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### **Military Industrialization and Economic Development: Jordan's Defense Industry**

Jomana Amara

Jordan is a recent entrant to the domestic defense industry with the establishment of King Abdullah II Design and Development Bureau (KADDB) in 1999. The defense industrial initiative is intended to jumpstart industrialization across a range of sectors. With the Jordanian defense expenditures at 8.7% of GDP, the Jordanian authorities created the defense industry to utilize defense budget spending power and to assist in economic growth without placing additional demands on the national budget. This study examines Jordan's attempt to establish a defense industry and reviews its accomplishment. The study also compares the economic achievements of the defense industry to those of the Qualified Economic Zones (QIZ), another major government facilitated economic development mechanism.

Defense Resources Management Institute  
School of International Graduate Studies  
Naval Postgraduate School  
Building 234  
699 Dyer Road  
Monterey, CA 93943-5138  
831-656-2306  
[www.nps.navy.mil/drmi](http://www.nps.navy.mil/drmi)

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## **Military Industrialization and Economic Development: Jordan's Defense**

### **Industry**

**Jomana Amara**

Defense Resources Management Institute

Naval Postgraduate School

699 Dyer Road, Bldg 234

Monterey, CA 93943-5138

(813) 656-3591

Email: [jhamara@nps.edu](mailto:jhamara@nps.edu)

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### **Abstract:**

Jordan is a recent entrant to the domestic defense industry with the establishment of King Abdullah II Design and Development Bureau (KADDB) in 1999. The defense industrial initiative is intended to jumpstart industrialization across a range of sectors. With the Jordanian defense expenditures at 8.7% of GDP, the Jordanian authorities created the defense industry to utilize defense budget spending power and to assist in economic growth without placing additional demands on the national budget. This study examines Jordan's attempt to establish a defense industry and reviews its accomplishment. The study also compares the economic achievements of the defense industry to those of the Qualified Economic Zones (QIZ), another major government facilitated economic development mechanism.

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## **I. Introduction**

Jordan is a recent entrant to the domestic defense industry with the establishment of King Abdullah II Design and Development Bureau (KADDB) in 1999. As a measure of the importance Jordan attaches to the creation of this fledgling industry, KADDB was established by royal decree, and reports directly to the King of Jordan.<sup>1</sup> KADDB is to provide scientific and technical services to the Jordan Armed Forces, to supply defense and commercial equipment customized to meet the needs of clients in the Middle East and North Africa, and to assist Jordan in creating a sustainable industrial base that would complement commercial civilian applications.<sup>2</sup> Jordan markets itself as the “Gateway to the Middle East” and within that context, KADDB has positioned itself as the “Technology Partner of Choice for the Middle East and North Africa.”

In contrast to other countries that have developed domestic defense industries for strategic reasons, Jordan’s primary reasons appear to be economic.<sup>3</sup> As part of an economic reform program, the defense industrial initiative intends to jumpstart

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<sup>1</sup> KADDB publication.

<sup>2</sup> To facilitate the establishment of a civilian commercial industry, KADDB and the Royal Scientific Society (RSS) signed an agreement early 2005 to establish a commercial industrial research center, the Center for Applied Industrial Research (CAIR). CAIR technical staff will consist of scientists from both organizations. CAIR’s stated goal will be to advance Jordan’s science based industries by focusing on fields of research such as materials science, energy, water resources, biomechanics, nanotechnology, and safety and security. The UK’s Defense Evaluation and Research Agency (DERA) identified these fields of research as areas that are attracting resources for research and development in NATO (Jane’s International Defense Review, 2002)

<sup>3</sup> The motivations for domestic defense production are to reduce dependence on outside arms suppliers, to enhance a nation’s status in the international community, to facilitate the transfer of technology, and, over time, to gain economically. South Africa’s stated goal in developing its defense industry in the early 1960s was (Brauer 2002) to provide the country with a reliable source of arms after its increasing isolation from the world as a result of its apartheid policies. After the emergence of a new political order in 1994, following the election of an ANC led government, and the lifting of the UN arms embargo, the defense industry underwent substantial restructuring with the new government struggling to justify maintaining the existence of the industry. Eventually, the justification focused on trade, economics, and employment maintenance and creation. (Batchelor and Willett 1998).

Brazil built an defense industry for national security to enhance its ambitions both as a regional and global power (Freeman 2002) and as a preemptive strategic move (Brauer 2002).

industrialization across a range of sectors. Jordan's goals are to stimulate the development of a defense scientific industrial base, to enable import substitution and export sales generation, to ensure the development of domestic industries and technology, to provide training to technical personnel for improved employment opportunities, and to promote the development of regional industrial joint ventures.<sup>4</sup> With the Jordanian defense expenditures at 8.7% of GDP, the Jordanian authorities created the defense industry to utilize defense budget spending power to assist in economic growth without placing additional demands on the national budget.<sup>5</sup> Table 1 details Jordan's defense burden and military expenditures from 1992-2002. The Jordanian defense industrial initiative is being undertaken during a period of uncertainty as to the future security environment.<sup>6</sup>

In this study, I review the Jordanian defense industry and assess the success and failure of this industry as a stimulus to economic development. In addition, I evaluate the resulting employment creation, technology transfer, improved trade, and both backward and forward linkages to the civilian industrial sectors. I compare the economic achievements of the defense industry to those of the Qualified Economic Zones (QIZ), another major government facilitated economic development mechanism.

The rest of the paper is structured as follows. Section two reviews the economics of military industries. Section three provides an introduction to Jordan and the evolution of its economy. Section four details KADDB and describe its role in the Jordanian

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<sup>4</sup> KADDB, Jane's IDR 2002.

<sup>5</sup> Looney (1988) points out that the economic effects of military industrialization can not be considered separate from patterns of military spending. He concludes that developing countries may minimize the adverse impacts of increasing military burdens by creating macro-linkages from the arms industry to the economy.

<sup>6</sup> SIPRI Military Expenditures and Arms Production Project – June 2005.

economy. Section five reviews KADDB's accomplishments, compares it that of the QIZs and the last section offers concluding remarks.

## **II. Economics of Military Industries**

The creation of indigenous defense industries in developing countries is motivated by a variety of strategic, political, and economic factors. Since arms are not regarded as a purely commercial good, their production in developing countries is not governed solely by the economics of comparative advantage. A strategic motivation behind the creation of a military industry is to reduce the dependence on unreliable, or potentially unreliable, sources of arms. South Africa, for example, initiated an intense effort to build its military industry in the late 1960s and early 1970s in anticipation of an arms embargo.<sup>7</sup> Brazil, from the late 1960s, pursued a political strategy of building up its defense industry not only as part of its ambitions to be a regional power and a symbol of national pride, but also in response to a US arms embargo.<sup>8</sup> Yet, once political conditions change, nations reassess the benefit of defense industries to national strategic goals.

Proponents of a domestic defense industry argue that industrial development, job creation, and export opportunities provide marginal benefits in excess of marginal costs. Ideally, the defense industry would promote the development of human capital and prevent the emigration of skilled labor. The creation of a military industry would also promote the development of a civilian industry by providing backward linkages into the economy for support industries and forward linkages by feeding into downstream industries. Offset deals, co-production and license agreements with foreign producers

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<sup>7</sup> Krause (1992), Anthony (1993), and Brauer (2002).

<sup>8</sup> Freeman (2002) and Brauer (2002)

would promote technology transfer from more technologically advanced nations. Ideally, the country would improve its balance of payments by import substitution industrialization, substituting the imports of arms for those locally produced, and by exporting to foreign markets, thus saving foreign currency.

However, there are many hidden costs in defense production. Developing countries rely on importing raw material, parts, and technology for the industry. These imports drain the foreign exchange reserves that the defense industry generates. Arms exports and industries are often subsidized by governments. The subsidies conceal the true cost of the transactions. In general, defense industries are less productive than civilian industries and the cost of maintaining advanced technology could be prohibitive.<sup>9</sup> In addition, the industries demand for highly skilled labor could deprive civilian industries of resources needed to develop.<sup>10</sup>

Krause (1992) enumerates a process, an eleven step “ladder of production,” by which a developing country would progress from an arms importer to a fully independent arms producer (Table 2). Krause explains such models as being descriptive of the evolution, rather than the linear progression, of the defense production process. Brauer (2002) points out that some countries may chose to enter into the defense production industry at entry points beyond stage one. In addition, some countries may chose to focus on different entry points for different arms. He distinguishes between complete weapons systems production and weapons modules development. Although the US, and to a lesser extent, countries such as France, the UK, and Russia are technological

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<sup>9</sup> Brzoska (1995) illustrates this point using India as an example. After repeatedly purchasing technology on the international market, India failed to advance the technology on its own and fell behind the subsequent advances in the technological frontier made in the US and Western Europe.

<sup>10</sup> Batchelor and Willett (1998) make the case for South Africa.

innovators in defense production, Krause (1992) argues that most arms production efforts seem to end between stage eight and nine with progress beyond limited R&D being rare. While the ladder of production is descriptive of the evolution of the defense production process, it does not capture the time progression of the development of indigenous arms industries. Figure 1 depicts the time progression of the eleven steps of the ladder of production as a function of the time required to attain each level. The process is non-linear with increasing opportunity cost for a country to reach the higher stages. The production process through the first five steps can skip levels or enter at any level. However, it would be difficult for a country to ascend to higher stages by skipping lower stages. Comparative advantage would suggest that countries should produce at a level with the ratio of their marginal cost to marginal benefit equal to that of other arms producers.

Offsets, an industrial compensation practice imposed by the buyer country as a condition of purchase on the seller company, have become a popular method for stimulating domestic economic activity. While civil offset programs are not permissible for developed countries under Article XXIII of the Government Procurement Act of the World Trade Organization, offsets from defense procurement are an option available to all countries. The offsets can be directly linked to defense contracts such as technology transfer, co-production, or local assembly related directly to the equipment purchased or they can be indirectly sourced where civilian, military goods, or services are unrelated to the defense equipment purchased. Although, the costs and benefits of offsets are debatable, no compelling evidence points to the positive impact of offsets on a domestic economy. This pattern is consistent across countries as varied as Brazil, India, and Saudi



Arabia where offsets were used to stimulate a variety of economic and industrial policy initiatives.<sup>11</sup>

South Africa presents a good example of progress in indigenous defense production. Batchelor and Willett (1998) divide South Africa's defense production into three distinct time periods in which civilian manufacturing employment growth exceeded that of the defense industry and where military expenditures grew faster than total government expenditure. During the first period, 1961-68, South Africa shifted away from a heavy reliance on complete weapons systems imports to stage five of the production ladder, final weapons systems assembly and local component production. By the end of the second period, 1968-77, South Africa reached stage seven, limited R&D improvements to local license-produced arms, and was close to stage eight, limited independent production of less sophisticated weapons and limited production of more advanced weapons, in certain sections, such as ammunitions and small arms. In the last period, 1977-89, the defense industry reached stage nine, independent R&D and production of less sophisticated weapons. The ammunitions and small arms sector were at stage ten, independent R&D and production of advanced arms with foreign components, Military aircraft, missiles, and naval vessels production were at much lower stages of the ladder.

Defense production is less efficient than civilian industry as its primary aim is raising weapons systems performance by technological improvements, rather than cost reduction through a streamlined production process. In addition, investment in defense

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<sup>11</sup> Refer to Perlo-Freeman (2004) for a discussion on the Brazil offset program. Matthews (2002) for a discussion regarding Saudi Arabia. Batchelor and Willett (1998) for information on South Africa's offsets.

production and poor choices of military technology led to underinvestment in civilian industries for the same countries.<sup>12</sup>

The evidence in support of the economic gains from establishing military industries is quite mixed for developing countries. Devarajan, Swaroop, and Zou (1996) test whether the share allocated to various components of government expenditures is associated with higher growth. They find that defense expenditures appear to have a negative influence on economic growth whereas consumption oriented public expenditures appear to positively influence economic growth. Dunne (1996) substantiates their findings and affirms that reallocations from defense spending to other forms of government spending have been shown to increase employment in developing countries.

Batchelor and Willett (1998) analyze the economic significance of South Africa's defense industry and conclude that despite increasing numbers of highly skilled workers employed in the industry, it absorbed scarce labor resources making them unavailable to the civilian industry. Brazil's economic gains from its weapons industry are mixed. Although, in absolute numbers, about 200,000 jobs were created at the height of the industry's success, a trivial amount for a country of Brazil's size.<sup>13</sup> They also point out that domestic defense production remained a net user of foreign exchange with no positive impact on the country's technological performance. Foreign exchange earnings are questionable when balanced against the cost of acquiring technology and components. The resulting development and success of the Brazilian civilian aircraft industry came at

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<sup>12</sup> Batchelor and Willett (1998) report the capital intensity of the arms industry in South Africa being double the average of the manufacturing sector as a whole. Hartley and Sandler (1995) highlight the fact that investment in indigenous arms production may have negative resource allocation effects by crowding out civilian investments.

<sup>13</sup> Brigagao (1986).

a great cost and may have been achieved by direct government support rather than indirect military production promotion. In Brazil, however, the skill and technology levels of military and civilian industries are more compatible than in other countries and these industries have managed to support each other.<sup>14</sup>

### **III. Economy of Jordan: Background**

The Hashemite Kingdom of Jordan is a middle income country with a population of 5.5 million. Jordan is a small open economy with few natural resources and little manufacturing, but has a large skilled population that works abroad. Jordan has inadequate supplies of water and consists mainly of arid desert with around 4% arable land. Its main natural resources are potash and phosphate

The main challenges facing Jordan are reducing dependence on foreign grants, reducing the budget deficit, and creating investment incentives to promote job creation.

A substantial percentage of the population, 38% is under the age of fourteen resulting in a rapid increase in the working age population. Jordan currently has a large disparity between its official and unofficial employment rates at 15% and 30% respectively.<sup>15</sup> The GNI per capita in 2004 was \$2140, which afforded the population one of the highest regional per capita disposable income compared to other emerging

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<sup>14</sup>Brzoska (1995) reports that the recent conflicts in the Middle East, Gulf War I, Gulf War II, have dealt a serious blow to the defense industries of developing nations. The superiority of advanced technology weapons increased the demand for US and European weapons and closed the market for developing countries. In an interview with Gen. Div. Werlon Roure, Director of the Directoria de Material Belico/Brazilian Army Staff, 01/17/94, reported by Bittencourt (1994), the General summarizes the causes of the Brazilian defense industry crises and points out that the “Gulf War gave absolute dominance of the Middle East market to the United States and some European producers.”

India’s case differs from Brazil in that it is a situation of over ambitious expectations. The country had faltered in keeping up with the current arms technology despite repeated purchasing of advanced technology. *Defense News, January 9, 2006* reports on the poor quality of domestically produced defense equipment. In addition, Argentina’s defense productions program, started in the 1950s, faltered despite the existence of a relatively advanced civilian industrial base because of over ambitions expectations.

<sup>15</sup> CIA, *The World Fact Book*, 2005.

countries. The relatively comfortable economic situation can be credited to the country's ability to maintain social and political stability. Jordan depends on one of the world's highest share of workers' remittances, about 20% of GDP, to support its balance of payments.

In the early 1990s, the Jordanian economy was highly regulated and recovering from an exchange rate and banking crisis. The country was struggling to absorb Jordanian refugees as a result of the Gulf War. While economic growth was due to housing investment, external trade and exports were predominantly mining and agricultural products. The government controlled a significant share of industrial production and regulated commodity prices.

Since the early 1990s, Jordan has undertaken some broad economic reforms aimed at stabilization by reducing the budget deficit and the foreign debt through forgiveness and rescheduling. In addition, the Jordanians reduced trade tariffs and regulations, freed most commodity prices, and pursued a market orientation primarily through privatization.<sup>16</sup> The government also has liberalized the trade regime sufficiently to secure Jordan's membership in the World Trade Organization (WTO) in 2000. Building on the related reforms enacted in 2000, Jordan and the US began implementation of the Free Trade Agreement in December 2001, positioning Jordan as the fourth country (after Canada, Mexico, and Israel) to enjoy such a relationship with the US; Jordan also has an Association Agreement with the EU (2001). These measures have helped improve productivity and have put Jordan on the foreign investment map.

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<sup>16</sup> \$900 million in state-owned enterprise assets have been transferred to private-sector control as of 2004, Ministry of Foreign Affairs, Jordan.

Jordan imported most of its oil from Iraq at a concessionary price, but the US-led war in Iraq in 2003 made Jordan more dependent on oil from other Gulf nations, forcing the Jordanian government to both raise the retail petroleum product prices and sales tax base. The increase in petroleum product prices resulted in a spike in consumer price inflation and a marked increase in the current account deficit. Jordan's export market, which is heavily dependent on exports to Iraq, was also affected by the war. The market recovered quickly, however, due to the Iraq rebuilding effort.

Historically, Jordan has had difficulty attracting investments. The development of the US Jordan Free Trade Area Agreement (FTA), QIZ,<sup>17</sup> the Aqaba Special Economic Zone (ASEZA),<sup>18</sup> and KADDB<sup>19</sup> are government attempts to more closely integrate

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<sup>17</sup> Substantial differences exist between the FTA and QIZ. US officials established the legal framework for QIZs in 1996 by offering special duty and quota free access to goods produced with specified minimum Jordanian, Palestinian, and Israeli content. To qualify a product in the QIZ, a minimum of 35% of the product's appraised value must be produced in the QIZ. The 35% may be arrived at using one of three methods. The first is 11.7% from a Jordan QIZ, 8% from Israel (7% for high tech). The remaining content may come from Jordan, Israel, West Bank/Gaza, and the USA. The second method requires that Jordanian and Israeli manufacturers maintain at least 20% of the total production cost. The third involves a combination of the first two methods. Textiles and apparel have been the primary products of QIZ to circumvent the high US custom duty on these items. Jordan feared that the 2005 expiration of the WTO multi-fiber agreement, which would allow China unimpeded access to the US market, would render the QIZs unprofitable. The Bush administration, however, reimposed textile quotas in some categories imported from China allowing a limited increase in imports to the US. As a result, Jordan experienced a rise in the number of QIZ companies registering in 2005. The QIZs ownership is overwhelmingly non Jordanian.

The FTA is a phased arrangement, only eliminating duties on a number of products after 10 years. Products exported from QIZs have immediate duty and quota free access. The rules of product origin are different between the QIZ and FTA with a larger Jordanian percent value added under FTA.

<sup>18</sup> Jordan officially launched ASEZA in May 2001. As of 2004, the zone has attracted \$1 billion in private investment and registered 250 companies. The zone is the largest free zone at an area of 375 square kilometers. It offers investors a business income tax set at 5%, no tariffs on imported goods, streamlined labor and immigration procedures, and no restrictions on foreign equity investment. To date, the two largest projects appear to be tourism related, Tala Bay, a residential and resort complex, at \$350 million and Ayla Oasis, a marine town, at about \$700 million. Over the next 20 years, approximately 50% of investments in Aqaba are anticipated to be tourism related, 30% in industry, and the remaining in services. The *Jordan Times* reported August 24, 2005 that a maintenance center serving Russian made planes operating on Middle East routes will start operating in 2007 at the King Hussein International Airport in Aqaba. The project will benefit from incentives offered by ASEZA.

*Defense News* reported May 29, 2006 that a Russian company OPK Oboronprom established a joint venture with a Jordanian Holding company, Orangeville Consultants for the production and maintenance of Kamov's Ka-22 helicopter at an unspecified facility in Jordan.

Jordan into the global economy by spurring trade and investment. Since 2000 there has been a rapid growth in merchandise exports especially in textile and pharmaceutical products. A significant portion of export growth is due to duty and quota free access to US markets from the QIZs. Table 3 details the increase in QIZ exports and number of QIZ companies. In addition, job creation was regarded as an essential component of QIZs in Jordan. The number of QIZ jobs created from 2001 to 2004 rose by 46% for local workers. The jobs available for expatriate workers, however, rose even more dramatically during the same time period by 360%.<sup>20</sup> Table 4 details the QIZ labor force. Table 5 lists the QIZs, their status, and their ownership. Table 6 lists the QIZ companies and ownership.

#### **IV. KADDB**

In the early 1990s, Jordan's military industry expertise lay with the Royal Maintenance Corps (RMC), which was charged with maintenance, overhaul, and limited upgrades of equipment. The largest facility was the King Hussein Main Workshops (KHMW) in Zarqa. The RMC rebuilt armored vehicles, performed some redesign on the British built Alvis Scorpion tracked reconnaissance vehicle and undertook the modernization of armored fighting vehicles and armored personnel carriers.<sup>21</sup> The RMC

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<sup>19</sup> There is no documented case of defense production in developing nations without government involvement. The case of Mexico reinforces this argument where a much higher level of defense production would be expected than currently exists. However, the consensus is that there is no political will to establish a defense industry even though there is a high level of civilian industrial capability.

<sup>20</sup> Many explanations have been provided for the increase in foreign workers. They include the perception that foreign workers are more efficient, willing to work longer hours, and have higher skills than local workers. However, Kardoosh and Khouri (2004) point out that the companies that are Jordanian owned have a small proportion of foreign workers and in some cases none at all.

<sup>21</sup> The M60A1 main battle tank was upgraded to A3 standard. In addition, the Khalid (Chieftain) and Tariq (Centurion) MBTs were modified and routine and heavy maintenance performed to them at KHMW. Jane's, 18 March, 1997

outfitted some Scorpions with TOW anti-tank missiles, and others with a mortar carrier.<sup>22</sup> This work was part of a plan to create an indigenous military industrial capability known as the Jordan National Industry.

In August of 1999, the Jordanians established KADDB as an independent government entity within the Jordan Armed Forces (JAF) with a Board of Directors reporting to the Private Office of the King of Jordan through the Chairman of the Joint Chiefs of Staff. KADDB's operations are funded from the defense budget and earned income. KADDB mission is to supply the JAF with a range of scientific and technical services in engineering and applied research including policy and technical advice and support, operational assessments and studies, formulation of user requirement statements, concept definition, project support, equipment trials and evaluation, and general support.<sup>23</sup> In addition, KADDB is to provide training for Jordanian engineers in research, design, and development to facilitate further employment opportunities.

KADDB operates with two strategic business groups. The Engineering Group is responsible for the design, development, prototyping, evaluation, and industrialization of equipment primarily for the Jordanian armed and civil defense forces and secondarily for markets in the Middle East and North Africa. KADDB's Commercial Operations Group has two departments, Marketing and Business Development. The commercial group is responsible for the marketing of KADDB projects, technologies, and services. KADDB

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<sup>22</sup> Jane's, 19 June 1997.

<sup>23</sup> KADDB publication.

had expected to generate, within five years of its conception in 1999, a revenue stream enabling a self sufficient Bureau to operate without government subsidies.<sup>24</sup>

KADDB's strategic direction, from its inception to 2005, was to focus on wheeled and tracked armored fighting vehicles (AFV) design, development, integration, prototyping, testing, and evaluation to be achieved through joint venture operations.

KADDB medium term plans are to expand land system capabilities to include communication systems, battlefield management systems, and air defense systems.

KADDB is to develop the capability to upgrade aircraft and integrate aircraft systems.

Appendix A provides an overview of KADDB products.<sup>25</sup> Table 7 details the companies KADDB formed, the strategic partners involved, and the employment generated.

KADDB does not have access to offset agreements to help develop its capability since Jordan currently does not have offset agreements with any of its suppliers and, quite probably, does not have the purchasing power to be able to aggressively pursue offsets. However, since the benefits of offsets, both those that are direct and indirect, are questionable, it may be in Jordan's best interest to refrain from pursuing this option; this is especially true because arms purchasers may actually pay a higher price when seeking offsets.

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<sup>24</sup> According to KADDB sources, KADDB still receives funding from the Jordanian government of about \$12 million a year. However, sales and revenue figures are not disclosed so it is not clear what percentage of KADDB operating funds are from the government.

<sup>25</sup> Defense News 03/30/06 reports that the Pince Feisal Information Technology Center in which KADDB is a 40% shareholder as an agreement with a university in the U.K. and Cranfield University Defence Academy to educate Jordanians how to teach technology. In the first phase of the project, Jordanian staff are to attend a course in defense technology in the U.K. The second phase will allow the Jordanians to teach one third of the class in Jordan and, by the third phase, the Jordanians will take over teaching the class. The material will eventually be translated to Arabic and offered in the region. *Defense News* 03/29/06 reports talks between Northrop Grumman and KADDB to promote and support robotics in the region by having KADDB either assemble parts from kits or maintain the equipment.



The US has increased its military aid to Jordan since the mid 1990s, helping maintain Jordan's level of military expenditures. Jordan currently has one of the highest military expenditures to GDP ratios for its income class. The Jordanian Armed Forces currently rely on the United States Foreign Military Financing (FMF) for a substantial percentage of their military expenditures. Table 8 details the Annual US military assistance to Jordan. The US level of aid has fluctuated widely over the past 10 years in response to political conditions and available aid funding. Jordan can not access FMF for domestic acquisition, and as such, KADDB does not have the flexibility to use these funds to help develop Jordan's indigenous defense industry.<sup>26</sup> However, because of the fungibility of these funds, Jordan is able to maintain the same level of military expenditures with less domestic funds and at the same time support its defense industry.

## **V. KADDB and QIZ**

KADDB and the QIZ are the two major economic efforts undertaken by the Jordanian government to stimulate the domestic economy. Although, the QIZ program was established three years before KADDB, comparing their performance to this point would be beneficial.

In absolute numbers, even after accounting for expatriate employment, the QIZs have created more employment opportunities for Jordanians than KADDB<sup>27</sup>. Most of the QIZ created jobs, however, require minimal technical skills. Data available from the Ministry of Industry and Trade for 2002 provide a rough classification of jobs available

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<sup>26</sup> Jordan conducts courses and training for the New Iraqi Army Training Project with US funding. Data regarding the extent of KADDB's participation and benefit from this is unavailable.

<sup>27</sup> The number of jobs generated by the QIZs in 2003, five years from their establishment, are about 15214. The jobs generated by KADDB in 2005, five years after establishment, are about 1300.

in 31 QIZs. While it is difficult to determine the level of skills required using the job description provided, by the process of eliminating obviously low skilled positions, it is estimated that, at a maximum 6% of domestic jobs generated by QIZs, about 1200, require some technical expertise.<sup>28</sup> Although, the available information for the jobs KADDB created is not complete, it would not exceed 1250 positions and presumably a high percentage of them require some technical skills and a fair percentage would require some form of higher education.<sup>29</sup>

The level of technology used in the QIZs does not extend beyond garment assembly (sewing, ironing and washing). As such, the technology transfer from the QIZs into Jordan is minimal. Applying Krause's production ladder, the QIZs probably operate at an equivalent of level one with the ability to perform simple maintenance work. KADDB, using Krause's "ladder of production" has reached level five by having attained the capability of performing final assembly of less sophisticated weapons with some local component production and to a small extent may have reached level six of co-production or complete licensed production of less sophisticated weapons. KADDB has started operating at level seven of limited R&D improvements to local license produced arms for some systems. KADDB is clearly transferring more technology into Jordan than the QIZs. Comparing the technology transferred by KADDB and the civilian sector into the country, it appears to be at about the same level for equipment manufacturing and

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<sup>28</sup> Based on information provided by the Ministry of Trade and Industry. The author considers jobs that are described as supervisory, maintenance, IT, personnel, accounting, nursing, public relations, and translating as requiring technical skills. Packing, cutting, sewing, security, driving, and washing are not technical.

<sup>29</sup> Based on information provided by KADDB, the number of direct KADDB employees is 300 with approximately 30 in management, 200 skilled technically and the remainder semiskilled and non-skilled. The joint venture companies employ around 950 people. KADDB was unable to provide a breakdown by skills for the joint venture companies.

assembly.<sup>30</sup> However, the IT transfer into the country appears to be higher than that available in the civilian sector.<sup>31</sup>

Little evidence exists to confirm the QIZ or the KADDB success in creating strong backward and forward linkages into the economy because of Jordan's narrow industrial base. QIZs essentially transform imported raw material into a finished product. Little of what goes into creating a final product originates domestically and the value added comes from the transformation (i.e. fabric into clothing). Table 5 lists the number of subcontractor companies created in the QIZ zones to support QIZ activities. All these companies are connected in some way to the garment industry<sup>32</sup>. There is no employment or sales data available for these companies. As it takes very little capital investment to establish a garment facility, these industries are easy to relocate to other countries. The concern is that the QIZs located in Jordan could migrate to Turkey, Morocco, or Egypt, nations with a larger domestic industrial base, when these nations conclude similar arrangements with the US.<sup>33</sup> KADDB seems to make a policy of partnering with a domestic civilian entity for its projects. As such, these civilian entities may be able to transfer their knowledge and experience into the civilian economy. What is not clear at this time is the extent of these industries reliance on defense work and whether they have been able to branch out into the non-defense sector.

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<sup>30</sup> Civilian joint ventures were concluded to maintain and produce the Russian Ka-266 helicopter and to manufacture and assemble of Land Rover vehicles activities similar to those of KADDB. Jane's Information Group, August 1, 2004.

<sup>31</sup> This is based on the premise that the staff of the Prince Faisal Information Technology Center have had to receive training outside Jordan because the technology and the skilled staff are not available in the country.

<sup>32</sup> No details exist as to what business these companies are engaged in. However, all have a variant of the word textile or garment in their name. There is no employment or sales data available for these companies. They are small privately held business not involved in export and presumably provide support services such as packing and laundering.

<sup>33</sup> The majority of QIZs are owned by non-Jordanian. Table 6 details the ownership of the QIZs.

QIZ generated exports increased from \$2.44 million in 1999 to \$919.94 million in 2004. These constituted 23% of all exports from Jordan in 2004. All QIZ exports are directed to the US and it is highly unlikely that Jordan exports to the US would have increased at this rate without the QIZ arrangements. What is not clear at this time is Jordan's success at cultivating the EU and regional markets for QIZ type products. At this point, it is impossible to gauge KADDB's success in exporting since KADDB does not disclose its sales figures. However, KADDB reports some success exporting to Algeria, Iraq, Libya, Saudi Arabia, Sudan, Yemen, and UAE.<sup>34</sup> KADDB also reports sales to the JAF. Again, sales figures were not made available.

Neither the QIZs nor KADDB have been successful in attracting regional capital. The QIZ companies have generated about \$182 million in Foreign Direct Investment (FDI). Approximately 88% of the capital is classified as non-Arab and 5.7% as Jordanian with the balance of 6.3% being regional capital.<sup>35</sup> None of the KADDB joint venture companies list a regional partner (Table 7) and KADDB does not report figures regarding the amount of FDI resulting from non-regional partners.<sup>36</sup>

## **VI. Conclusion**

Whether KADDB can have a positive influence on the Jordanian economy is still an open question. The success of the development of an indigenous military industry is dependent on the existing level of civilian industrialization. Working against the success

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<sup>34</sup> The items sold are the Desert Iris, Body armor and helmets, armored vehicles, ammunition, and small arms. Source:KADDB, 2006.

<sup>35</sup> Kardoosh and Khouri (2004)

<sup>36</sup> Seabird Aviation Jordan in its online publicity material, [http://www.seabirdaviationjordan.com/about\\_us.shtml](http://www.seabirdaviationjordan.com/about_us.shtml) reports the sale of equity to the Dabin Group, a regional company. However, the date, size, and conditions of the transaction are not reported.

of military industries in Jordan is the very same thing that the military industries have envisioned creating, a civilian industry. The developing nations that have had some measure of success in defense production, such as Brazil, South Africa, Taiwan, and South Korea, had a foundation of a diversified civilian industrial sector. The evidence in support of the economic gains resulting from the establishment of military industries is quite mixed for developing countries since defense industry is less productive than civilian industry; research indicates that the reallocations from defense spending to other forms of government spending increase employment. In addition, investment in defense production and poor choices of military technology lead to underinvestment in civilian industries, thus, defeating the purpose of using defense industrialization to jumpstart civilian industries.

The arms market is a buyer's market, especially for low technology products. Demand is for high technology, particularly after the recent engagements in the Middle East proved the superiority of technically advanced weapons systems. As such, KADDB will face intense competition in breaking into the international market and needs an attractive opening to take advantage of economies of scale or dual use technology in its production.

Skilled labor is an essential input into any business venture. As such, KADDB should offer competitive wages to retain skilled labor, and should actively recruit and train personnel from outside the armed forces to avoid introspection and to provide a diverse perspective and a cadre of technically skilled personnel.

KADDB is realistic in its expectations of the industries it is seeking to establish. No attempt has been made to attempt to import or deal with technology beyond its reach

and has accepted a certain level of technological dependence. Nonetheless, it needs to maintain a high quality of research and development to guarantee its survival.

KADDB has made serious efforts to recruit domestic civilian industrial partners and, perhaps working to its advantage, has no offset agreements with any outside suppliers. In addition, KADDB has established an engineering group, manufacturing group, programs group, and several other departments including marketing, business development, supply, operations, and strategic studies that are hopefully engaged in long range regional and security planning.

KADDB could potentially benefit from Jordan's position as a "gateway to the Iraqi market" and establish a niche market. What remains to be seen is whether KADDB can develop the regional markets that it sees for its products and whether it can expand and reach the goals it has set for itself of being self-sufficient and operating without government subsidies

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## Appendix A

Temsah: Temsah is a conversion of a Main Battle Tank (MBT) to provide a mission capable, multi-configured heavily protected Infantry Fighting Vehicle (IFV). The Temsah, developed in collaboration with Mechanology Design Bureau of South Africa, General Dynamics, and CLS Jordan, is based on a modified Tariq MBT chassis, which is a British supplied and General Dynamics upgraded Centurion.

Phoenix M60 battle tank upgrade: KADDB, in conjunction with General Dynamics, RUAG, and Raytheon, developed the Phoenix battle tanks upgrade. This upgrade involves a mobility, lethality, and shoot on the move to increase the M60s operational capability.

Falcon Turret: KADDB, in partnership with the Mechanology Design Bureau (MDB) and IST Dynamics of South Africa developed the Falcon Turret as part of intellectual development and technology transfer between the South African defense industrial private sector and Jordan. The intended platform for the turret is the Al-Hussein MBT (British Army Challenger 1).

Desert Ranger: The Desert Ranger is an all terrain motorcycle designed by Rokon and modified by KADDB to meet Jordanian military requirements.

Monjed P2: The Monjed is a converted recovery vehicle based on the chassis of the decommissioned M60A1 battle tank. The Monjed is a collaboration between KADDB and the Jordan Armed Forces.

Armored Shield: Armored shield provides protection for the gunner on the M113 Armored Personnel Carrier (APC). The shield was designed by KADDB in association with the Jordan Armed Forces.

M113A2 MK1J APC: This is essentially a mobility upgrade for a M113A1 APC with United Defense Industries. It includes a new turbocharged engine, associated transmission, drive train, differential and suspension upgrade kits.

Road Wheels and Tracks: KADDB in partnership with the RMC will refurbish and manufacture Armored Fighting Vehicle (AFV) tracks, pads, and road wheels.

Al-Jawad: Al-Jawad is an armored troop carrier designed and engineered by KADDB in conjunction with Jankel. The carrier comprises an armored body and standard Ford chassis.

Stirling Tactical intervention Vehicle: The Stirling is a collaborative project between KADDB and Jankel. The vehicle is a counter terrorist vehicle for use by hostage rescue teams.

Al Thalab: Al-Thalab is a long range patrol vehicle developed by KADDB in conjunction with Jankel.

Armored Toyota 78 and 105 Land Cruiser: in partnership with Jankel.

Desert Iris 4x4: The Iris is a multipurpose light weight utility vehicle developed in conjunction with SHP Motorsports.<sup>37</sup>

Unmanned Arial Vehicles (UAV): KADDB in partnership with Jordan Advanced Remote Systems (JARS), and Jordan Aerospace Industries has developed three modes of UAVs. The Jordan Silent Eye portable UAV designed for scouting missions. The

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<sup>37</sup> Lockheed Martin and KADDB mount a two laser designated Hellfire II guided missile on the Desert Iris. (Defense News 03/30/2006)

Falcon designed for surveillance missions, and the Arrow for air defense training and weapons systems. In addition, JARS has equipped the Canadian licensed, locally produced Sama CH 2000 single prop, two seater aircraft with a camera and infrared surveillance ball.

Combat body armor and helmet: The body armor is manufactured in association with NP Aerospace Ltd. UK.

Surveillance aircraft: KADDB and Seabird Aviation of Australia established a joint venture in 2003 to assemble the Seeker SB7L-360 low level observation and surveillance aircraft at an air base in Jordan to supply aircraft to Iraq for patrol protection of oil fields and pipelines.

Refurbished vehicles: ITT industries Systems Division (ITT-SD) of the US and KADDB entered into a contractual agreement to facilitate the delivery of repaired and refurbished US military vehicles to the Iraqi Armed Forces. A significant volume of the work will be subcontracted to KADDB joint venture and partner companies.<sup>38</sup>

Marine products: KABBD is a joint venture with Hurricane Engineering will provide complete solutions for marine operators, from design, development, and manufacture to after sales support.

A number of cooperative programs have been instituted on the back of recent projects: electrical equipment and manufacturing repair facility operated by CLS Jordan, electrical harness production with Raytech of Austria; the establishment of a forward logistics base

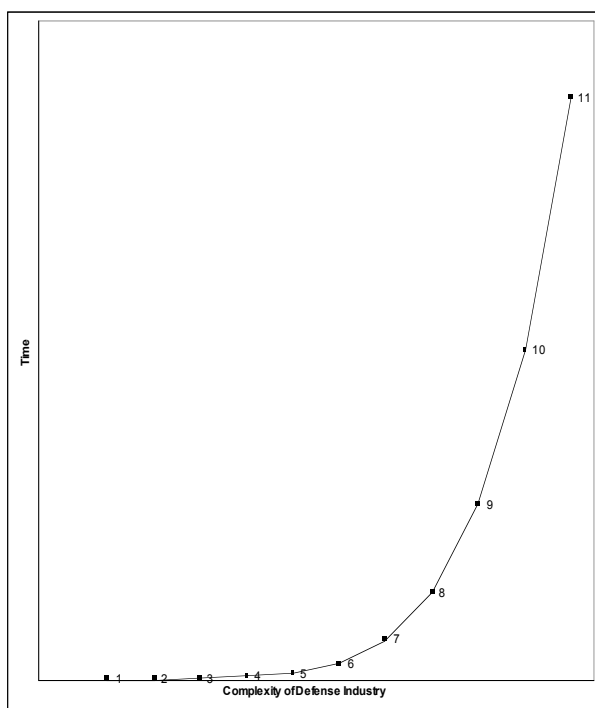
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<sup>38</sup> Defense News 03/30/2006 reposts that ITT wants to establish a regional facility for vehicle maintenance and upgrade at an existing KADDB facility in Zarka, Jordan. Currently, KADDB's facility in Zarka is being used to upgrade M800 and M900 series trucks and could be forced to close at the end of the project for lack of work.

In addition, Defense News 03/30/2006 reports that Thales is in talks with KADDB to capture some of the Iraqi vehicle fleet's upgrades. KADDB would act as a prime contractor and systems integrator while Thales would supply the electronic equipment.

at Aqaba by Raytheon; and the introduction of composite materials technology by XS  
Design of Germany and Swesco of Sweden

Figure 1: Time Progression of Defense Production



1. Capability of performing simple maintenance
2. Overhaul, refurbishment and rudimentary modification capabilities
3. Assembly of imported components, simple licensed production
4. Local production of components or raw materials
5. Final assembly of less sophisticated weapons; some local component production.
6. Co-production or complete licensed production of less sophisticated weapons
7. Limited R&D improvements to local license -produced arms
8. Limited independent production of less sophisticated weapons; limited production of more advanced weapons
9. Independent R&D and production of less sophisticated weapons
10. Independent R&D and production of advanced arms with foreign components
11. Completely independent R&D production

Table 1: Jordan Military Expenditure

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Milex(m dinars)	301	326	361	586	417	445	491	512	531	537	551	629	623
Milex (constant 2003 US \$m)	564	592	634	1004	671	694	744	771	795	789	796	887	849
Government Expenditures (m dinar)	1081.2	1235.1	1312.8	1471.5	1666.9	1681.9	1876.8	1804.1	1868.6	2027.7	na	na	na
GDP (m dinar)	3610	3884	4358	4714	4912	5137	5609	5767	5989	6338	6698	7056.2	na
Defense/GDP	8.3	8.4	8.3	12.4	8.5	8.7	8.8	8.9	8.9	8.5	8.2	8.9	na
Defense/Gov	27.8	26.4	27.5	39.8	25.0	26.5	26.2	28.4	28.4	26.5	na	na	na

Source: Milex data SIPRI  
 GDP IMF IFS, 2005.  
 Government Expenditures IMF IFS, 2006.



**Table 2: The steps in defense production for a developing nation**

- 1 Capability of performing simple maintenance
- 2 Overhaul, refurbishment and rudimentary modification capabilities
- 3 Assembly of imported components, simple licensed production
- 4 Local production of components or raw materials
- 5 Final assembly of less sophisticated weapons; some local component production.
- 6 Co-production or complete licensed production of less sophisticated weapons
- 7 Limited R&D improvements to local license-produced arms
- 8 Limited independent production of less sophisticated weapons; limited production of more advanced weapons
- 9 Independent R&D and production of less sophisticated weapons
- 10 Independent R&D and production of advanced arms with foreign components
- 11 Completely independent R&D production

Source: Krause (1992)

Table 3: Jordan Exports

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Number of QIZ companies								2	12	38	43	49	58	55
QIZ exports m USD	na	na	na	na	na	na	na	2.44	25.19	150.12	381.2	586.61	919.94	1011
Total exports (m dinar)	829.31	864.66	995.2	1241.1	1288.2	1301.4	1277.9	1298.8	1346.6	1626.4	1963.9	2184.87	2800.3	3088.73*
Total exports (m USD)	1200.01	1227.82	1420.15	1749.95	1816.36	1834.97	1801.84	1831.31	1898.71	2293.22	2769.10	3080.67	3948.42	4355.11*
QIZ/exports(%)	na	na	na	na	na	na	na	0.13	1.33	6.55	13.77	19.04	23.30	23.21

Source: QIZ exports Jordan Ministry of Industry and Trade, Industrial Development Directorate.

Total exports, IMF IFS, 2005.

Conversion rate, IMF IFS, 2005.

\* Preliminary figures

Table 4: QIZ Direct Employment

Year	2001	2002	2003	2004	2005
Local	13300	13900	15214	19416	16411
Expatriate	5700	9600	11339	26418	29902
Total	19000	23500	26553	45834	46313
% Local/Total	70.00	59.15	57.30	42.36	35.43

Source: Jordan Ministry of Industry and Trade, Industrial Development Directorate.

Table 5: Established QIZs

	Ownership	QIZ Status	QIZ Companies	Sub Contractors
Al Hassan Industrial Estate	Public	active	15	21
Al Hussein Bin Abdullah II Industrial City(Al-Karak)	Public	active	3	1
Aqaba QIZ	public	not active	0	0
Ad-Dulayl Industrial Park	private	active	13	6
Al-Tajamout Industrial City	private	active	19	12
Cyber City Park	private	active	2	3
Al-Qastal Industrial Park	private	active	2	0
Al-Zay Ready Wear (Al-Rusaifa)	private	active	1	0
Al-Mashta Qualified Industrial Park	private	not active	n/a	n/a
Gateway Park	private	not active	n/a	n/a
Hillwood Hashemite University	private	not active	n/a	n/a
Al-Hallabat Industrial Park	private	active	n/a	n/a
Al-Mawared	private	active	n/a	n/a

Data as of 8/2006

Source: Ministry of Industry and Trade

Table 6: QIZ Companies

	Ownership	Location
Sari International	UK	Al-Hassan Industrial Estate
Falcon	50% UK, 50% Chinese	Al-Hassan Industrial Estate
Century Standard Textile	Jordan	Al-Hassan Industrial Estate
Century Miracle	65% UK, 35% Jordan	Al-Hassan Industrial Estate
Century Trading	50% Jordan, 50% Netherlands	Al-Hassan Industrial Estate
Oasis Textile International	Thai	Al-Hassan Industrial Estate
Business Faith	60% UK, 40% Hongkong	Al-Hassan Industrial Estate
American Jordanian Company for Apparel	USA	Al-Hassan Industrial Estate
Rolex	UAE	Al-Hassan Industrial Estate
Al-Manar	Jordan	Al-Hassan Industrial Estate
International Business	80% UK, 20% China	Al-Hassan Industrial Estate
Classic Fashion Apparel Industry	India	Al-Hassan Industrial Estate
United Bright	UK	Al-Hassan Industrial Estate
Elmasira	98% Israel, 2% Jordan	Al-Hassan Industrial Estate
Hussen	Israel	Al-Hassan Industrial Estate
Century Wear	50% Jordan, 50% Swiss	Al-Hassan Industrial Estate
Camel Textile	100% UK	Al Hussein Bin Abdullah II Industrial City(Al-Karak)
Honorway Apparel	67% Bangladesh, 33% Hongkong	Al Hussein Bin Abdullah II Industrial City(Al-Karak)
Expo	Jordan	Al Hussein Bin Abdullah II Industrial City(Al-Karak)
Hi-Tech Textile	Pakistan	Ad-Dulayl Industrial Park
United Creations LLC	Israel	Ad-Dulayl Industrial Park
Mediterranean	UAE	Ad-Dulayl Industrial Park
Petra	Pakistan	Ad-Dulayl Industrial Park
Rainbow textiles	Pakistan	Ad-Dulayl Industrial Park
Neddele Craft	Pakistan	Ad-Dulayl Industrial Park
Fine Apparel Ltd.	50% Pakistan, 50% USA	Ad-Dulayl Industrial Park
Mustafa and Kamal	Oman	Ad-Dulayl Industrial Park
Al-Qadir	India	Ad-Dulayl Industrial Park
Bee Line	80% Singapore, 20% India	Ad-Dulayl Industrial Park
Sun Jordan	Turkey	Ad-Dulayl Industrial Park
Al-Mateen	90% Israel, 10% Jordan	Ad-Dulayl Industrial Park
Ayam Maliban	SriLanka	Ad-Dulayl Industrial Park
New World Textile	USA	Al-Tajamout Industrial City
Al-Aham	UK	Al-Tajamout Industrial City
Maintrend	UK	Al-Tajamout Industrial City
CCKM	USA	Al-Tajamout Industrial City
United Garments	50% Jordan, 50% Pakistan	Al-Tajamout Industrial City
Jerash Fashions	UK	Al-Tajamout Industrial City
Silver Planet	Pakistan	Al-Tajamout Industrial City
Fomosa	China	Al-Tajamout Industrial City
Ivory	India	Al-Tajamout Industrial City
Dragon Jordan	50% UK, 50% China	Al-Tajamout Industrial City
Prestige	India	Al-Tajamout Industrial City
Aseel	India	Al-Tajamout Industrial City
Golden Wear	India	Al-Tajamout Industrial City
Pacific	India	Al-Tajamout Industrial City
Taiyar	China	Al-Tajamout Industrial City
Atatex	Turkey	Al-Tajamout Industrial City
Jordan Silk	60% Jordan, 40% China	Al-Tajamout Industrial City
W&D	Taiwan	Al-Tajamout Industrial City
El-Zay Ready Wear Manufacturing Co	Jordan	Al-Zay Ready Wear (Al-Rusaifa)
United Textile Group	Jordan	Al-Qastal Industrial Park
Prime Five Manufacturing	Jordan	Al-Qastal Industrial Park
Rich Pine	UK	Cyber City Park
Caliber	India	Cyber City Park

Data as of 08/2006

Source: Ministry of Trade and Development

Table 7: KADDB Joint Venture Companies

	Ownership	Share(%)	Specialization
Jordan Light Vehicle Manufacturing (JVLM)	KADDB	74.50%	Manufacturing and customizing of armored vehicles
	JankeI	25.50%	
Jordan Special Vehicle Manufacturing (JSVM)	KADDB		Desert Iris
CLS Jordan	KADDB	48.50%	Automotive and electrical equipment
	CLS Middle East	51.50%	
Raytech Jordan	KADDB	33.33%	Electrical harnesses, systems design
	CLS Middle East	33.34%	
	Raytech	33.33%	
Seabird Aviation Jordan	KADDB	49.53%	Light aircraft
	Seabird Aviation	50.47%	
NP Aerospace Jordan	KADDB	49.00%	helmets and body armor
	NP Aerospace	51.00%	
Josecure International	KADDB	100.00%	Personal and infrastructure security
National Resources Development Company	KADDB	100.00%	Service and solutions in security field
Prince Faisal Information Technology Center	KADDB	20.00%	Education in IT, embedded systems, and software technology
	Yarmouk University	40.00%	
	Park Controls	40.00%	
Mechanology Jordan	KADDB	49.00%	Marketing and sales of military and commercial products
	Mechanology	10.00%	
	The Virlean Initiative	41.00%	
Sofex Jordan	KADDB	100.00%	Exhibit space
Ultimate Building Machines Investment and Development	KADDB	100.00%	Steel fabrication and hanger construction
United Jordanian for Technical Consultancy	KADDB	100.00%	Consulting services (not active)
United Jordanian Telecom Networks	KADDB	100.00%	Technical services (not active)
Applied Defense Systems	KADDB	34.00%	Defense electronics (not active)
	Yazan Muft	33.00%	
	Amin Bader	33.00%	
Jordan Armaments and Weapons Systems	KADDB	100.00%	multi caliber pistol

Source: KADDB

Table 8: Annual U.S. Military Aid to Jordan

Fiscal Year	Military Assistance (current year M\$)		Military Assistance (2003 M\$)		Jordan mil ex (2003 M\$)	% U.S. funded
	FMF	IMET	FMF	IMET		
1991	20	1.3	27.01	1.76	544	5.3
1992	20	0.6	26.22	0.79	564	4.8
1993	9	0.5	11.46	0.64	592	2.0
1994	9	0.8	11.17	0.99	634	1.9
1995	7.3	1	8.81	1.21	1004	1.0
1996	200	1.2	234.57	1.41	671	35.2
1997	30	1.7	34.38	1.95	694	5.2
1998	75	1.6	84.64	1.81	744	11.6
1999	70	1.6	77.30	1.77	771	16.7
1999 (Wye)	50	0	55.22	0.00		
2000	75	1.6	80.12	1.71	795	29.2
2000 (Wye)	150	0	160.24	0.00		
2001	75	1.7	77.92	1.77	789	10.1
2002	75	2	76.70	2.05	796	13.0
2002 (suppl)	25	0	25.57	0.00		
2003	198	2.4	198.00	2.40	887	68.4
2003 (suppl)	406	0	406.00	0.00		
2004	206	2.9	200.63	2.82	849	24.0
2004 (suppl)	0	0	0.00	0.00		
2005	206	3	194.04	2.83		
2005 (suppl)	100	0	94.20	0.00		
2006	210	3	na	na		
2007	206	3.1	na	na		

Source: Congressional Research Service Issue Brief for Congress  
 Jordan: U.S. Relations and Bilateral Issues, updated March 14,2006  
 SIPRI for Jordan mil ex  
 IMF IFS for deflator