US$ billions, 2015 prices)[9]

Although the large Israeli defense companies account for less than 3 percent of total global defense sales, they frequently compete with each other in the same market segments. The Israeli Ministry of Defense and the Ministry of Finance are therefore inclined to employ regulatory intervention in competition between the defense companies in the Israel and global markets. For example, in 2013, the Ministry of Defense suspended an important tender for the sale of unmanned aerial vehicles to Poland in which two companies publicly attacked each other. Another dimension of the intense competition between the Israeli defense companies was expressed in the privatization and sale of part of IMI Systems to Elbit Systems. IAI and Rafael expressed concern during this process that acquisition of a major part of IMI Systems by Elbit Systems would make the latter the dominant company in the local defense market, and would detract from their ability to complete. These claims were examined by the Israeli government in the course of IMI Systems' privatization process. The process of selling part of IMI Systems to Elbit Systems, however, was eventually approved in 2018 by the relevant Israeli authorities. This competition is expected to intensify in the coming years, given the changes that have occurred in the 2016 MOU governing US defense aid to the Israeli government in 2019-2028.[10] This agreement will gradually reduce conversion of part of the American aid into shekels ($815 million of US aid in 2019 could be converted into shekels. This amount will be gradually reduced over the years of the agreement, until it is completely eliminated in 2028). This change is expected to boost Israeli use of American weapons systems and military platforms, a trend that will intensify competition between the Israeli companies for the shekel part of the defense budget. Furthermore, this change is likely to have a negative impact on the state of the small- and medium-sized defense companies, because these companies currently derive their livelihood mainly from sales in the domestic market, while the sale of the large Israeli defense companies are export-oriented, and the latter companies have overseas subsidiaries and/or partners. A more thorough examination of the question of Israeli defense exports shows that there is also a difference in the proportion of sales to foreign customers between the three largest Israeli companies. While Elbit Systems and IAI export some 80 percent of their total output, Rafael exports only approximately 60 percent of its output.

An understanding of the performances, strengths, and weaknesses of the large Israeli defense companies can be gained by perusing the values

of a number of important parameters in their financial performances in recent decades, including the real change in sales, spending on research and development, marketing and sales expenses, and gross and net profit (see Figures 4-5 and Table 1).

The figures show a steady rise in the volume of sales of the three largest defense companies in the first decade of the 21st century and stable sales in the past decade (corresponding to the period in which most American forces withdrew from Iraq and Afghanistan). Sales by Elbit Systems grew substantially in 1996-2009, and by an annual average of approximately 17 percent in the past two decades. Rafael's sales also grew steadily from 2005 onwards, and by an annual average of around 5 percent from 1990 until the present time. IAI's sales have increased very slightly over the years, by an annual average of only 1 percent a year from 1990 until the present, while sales by IMI Systems, which focused on conventional defense products and did not develop new products and markets during the period under review, declined steadily. It can also be seen that Elbit Systems and Rafael maintained their profit margins in the past 15 years, while IAI reported a substantial decline in its profits during this period, especially in recent years, during which the company's profit was negligible. IMI Systems reported a loss during the entire period under review, a trend that brought the Israeli government to complete the process of the company's privatization and sale to Elbit Systems in 2018.

A comparison of the data for Elbit Systems, Rafael, and IAI over the past decade highlights the difference between the government-owned defense companies and the privately or publicly owned ones. The figures show that Elbit Systems, a public company, is more profitable (by a ratio of 1.5-2:1) and invests more in marketing its products (2-3 times as much) than Rafael and IAI, which are government-owned companies. These figures for Elbit Systems are similar to the corresponding figures for other large private defense companies around the world. A slightly different picture is obtained with respect to spending on research and development. Elbit Systems spends 1.75 times as much (as a proportion of revenue from sales) as IAI and a sum comparable to that of Rafael. This pattern can be explained by the fact that Rafael was initially founded as an authority for developing weapons, and maintained its basic purpose as a research laboratory of the Israeli defense establishment, in addition to being an arms manufacturer. The figures in

Table 1 and Figures 4-5 support the argument that private/public companies have a greater incentive than government companies to increase the quantity, quality, and diversity of the goods and services supplied to their various customers, and are therefore more export-oriented than government-owned companies.[11]

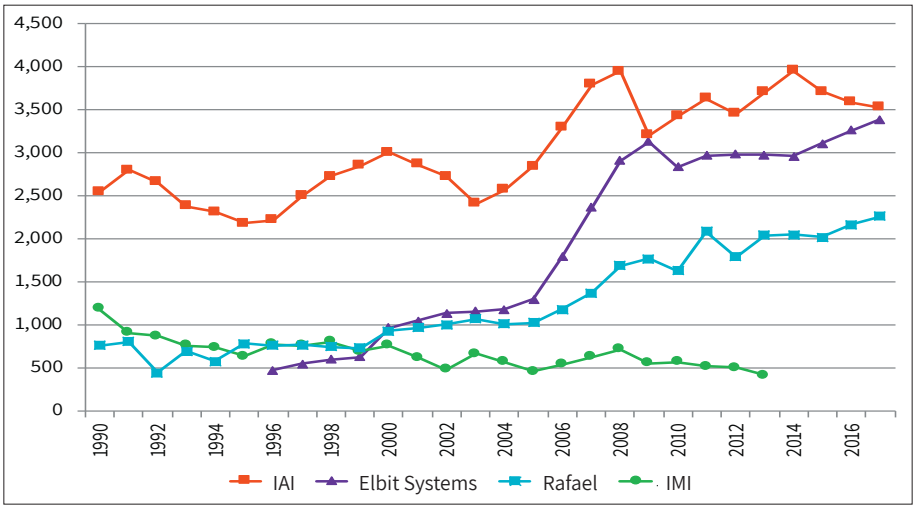

Figure 4: Sales of the large Israeli defense companies (1990-2017, US$ millions, 2014 prices)[12]

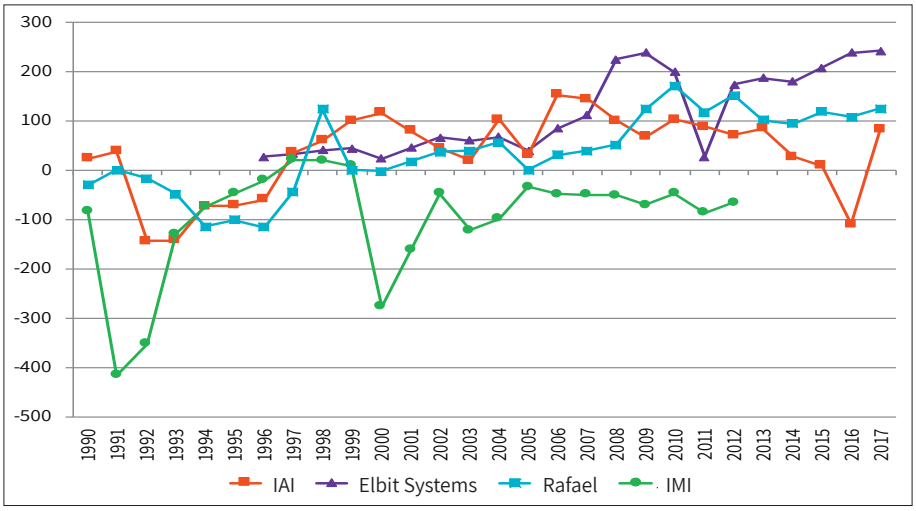

Figure 5: Profits of the large Israeli defense companies (1990-2017, US$ millions, 2014 prices)[13]

Table 1: Gross profit, R&D spending, and marketing and sales expenses of the Israeli defense companies (2008-2017, as a percentage of sales)[14]

Year	Gross profit			Marketing and selling expenses			Research and development		
	Elbit Systems	IAI	Rafael	Elbit Systems	IAI	Rafael	Elbit Systems	IAI	Rafael
2008	29.1	14.2	20.8	7.5	2.0	4.3	7.0	3.5	6.6
2009	30.0	15.1	21.9	8.9	2.4	3.8	7.7	4.2	7.3
2010	29.9	14.5	20.2	8.6	2.3	4.3	8.8	4.4	7.8
2011	26.0	15.1	21.7	8.4	2.3	4.7	8.6	4.5	7.0
2012	28.2	15.2	22.8	8.4	2.7	5.2	8.1	4.7	7.7
2013	28.2	14.3	20.0	8.1	2.4	4.0	7.5	4.9	7.6
2014	27.9	14.9	22.7	7.3	2.6	4.1	7.7	4.3	7.4
2015	28.9	13.3	21.	7.7	2.6	3.7	7.8	4.8	7.0
2016	29.4	13.3	20.9	8.3	2.7	3.9	7.8	4.6	7.2
2017	29.5	15.3	22.1	8.3	2.6	4.0	7.8	5.2	8.1
Average	28.7	14.5	21.4	8.1	2.4	4.2	7.9	4.5	7.4

Future Challenges Facing the Israeli Industry

Maintaining a high level of national security is one of the Israeli government's principal tasks. The frequent changes in the geopolitical environment and the character of the regimes in Middle East countries, combined with the difficulty in achieving progress in a peace process between Israel and the Palestinian Authority, require Israel to maintain a powerful, high-quality, and innovative defense establishment that constantly changes in accordance with the rapidly changing environment of threats against it. The defense industry must accordingly remain large (relative to Israel's size), modern, and above all, innovative, and entrepreneurial, with an emphasis on the retaining and development of excellent and entrepreneurial personnel (human capital). Furthermore, in contrast to the large Western countries (where some of the world's largest defense companies operate), whose potential enemies are distant, Israel's existing and potential enemies are located in close proximity to it. In any case, Israel must develop unique weapons systems, intelligence, and computer capabilities (some of which must respond very quickly to activity by Israel's enemies) that are not developed by the world's largest weapons manufacturers (because they have no immediate need for them).

The adaptation of weapons systems to the Middle East, and to Israel's special needs, is made even more essential by the recent developments in the Iranian nuclear program and the consolidation of the Iran-Syria-Hezbollah-Hamas coalition in recent years in the framework of the civil war in Syria, which has greatly heightened the security tension in the Middle East and has accelerated the arms race in general, and between Israel and its enemies in particular.

The challenges facing the Israeli defense industry are accordingly as follows:

1. The aid MOU between Israel and the United States for 2019-2028 gradually eliminates the option to convert the aid in foreign currency into local currency (this option will cease completely in the final year of the agreement). This will require the Israeli defense companies, including those taking part in the production chain for weapons systems and military platforms, to allocate more resources to entering new markets and expanding their marketing activities so as to bolster exports of Israeli weapons systems to existing and new customers. In order to maximize the benefit from the new MOU, the Israeli defense companies will have to consolidate and institutionalize partnerships with American defense companies, and institute new production lines in the United States or divert existing production lines from Israel to the US. It is likely that these measures will cause Israeli employees to be laid off, and are liable to severely affect small- and medium-sized defense companies in Israel, unless wise advance preparations are made to offset the end of the conversion option.
2. Preserving technological independence and leadership: the Israeli defense industries feature the development and manufacture of high-quality defense products at the forefront of technology, with great complexity in various spheres. Examples include munitions, defense systems (Iron Dome, David's Sling, the different versions of the Arrow, Trophy, and Iron Fist), unmanned aerial vehicles, communications systems, command and control systems, intelligence systems, satellites, robotics, electronic warfare, etc. In order to maintain these industries' leading position in technology, in comparison with large overseas companies, and given the expansion trend among large American and European defense companies into new markets and countries, the Israeli defense industries must continue increasing their investment in R&D and their recruitment of top-level

human capital, and strengthen their close relations with security agencies in Israel and throughout the world.

3. Expanding cooperation between Israeli defense companies: the tension created by intense competition between the Israeli companies sometimes causes damage to the companies themselves. In view of the globalization taking place in the world market, combined with Israel's policy of preference for procurement from the domestic industry over overseas options (the same policy exists in the US and India), it is essential for Israeli companies to step up their mutual cooperation in tenders in Israel and overseas in order to maximize their profits in the long term.
4. The optimal structure of the Israeli defense industry: the Israeli defense companies are export-oriented, and must compete against huge companies from the United States, Western Europe, and Russia in defense tenders all over the world, in addition to internal competition for domestic procurement by the IDF and other security agencies in Israel. Changes in the global defense market, together with the geopolitical changes and the strategic environment in the Middle East, are posing a number of dilemmas to decision-makers in Israel. These include questions such as whether it is correct to privatize the defense industries in full, only partially, or not at all, and what the optimal number of defense companies in Israel is.

The answers to these questions are complex. Among other things, they depend on the policy of other countries all around the world; the development of the business market in general, especially in Israel; and others. The study conducted by Pinchas[15] presents analytical and empirical tools for assessing the conditions under which private ownership of defense companies in Israel is preferable to government ownership, and facilitates evaluation and analysis of the Israeli defense industry's behavior, including interactions between the defense companies and the government under conditions of an arms race between Israel and Syria and Iran.

A number of models describing how Israel's social welfare and national security are affected by country's economic characteristics, together with the features of the Israel defense industry, were developed and applied in this study. The models developed stress the following interactions:

1. Between the countries active in the defense market;
2. Between the defense companies in Israel and elsewhere in the world;

3. Between the countries in an arms race (Israel against Iran and Syria, for example); and
4. Between two types of defense products and weapons systems (platforms versus all other weapons systems).

This study shows that social welfare, national security, and the economic performance of the Israeli defense industry are affected by the type of ownership found in the industry. For example, a government-owned Israeli defense company can sometimes bring greater benefit for the government and a higher level of security than a privately owned firm. At the same time, privately owned defense companies have higher profits than their government-owned counterparts, because they are more efficient at production, are export-oriented, and invest more in marketing and R&D. In most cases, privately-owned Israeli defense firms will bring about slightly higher general welfare (from government activity and from the defense companies' profits) than government-owned companies.

The relatively small size of the Israeli defense companies greatly affects their efficiency and marketing capabilities in comparison with the large companies abroad. This is because the Israeli defense firms operate in a relatively small country, and serve a very small defense establishment, in comparison with, say, defense firms of the United States, Russia, and Western Europe. In this situation, private companies, which are more efficient and have better marketing capabilities than government-owned Israel companies, have an advantage.

In addition, the study findings support the argument that a lower degree of concentration of the defense industry in a small country like Israel will lead to a higher aggregate profit (see the analysis by Shefi and Tishler, for example).[16]

In summary, the challenges facing the Israeli defense industry are substantial, and are likely to have a significant effect on the country's level of national security. At the same time, thorough and extensive preparation by local defense firms and cooperation between them and with the defense and government sectors in Israel can preserve, and under certain circumstances also improve, the standing of the defense industry in Israel.

Notes

1 Alex Mintz, "Military-Industrial Linkages in Israel," *Armed Forces and Society* 12 (1985): 9-27; Ori Swed and John Sibley Butler "Military Capital in the Israeli Hi-Tech Industry," *Armed Forces and Society* 41, no. 1 (2015): 123-41.

2 See SIPRI Yearbooks, 2013-2017, https://www.sipri.org/yearbook, Dov Dvir and Asher Tishler, "The Changing Role of the Defense Industry in Israel's Industrial and Technological Development," *Defense Analysis* 16, no. 1 (2000): 33-52; *Haaretz*, "Boss of Israel's Major Defense Contractor Rafael Forced to Take Leave," May 31, 2015, https://www.haaretz.com/.premium-ya-alon-forces-rafael-boss-to-suspend-himself-1.5367951?=&ts=_15174142; financial reports of IAI, Rafael, and Elbit Systems.

3 See Gil Pinchas, "On the Optimal Ownership Type, Size and Structure of Israel's Defense Industry," PhD Thesis, Tel Aviv University (2018); Stephanie Neuman, "Power, Influence, And Hierarchy: Defense Industries in a Unipolar World," *Defence and Peace Economics* 21, no. 1 (2010): 105–34.

4 Source: SIPRI Military Expenditure online database, 2018, www.sipri.org/databases/milex.

5 Source: SIPRI Arms Industry online database, retrieved December 2017, www.sipri.org/databases/armsindustry.

6 *The Economist*, "Taking Fight," June 8, 2017, www.economist.com/technology-quarterly/2017-06-08/civilian-drones.

7 Source of the data: Price indices, real prices, base year: 2009: Source: United States, Bureau of Economic Analysis (BEA) price books.

8 Charles W. Mahoney, "Buyer Beware: How Market Structure Affects Contracting and Company Performance in the Private Military Industry," *Security Studies* 26, no. 1 (2017): 30-59.

9 Source: SIPRI Yearbooks, 2009-2017; Gil Pinchas, "On the Optimal Ownership Type, Size and Structure of Israel's Defense Industry," PhD Thesis, Tel Aviv University (2018); financial reports of Israeli defense firms (2008-2017); websites of the defense firms; various newspaper publications.

10 MOU (2016), Memorandum of Understanding between USA and the State of Israel, 2019-2028, www.obamawhitehouse.archives.gov/the-press-office/2016/09/14/fact-sheet-memorandum-understanding-reached-israel.

11 On this issue, see Matthew Bishop, John Kay, and Colin Mayer, "Introduction: Privatization in Performance," in *Privatization and Economic Performance*, eds. Bishop, Kay, and Mayer (Oxford: Oxford University Press, 1994), pp. 1-14.

12 Source: SIPRI Yearbooks, 2009-2017, www.sipri.org/yearbook/; Israel Government Companies Authority (2018). https://mof.gov.il/GCA, financial reports of Israeli defense firms, various newspaper publications, financial reports and websites of IAI, Rafael, and Elbit Systems (2008-2017).

13 Source: see note 12.

14 Source: see note 12.

15 Gil Pinchas, "On the Optimal Ownership Type, Size and Structure of Israel's Defense Industry," PhD Thesis, Tel Aviv University (2018).

16 Yoad Shefi and Asher Tishler, "The Effects of the World Defense Industry and US Military Aid to Israel on the Israeli Defense Industry: A Differentiated Products Model," *Defense and Peace Economics* 16, no. 6 (2005): 427-48.