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Military Industrialization and Economic Development: Jordan's Defense Industry

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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. The stated goals of this initiative are to stimulate the development of a defense scientific industrial base, to enable import substitution and generate export sales, to ensure the development of domestic industries and technology, to provide training to technical personnel to provide further employment opportunities, and to ensure the development of regional industrial joint ventures. With the Jordanian defense expenditures at 8.7% of GDP, the creation of a defense industry was thought to be a means of utilizing the spending power of the defense budget to assist in economic growth without placing additional demands on the national budget. This study examines Jordan's attempt to establish an arms industry and reviews its accomplishment. In addition, the study compares the arms industry to the QIZs as the alternate government facilitated economic development mechanism.

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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. The stated goals of this initiative are to stimulate the development of a defense scientific industrial base, to enable import substitution and generate export sales, to ensure the development of domestic industries and technology, to provide training to technical personnel to provide further employment opportunities, and to ensure the development of regional industrial joint ventures. With the Jordanian defense expenditures at 8.7% of GDP, the creation of a defense industry was thought to be a means of utilizing the spending power of the defense budget to assist in economic growth without placing additional demands on the national budget. This study examines Jordan's attempt to establish an arms industry and reviews its accomplishment. In addition, the study compares the arms industry to the QIZs as the alternate government facilitated economic development mechanism.

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.[1] The stated goals of KADDB are 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 cross over to commercial civilian application.[2]

In contrast to other countries that have developed domestic defense industries for strategic reasons[3], Jordan's primary reasons appear to be economic. As part of an economic reform program, the defense industrial initiative is intended to jumpstart industrialization across a range of sectors. The stated goals of this initiative are to

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[1] KADDB publication.

[2] 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 material science, energy, water resources, biomechanics, nanotechnology, and safety and security. These fields of research were identified by the UK's Defense Evaluation and Research Agency (DERA) as areas that are attracting resources for research and development in NATO (Jane's International Defense Review, 2002)

[3] The motivation for domestic arms production are to reduce dependence on outside arms suppliers, to enhance a nations 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 arms industry in the early 1960s was as an acute strategic move (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 emerging of a new political order in 1994 following the election of an ANC led government and the lifting of the UN arms embargo, the arms industry underwent substantial restructuring with the new government struggling to justify maintaining the industry. Eventually, the justification focused on economics, employment maintenance and creation, and trade (Batchelor and Willett 1998).
Brazil built an arms industry for national security to enhance its ambitions as a regional and global power (Freeman 2002) and as a preemptive strategic move (Brauer 2002).

stimulate the development of a defense scientific industrial base, to enable import substitution and generate export sales, to ensure the development of domestic industries and technology, to provide training to technical personnel to provide further employment opportunities, and to ensure the development of regional industrial joint ventures.[4] With the Jordanian defense expenditures at 8.7% of GDP, [5] the creation of a defense industry was thought to be a means of utilizing the spending power of the defense budget to assist in economic growth without placing additional demands on the national budget. This is being undertaken at a period of falling arms sales and production.[6] Table 1 details Jordan military expenditures from 1992-2002. Jordan has sold 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'.

This paper will review the development of the Jordanian arms industry. The paper will attempt to assess the successes of the strategy behind the creation of the industry, namely employment creation, technology transfer, improved trade, and backward and forward linkages. The paper will also examine potential pitfalls such as crowding out, value added, and the economic costs of losing industry.

Section 2 will provide an introduction to Jordan and the evolution of its economy. Section 3 will review the economics of military industries. Section 4 will detail KADDB and describe its role in the Jordanian economy. Section 5 will review KADDB's accomplishments, compare it to the QIZs as alternate government facilitated economic development mechanisms and conclude.

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[4] KADDB, Jane's IDR 2002.
[5] SIPRI reports defense expenditures in 2000 at USD 795, in 2001 USD 789, in 2002 USD 796 all in constant 2003 $.
[6] SIPRI Military Expenditures and Arms Production Project – June 2003.

Economy of Jordan: Background

The Hashemite Kingdom of Jordan is a lower middle income country with a population of 5.5 million. Jordan is a small open economy with few natural resources and little manufacturing but a large skilled population that works abroad. 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 14 resulting in a rapid increase in the working age population. Jordan currently has an official unemployment rate of about 15% and an unofficial of about 30%.[7] The GNI per capita in 2003 was $1850 affording the population one of the highest per capita disposable income compared to other emerging countries in the region. The relatively comfortable economic situation can be credited to the countries ability to maintain social and political stability. Jordan depends on one of the world's highest share of workers remittances, about 20% of GDP, and public grants.

Jordan is resource poor and has no oil resources. 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. 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 raise retail petroleum product prices and the sales tax base. The increase in petroleum product prices resulted

[7] CIA, The World Fact Book, 2005.

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 due to the Iraq rebuilding effort.

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 Jordan refuges as a result of the Gulf War. Economic growth was mainly due to housing investment and external trade and exports were mainly 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. The government also reduced trade tariffs and regulations, freed most commodity prices, and pursued a market orientation primarily through privatization.[8] The government also has liberalized the trade regime sufficiently to secure Jordan's membership in the WTO (2000). Building on the World Trade Organization-related reforms enacted in 2000, Jordan and the U.S. Government 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 United States and an Association Agreement with the EU (2001). These measures have helped improve productivity and have put Jordan on the foreign investment map.

[8] $9oo million in state-owned enterprise assets have been transferred to private-sector control as of 2004, Ministry of Foreign Affairs, Jordan.

Historically, Jordan has had difficulty attracting investments. The development of the US Jordan Free Trade Area Agreement (FTA), qualified industrial zones (QIZs)[9], the Aqaba Special Economic Zone (ASEZA)[10], and KADDB[11] are attempts by the government to integrate the country more closely in the wider global economy by spurring trade and investment. There has been a rapid growth in merchandise exports since 2000 especially in textile and pharmaceutical products. A significant portion of export growth is due to duty and quota free access to USA markets from the QIZs. Table 2 details the increase in QIZ exports and number of QIZ companies. Job creation was an essential component of QIZs in Jordan. Job creation for local workers rose dramatically

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[9] There are substantial differences between the FTA and QIZ. The legal framework for QIZs was established in 1996 when the US offered 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 appraised value of the product 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 the Jordanian and Israeli manufacturers to maintain at least 20% of the total production cost. The third involves a combination of the firs two methods. Textiles and apparel have been the primary products of QIZ to circumvent the high US custom duty on these items. It was feared that by 2005 when the WTO multi-fiber agreement was to expire, the QIZs would no longer be profitable since countries such as China would be able to gain unimpeded access to the US market. However, the Bush administration reimposed textile quotas on some categories imported from China allowing a limited increase in imports to the USA. As a result, Jordan experienced a rise in the number of QIZ companies registering in 2005.
The FTA is a phased arrangement with duties on a number of products eliminated only 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.

[10] 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 operting 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.

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

from 2001 to 2004. However, the jobs available for expatriate workers rose even more dramatically. Table 3 details the QIZ labor force. Table 4 lists the QIZs, their status, and their ownership. Table 5 lists the QIZ companies and ownership.

Economics of Military Industries

The creation of indigenous arms production industries in developing countries is motivated by a variety of non-economic and economic factors. The non-economic are a combination of strategic and political. Since arms are not traded 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 initiated an intense effort to build its military industry in the late 60s and early 70s in anticipation of an arms embargo[12]. Brazil from the late 1960s pursued a political strategy of building up its arms production as part of its ambitions to be a great regional power and in response to a US arms embargo.[13]

The driving force behind the economic motivation for creating an arms industry is industrial development. The military industry would open up job opportunities domestically and by providing training produce a technically trained domestic labor force resulting in the development of domestic human capital. The industry would also reverse a brain drain by providing technical jobs. The creation of a military industry would promote the creation of a civilian industry by providing backward linkages into the economy for support industries. It would also provide forward linkages by feeding into

[12] Krause (1992), Anthony (1993), and Brauer (2002).
[13] Freeman (2002) and Brauer (2002)

downstream industries. It would promote technology transfer from more technologically advanced nations as a result of offset deals and co-production and license agreements with foreign arms producers. The country would improve its balance of payments by substituting the imports of arms for locally produces ones and would export to foreign markets thus saving hard currency.

Krause(1992) enumerates a process, an eleven step "ladder of production", by which a developing country would progress from arms importer to fully independent arms producer. Table 7 lists the steps defined by Krause for arms production for developing nations. Krause explains such models as being descriptive of the evolution of the arms production process and not necessarily a description of the linear progress of arms production. Brauer (2002) points out that some countries may chose to enter into the arms production industry at entry points other than stage one. In addition, some countries may chose to focus on different entry points for different arms. He distinguishes between the development of a complete weapon system production and weapon module production. Krause (1992) argues that most arms production efforts seem to end between stage 8 and 9 with progress beyond limited R&D being rare and technological innovation in arms production being the domain of nations such as the USA and to a lesser extent countries such as France, the UK, and Russia.

South Africa presents a good example of the progression of indigenous arms production. Batchelor and Willett (1998) divide South Africa's arms production into three distinct time periods in which growth in employment in the arms industry was greater than corresponding growth in civilian manufacturing and military expenditures grew faster than total government expenditure. During the first period, 1961-68, South

Africa sifts away from heavy reliance on imports of complete weapons systems to stage 5 of the ladder of production, final assembly of weapons systems and local component production. By the end of the second period, 1968-77, South Africa had reached had reached stage 7 and was close to stage 8 in certain sections such as ammunitions and small arms. The last period, 1977-89, the arms industry reached stage 9 with the ammunitions and small arms sector at stage 10 and the military aircraft, missiles, and naval vessels at much lower stages.

Arms production is less productive than civilian industry since the primary aim of arms production is to raise the performance of weapon systems by improving technological performance rather than focusing on reducing costs through streamlining of production process. As a result, the evidence in support of the economic gains resulting from the establishment of military industries is quite mixed for developing countries. Batchelor and Willett (1998) analyze the economic significance of South Africa's arms industry and conclude that even though the industry employed increasing numbers of highly skilled workers, it absorbed the scarce resources of labor and made then unavailable to the civilian industry. Dunne (1996) indicates that reallocations from defense spending to other forms of government spending have been shown to increase employment. In addition, investment in arms production and wrong choices of military technology led to under investment in civilian industries. They also point out that domestic arms production remained a net user of foreign exchange with no positive impact on the country's technological performance. The results are somewhat mixed for Brazil. Even though in absolute numbers about 200,000 jobs were created at the height

of the industry's success[14], this is considered trivial for a country as large as Brazil. The 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 a great cost and may have been achieved by direct government support instead of indirectly by the promotion of military production. However, in Brazil the skill and technology levels of the military and civilian industries are more compatible than in other countries[15] and these industries have managed to support each other.[16]

Brzoska (1989) divides the cost of weapons production into cost for research and development, cost of establishing a production line, costs for training and hiring employees, and the cost of actually producing components. The fixed costs, research and development, some training and some costs that are part of establishing a production line are fixed and thus independent of length of production run and amount of units produced. However, Brzoska makes the point that these fixed costs are dependent on the level of technological and industrial skills available, the lower the levels the higher the costs. For example, the cost of training a labor force is higher for a less skilled force and the lower labor cost in less developed countries is usually not an advantage since arms production in general is not highly labor intensive. In addition, the cost of research and development

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[14] Brigagao (1986).

[15] India is a case of over ambitious expectations. The country had faltered in keeping up with the current arms technology despite repeated purchasing of advanced technology. Argentina's arms productions program started in the 1950s faltered despite the existence of a relatively advanced civilian industrial base because of over ambitions expectations..

[16] Brzoska (1995).

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 arms 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."

is higher if the nation has a lower level of science and technology. Limited production of a weapon system can be highly expensive. As a matter of fact, it can be higher than purchasing the weapon. Japan in the early 1980s licensed the right to produce F-15. At the end of the production, the production line was shut down with the estimated cost of each plane reaching 250% of the cost of an outright purchase.

Offsets have become a very popular method of stimulating domestic economic activity. Offsets are industrial compensation practices imposed as a condition of purchase on the seller company by the buyer country. Civil offset programs are not permissible for developed countries under Article XXIII of the Government Procurement Act of the World Trade Organization. However, offsets from defense procurement is 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. The offsets may also be indirect where civilian, military goods, or services unrelated to the defense equipment purchased are sourced. The costs and benefits of offsets are debatable with no compelling evidence pointing to the positive impact of offsets on 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.[17]

KADDB

The expertise of the military industry in Jordan in the early 1990s lay with the Royal Maintenance Corps (RMC) which was charged with equipment maintenance,

[17] 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.

overhaul and limited upgrades. The largest facility was the King Hussein Main Workshops (KHMW) in Zarqa. The RMC performed some redesign on British built Alvis Scorpion tracked reconnaissance vehicle and undertook the modernization of armored fighting vehicles and armored personnel carriers.[18] Some Scorpions were outfitted with TOW, anti-tank missiles, and for others the turret was removed to produce a mortar carrier.[19] This work was part of a plan to create an indigenous military industrial capability known as the Jordan National Industry.

In August of 1999, KADDB was established as an independent government entity within the Jordan Armed Forces (JAF) with a Board of Directors reporting to the chief of staff. KADDB is financed by the defense budget and earned income. KADDB is to provide indigenous research and development of military and civilian equipment both for Jordan's operational requirements and for export. KADDB was viewed as a catalyst to spur the creation of a Jordanian defense and scientific industrial base. The strategy was to utilize the spending power available within the defense budget without placing additional demands on the national budget to assist economic growth by developing a defense scientific base. KADDB is to supply the JAF with a range of scientific and technical services in engineering and applied research, 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

[18] 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

[19] Jane's, 19 June 1997.

support.[20] 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 tasked with the design, development, prototyping, evaluation, and industrialization of equipment primarily for the Jordan armed and civil defense forces and secondly for markets in the Middle East and North Africa. KADDB's Commercial Operations Group is structures into two departments, Marketing and Business Development. The commercial group is tasked with the commercial exploitation of KADDB projects, technologies, and services. KADDB is expected to generate within five years a revenue stream to enable the Bureau to be self sufficient and operate without government subsidies.[21]

KADDB's strategic direction from its inception to 2005 is to focus on wheeled and tracked armored fighting vehicles (AFV) design, development, integration, prototyping, test, and evaluation. This is to be achieved by 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.

The following is an overview of KADDB products:[22]

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[20] KADDB publication.

[21] Since sales and revenue figures are not disclosed, it is not clear if KADDB has met its five year financial goal.

[22] 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 Cranfietd University Defence Academy to educate Jordanians how to teach technology. 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 Jordanian 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.

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

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

Falcon Turret: Developed as part of the MERLIN program which involves intellectual development and technology transfer between the South African defense industrial private sector, Mechanology Design Bureau and IST Dynamics, and Jordan. The turret is intended to be retrofitted to MBTs (Al- Hussein, British Army Challenger 1 for Jordan).

Desert Ranger: In conjunction with Rokon. The Desert Ranger is an all terrain motorcycle initially designed by Rokon. KADDB developed a modified version to meet local military requirements.

Monjed P2: a converted recovery vehicle based in the chassis of the decommissioned M60A1 battle tank.

Armored Shield: provides protection for gunner on M113 APC

M113A2 MK1J APC: upgrade from M113A1 with United Defense Industries. The upgrade is essentially a mobility upgrade with new turbocharged engines, associated transmission, drive train, differential and suspension upgrade kits.

Road Wheels and Tracks: new and refurbished AFV tracks, pads, and road wheels.

Al-Jawad: armored troop carrier in conjunction with Jankel. The carrier comprises an armored body and standard Ford chassis. Al-Jawad is intended for use as an armored personnel carrier.

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

Al Thalab: long range patrol vehicle in conjunction with Jankel.

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

Desert Iris 4x4: in conjunction with SHP Motorsports. The Iris is a multipurpose light weight utility vehicle.[23]

UAV: in partnership with Jordan Advanced Remote Systems (JARS), and Jordan Aerospace Industries to produce three UAVs. The Jordan Silent Eye portable UAV designed for scouting missions. The 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: 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. This was to supply aircraft to Iraq for patrol and to protect oil fields and pipelines.

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[23] Lockheed Martin and KADDB mount a two laser designated Hellfire II guided missile on the Desert Iris. (Defense News 03/30/2006)

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.[24]

Marine products: joint venture with Hurricane Engineering to 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 at Aqaba by Raytheon, and the introduction of composite materials technology by XS Design of Germany and Swesco of Sweden.

Table 6 details the companies formed by KADDB, the strategic partners involved, and 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 direct offsets and indirect offsets, is quite questionable, it may be in Jordan's interest not to pursue this option. This is especially

[24] 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 upgrades of Iraq's vehicle fleet. KADDB would act as a prime contractor and systems integrator with Thales supplying the electronic equipment.

import since in the pursuit of offsets, purchasers of arms may actually end up paying a higher price.

The Unites States has increased its military aid to Jordan since the mid 1990s helping maintain Jordan's level of military expenditures. Currently, Jordan has one of the highest military expenditure to GDP ratio for its income class. Table 8 overviews a selection of countries by income class and military expenditures to GDP ration. Currently, the Jordan Armed Forces rely on the United States Foreign Military Financing (FMF) for a substantial percentage of the nation's military expenditure. Table 9 details the Annual U.S. military assistance to Jordan. The U.S. level of aid has fluctuated widely over the past 10 years in response to political conditions and aid funding. Jordan can not access FMF for domestic acquisition. As such, KADDB does not have the flexibility to use these funds to help develop Jordan's indigenous arms industry.[25]

KADDB and QIZ

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

In absolute number, even after accounting for the employment of expatriate worker, the QIZs have created more employment opportunities for Jordanians than KADDB. However, most of the jobs created by the QIZs require minimal technical skills. Data available from the Ministry of Industry and Trade for 2002 provide a rough

[25] Jordan conducts courses and training for the New Iraqi Army Training Project under funding by the U.S. The extent of KADDB's participation and benefit from this is unclear.

classification of jobs available in 31 QIZs. While it is difficult to determine the level of skills required using the job description provided, by process of eliminating the obviously low skilled position, it is estimated that at a maximum 6% of domestic jobs require some technical expertise.[26] The information available for the jobs created by KADDB is not complete, it would not be more than 1000 positions. While the breakdown of jobs created by KADDB into skills is not available, it can be assumed that a high percentage of them require some technical skills and a fair percentage would require some form of higher education.

The level of technology used in the QIZs does not extend beyond simple garment assembly (sewing, ironing and washing). The technology transfer into Jordan is minimal. KADDB, using Krause's "ladder of production" is probably operating at level 5 having attained the capability of performing simple maintenance (level 1), overhaul refurbishment and rudimentary modification capabilities (level 2), assembly of imported components, simple licensed production (level 3), local production of components or raw materials (level 4), final assembly of less sophisticated weapons; some local component production (level 5). KADDB may be operating at level 6, co-production or complete licensed production of less sophisticated weapons for the UAVs. There is clearly more technology being transferred into Jordan by KADDB 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 (comparing the civilian joint ventures to maintain and produce the Russian Ka-266 helicopter to KADDB's work). The IT transfer into the country appears to be higher than that available in the civilian sector

[26] Jobs that are supervisory, maintenance, IT, personnel, accounting, nursing, public relation, and translating were considered to require more skills than positions such as packing, cutting, sewing, security, driving, and washing.

since the establish information technology center has had to rely on training outside Jordan.

There is little evidence that the QIZs or KADDB have been successful 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 (fabric into clothing). Since it takes so little capital investment to establish a garment facility, these industries are quite foot loose. The concern is that the regional QIZs could migrate to Turkey , Morocco, or Egypt when these countries conclude similar arrangements with the U.S. 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 the reliance of these industries on defense work and whether they have been able to branch out into the non defense sector.

Conclusion

Working against the success of military industries in Jordan is the very same thing that the military industries are envisioned creating, a civilian industry. Brauer (2002) asserts that "positive economic benefits do not exist. Military led generalized industrialization, an occasional exception notwithstanding is virtually dependent on the prior state of civilian industrial accomplishment." The developing nations that have had some measure of success in arms production, such as Brazil, South Africa, Taiwan, South Korea, had as a foundation 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 arms production is less productive than civilian industry and research indicates that the reallocations from defense spending to other forms of government spending increase employment. In addition, investment in arms production and wrong choices of military technology led to under investment in civilian industries.

The arms market is a buyers market especially in low tech products. Demand is for high technology especially 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 market.

However, KADDB is prudent and 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 the reach of KADDB. KADDB has made serious efforts to recruit domestic civilian industrial partners and perhaps working to its advantage it has no offset agreements with any outside suppliers. KADDB could potentially benefit from Jordan's position as "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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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 $	564	592	634	1004	671	694	744	771	795	789	796	887	849
Gov.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		

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

Table 2: Jordan Exports

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Number of QIZ companies								2	12	38	43	49	58
QIZ exports m USD	na	na	na	na	na	na	na	2.44	25.19	150.12	381.2	586.61	919.94
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
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
QIZ/exports(%)	na	na	na	na	na	na	na	0.13	1.33	6.55	13.77	19.04	23.30

Source: QIZ exports Jordan Ministry of Industry and Trade, Industrial Development Directorate.
Total exports, IMF IFS, 2005.
Conversion rate, IMF IFS, 2005.

Table 3: QIZ Direct Employment

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

Source: Jordan Ministry of Industry and Trade, Industrial Development Directorate.
* 2004 data available to May/2004

Table 4: Established QIZs*

	Ownership	QIZ Status	Companies	QIZ Companies
Al Hassan Industrial Estate	Public	active	58	18
Al Hussein Bin Abdullah II Industrial City(Al-Karak)	Public	active	3	3
Aqaba QIZ	public	not active	2	0
Ad-Dulayl Industrial Park	private	active	14	14
Al-Tajamout Industrial City	private	active	32	19
Cyber City Park	private	active	3	2
Al-Qastal Industrial Park	private	active	2	2
Al-Zay Ready Wear (Al-Rusaifa)	private	active	1	1
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 5/2005
Source: Ministry of Industry and Trade
Jordan Center for Public Policy Research and Dialogue

Table 5: 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
Millenium	China	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
Gals	Turkey	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)
Panorama	Jordan	Ad-Dulayl Industrial Park
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
Neddle 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 02/23/2005
Source: Ministry of Trade and Development

Table 6: KADDB Joint Venture Companies*

	Ownership		Specialization	Employees
Jordan Light Vehicle Manufacturing (JVLM)	KADDB	74.5%	Manufacturing and customizing of armored vehicles	61
	Jankel	25.5%		
Jordan Special Vehicle Manufacturing (JSVM)	KADDB		Desert Iris	80
CLS Jordan	KADDB	48.5%	Automotive and electrical equipment	30^
	CLS Middle East	51.5%		
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	28
	Seabird Aviation	50.47%		
NP Aerospace Jordan	KADDB	49%	helmets and body armor	7
	NP Aerospace	51%		
Josecure International	KADDB	100%	Pesonal and infrastructure security	196
National Resources Development Company	KADDB	100%	Service and solutions in security field	6
Prince Faisal Information Technology Center	KADDB	20%	Education in IT, embedded systems, and software technology	5
	Yarmouk University	40%		
	Park Controls	40%		
Mechanology Jordan	KADDB	49%	Marketing and sales of military and commercial products	46
	Mechanology	10%		
	The Virlean Initiative	41%		
Sofex Jordan	KADDB	100%	Exhibit space	11
Ultimate Building Machines Investment and Development	KADDB	100%	Steel fabrication and hanger construction	27
United Jordanian for Technical Consultancy	KADDB	100%	Consulting services (not active)	
United Jordanian Telecom Networks and Station Service	KADDB	100%	Technical services (not active)	
Applied Defense Systems	KADDB	34%	Defense electronics (not active)	
	Yazan Muft	33%		
	Amin Bader	33%		
Jordan Armaments and Weapons Systems	KADDB	100%	multi caliber pistol	8

*Data as of 02/23/2005
^CLS and Raytech combined emplyment
Source: KADDB

Table 7: The steps in arms 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 8

2002 Military Expenditures as a Percent of GDP, by Income Class

Income Class	0-1.5%	1.6-3.0%	3.1-5.0%	> 5%
Low	Malawi, Niger, Madagascar, Laos, Zambia, The Gambia, Ghana, Bangladesh, Nicaragua, Senegal, Haiti, Cameroon, Cote d'Ivoire, Papua New Guinea, Burkina Faso, Tanzania, Cambodia	Tajikistan, Mozambique, Mali, Nepal, Kyrgyzstan, Togo, Uganda, Kenya, Uzbekistan, Benin, Mauritania, Mongolia, Congo, Sudan, Sierra Leone, Chad, Nigeria, Central African Rep., Moldova, Guinea, Indonesia, Georgia, India, Lesotho	Rwanda, Pakistan, Zimbabwe, Azerbaijan, Guinea-Bissau	Ethiopia (5.8%), Burundi (9.7), Eritrea (40.5), Angola (10.0), Yemen (7.1), Vietnam (7.5)
Lower Middle	Honduras, Paraguay, Guatemala, El Salvador, Dominican Republic, Jamaica, Philippines, Albania, Thailand	Bolivia, Iran, Ecuador, Bulgaria, Romania, Macedonia, Peru, Tunisia, South Africa, Brazil, Kazakhstan	China, Morocco, Turmenistan, Algeria, Turkey, Bosnia and Herzegovina, Egypt, Russia, Colombia, Namibia, Belarus, Sri Lanka	Syria (6.5), Armenia(7.7), Jordan (8.1)
Upper Middle	Panama, Estonia, Mauritius, Costa Rica, Venezuela, Trinidad and Tobago, Mexico, Uruguay, Latvia, Gabon, Argentina	Lithuania, Malaysia, Slovakia, Poland, Croatia, Hungary, Czech Republic	Lebanon, Chile, Botswana	Saudi Arabia (9.8)
High	Slovenia, New Zealand, Spain, Canada, Ireland, Belgium, Germany, Finland, Austria, Denmark, Japan, Switzerland	Portugal, Italy, Australia, France, United Kingdom, Netherlands, Sweden, Norway, South Korea	Greece, United States	Israel (9.3), Kuwait (9.8), Singapore (5.3)

Low is per capita GDP $735 or less
Low Middle is between $736 and $2,935
Upper Middle is between $2,936 and $9,075
High is greater than $9,076

Military expenditure data from *The Military Balance 2004-2005* , Oxford University Press
GDP per capita data from World Development Indicators database, World Bank, 2004

Source: Defense Resources Management Institute, Naval Postgraduate School

Table 9: Annual U.S. Military Aid to Jordan

	Military Assistance (current year $)		Military Assistance (2003 $)		Jordan mil ex (2003 $)	% U.S. funded
Fiscal Year	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