

COMPONENTS OF TECHNOLOGY TRANSFER: A COMPARATIVE ANALYSIS OF OFFSET AND NON-OFFSET COMPANIES IN SAUDI ARABIA

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Abstract

The paper examines the Saudi economic offset program as one form of foreign direct investment and as a tool of counter-trade financing that was used by the Kingdom of Saudi Arabia to, *inter alia*, effect the transfer of appropriate technology to facilitate economic growth, diversification and long term sustainability of an oil based economy. The objectives and stated benefits of the economic offset programs are analyzed as well as actual offset project established. As a methodological frameworks, the paper analyses the non-offset joint venture projects set up over the same period to evaluate the components of technology transfer as a tool of comparison for the effectiveness of offset and non-offset programs in meeting the Kingdom's stated technology enhancement and diversification objectives. The paper concludes, that by and large, the offset companies did transfer high value technology to Saudi Arabia compared to non-offset projects. The paper recommends that the current offset program emphasizes advanced electronics and technological skill transfers rather than in identifying new offset projects.

Section 1: Introduction

Offset programs can be deemed to be special cases of foreign direct investment and transfer of technology, with offset, in essence, being one form of counter-trade whereby it refers to the requirements of an importing country that their purchase price be "offset" in some way by the selling nation (Hammond, 1990; Marvel, 1995). Exporters/sellers may be required to source some of the production locally, to increase imports from the importing country or to transfer technology (UNIDO, 1977, UNCTAD, 1978, Spencer et al, 1967). The Saudi Arabian offset program has concentrated on the last requirement and this has been re-stressed in the most recent meetings of the Saudi Economic Offset Committee (EOC) in the U.K. when the Chairman of the EOC Prince Fahd Bin Abdullah emphasized the priority for technology transfer and technological education. (Saudi Press Agency, 24 September 2003).

The objective of this study is to formulate a methodological framework analysis for components of "technology transfer" and compare the effectiveness of such technology transfer for offset related and non-offset joint venture companies in Saudi Arabia during the period 1990 – 2002 when the majority of the offset companies were established.

Section II. Saudi Arabian Offset Program overview:

The Economic Offset Program (EOP) as it become known, was an innovative investment program launched by Saudi Arabia in 1984, requesting international contractors to re-invest in the Kingdom a percentage of the value of awarded, mostly defense related contracts (Evans, 1996; Pike, 1989). It has been estimated that Saudi Arabia incurred around \$55-60

Billion of imported military and defense related equipment over the period 1983 – 1992 (O’Sullivan, 1995; Cordesman, 1997, p. 107).

Saudi Arabia was the first country of the Gulf Co-operation Council (GCC) to establish an offset program in 1984, but was followed by the United Arab Emirates and Kuwait some years later during 1991 and 1994 respectively (Al-Ibrahim, 1996). As stated earlier, offset programs are used by developing countries in an effort to reduce the economic burden created by an underlying defense import contract. Offset programs can be classified as *direct* and *indirect*. Simply defined, direct offsets are those by which the purchasing country joins the selling country to supply elements of the underlying purchased product through co-production, technology licenses and other supply arrangements. Indirect offset means the seller agrees to assist the importing country in its development or investment plans unrelated to the principal import contract. The two methods are summarized below:

Table 1: Direct and Indirect Offsets

Direct Offsets	Activity
• Co-production	• Oversees production based on Government to Government or producer agreements that permit a foreign Government to acquire the technical information and tooling to manufacture all or part of a defense contract.
• Directed sub-contracting	• Procurement of domestic-made components for incorporating or installation in items sold to that same nation under direct commercial contracts.
• Concessions	• Commercial compensation practices whereby capabilities and items are given free to the buyer.
• Technology transfers/licensed production	• Assistance in establishing defense industry capabilities by providing valuable technology and manufacturing know-how.
• Investments in Defense Firms	• Capital invested to establish or expand a company in the purchasing country.
Indirect Offsets	Description
• Procurements	• Purchases of parts/components from the purchasing country which are unrelated to the military system being purchased.
• Investments in non-defense firms	• Establishing corporations in the purchasing countries to invest capital in the nation’s companies.
• Trading of commodities	• Using brokers to link buyers with commodities sellers in the purchasing country.
• Foreign defense related projects	• Assisting the recipient country’s military services.

Saudi Arabia, as well as the other GCC states who later implemented offset programs, adopted the indirect offset approach, whereby the focus of the program is taking advantage of the expertise and experience of foreign contractors with the aim of supporting the development efforts of their economies towards non-oil industrial diversification (Al-Ibrahim, 1996; UAE Offset Group, 1994). The hope is that, with these offset programs, countries such as Saudi Arabia, seek to obtain the benefits from foreign contractors through transfer of technology and training of local labor (Evans, 1996; Sandusky, 1996).

According to the Economic Offset Office in Riyadh, the Saudi offset program complements the national objectives in several areas. The office has articulated the benefits and possible area of investments under the offset, and these are summarized in Table 2 below (Sugair, H. 2003).

Table 2: Saudi Offset Program: Stated Benefits and Fields of Investment

<p><u>A. Benefits</u></p>	<ul style="list-style-type: none"> i. Generation of advanced technical training and high value employment for Saudi nationals. ii. Boosting foreign investment in productive services and activities. iii. Import substitution as well as products for exports. iv. Development of local technical, professional and managerial expertise in high technology industries. v. Transfer of technological know-how through research, development and manufacturing processes. vi. Making use of the Kingdom’s raw materials.
<p><u>B. Fields of Investments</u></p>	<ul style="list-style-type: none"> i. Industry, specifically non-oil related, high technical content. ii. Defense. iii. Services. iv. Agriculture.

Source: Economic Offset Office, Riyadh, 2003.

To date, the Kingdom of Saudi Arabia has had offset programs, comprising contractors from three nations: (1) The USA, (2) The UK, and (3) France. These are explored in section III below.

Section III. Investment Structure of the Saudi Offset Program:

Table 3 below summarizes the Saudi economic offset program and main contractors. With the exception of the AT & T offset contract, which was the first and, to date, the only civilian related offset program, all the other offset programs were military related.

Table 3: Saudi Arabia – Economic Offset Programs and Contractors

Offset Program	Prime Contractor	Year Signed	Description	Value (US\$ Million)
Peace Shield I	The Boeing Co.	1984	AWACS Platform Command control and Communication Systems for the RSAF	5,600
Al-Yamamah	British Aerospace (BAe)	1986 (I) 1988 (II)	Tactical fighter aircraft, associated equipment and services, and airbase construction for the RSAF	7,600
Peace Shield II	Hughes Aircraft Co.	1991	Extension of the Peace Shield Program	837
General Dynamics Economic Balance Program	General Dynamics Corp.	1992	Supply of M1 A2 Abrams Main Battle Tanks and associated equipment and systems for the Royal Saudi Land Forces (RSLF)	N/A
McDonnell Douglas Peace Sun IX	McDonnell Douglas Corp.	1993	Supply of F-15 fighter aircraft and associated equipment and systems for the RSAF	N/A
Al-Sawari	Thomson – CSF	1994	Supply of frigates and associated weapons systems for the Royal Saudi Naval Forces	3,500
At & T Offset	AT & T International	1994	Sixth Telecommunication Expansion Project (TEP-6) for 1.5 million new telephone lines and 200,000 GSM lines	6,000
Total				\$25,537

Source: Offset Office, Riyadh, 2003.

In terms of the structure of the offset, the following has been advised as being the operating mechanism for the Saudi offset program.

Table 4: Saudi Offset Structure Guidelines

Structure	Implementation
1. Administration	Economic Offset Committee (EOC)
2. Focus	Defense and Civilian Projects
3. Amount of Obligation	35% of value of (technical) component
4. Earning Offset Credit	<ul style="list-style-type: none"> - Investment in import substitution joint ventures, - Equity contribution to joint ventures, - Medium to long term debt financing, - Retained earnings, - Investment in expansions, - Investment in research & development, - Training costs of local labor, - Project commissioning costs.
5. Timeframe of obligation	10 years
6. Non-performance Penalty	None
7. Others	<ul style="list-style-type: none"> - Emphasis on high technology projects - 60% of investment must be in industry - Cash equity contribution must equal at least 20% of total obligation - “In-kind” equity contribution to joint venture allowed (these include technical know-how, license agreement, assignment of scientists, engineers, technicians to the offset).

Source: Saudi Economic Offset Secretariat, Riyadh. 2003.

The most desirable type of investment projects for gaining offset credit seem to be manufacturing and services projects that (i) involve a significant degree of high technology; (ii) contribute to the training of Saudi Arabian nationals in management and high technology; or (iii) increase import substitution or provide export potential.

Table 5 below summarizes the offset projects by country of contract origin as well as provides detailed information on the joint venture partners, the business line of the local offset project, investment, and their operational status.

Table 5: Saudi Arabia – Economic Offset Projects

Name of Project/ Venture Entity	Joint Venture Partners (Share In Equity)	Line of Business	Project Location	Project Cost	Status	Foreign Partner Share (%) and Investment
A. U.S. PROJECTS:						
PEACE SHIELD-I OFFSET PROGRAM						
Advanced Electronics Co. (AEC)	Boeing Industrial Technology Group (BITG) – 10%; Arabic Computer Systems – 10%; Gulf Investment Corp. (GIC) – 10%; National Commercial Bank (NCB) – 10%; National Industrialization Co. (NIC) – 10%; Saudi Arabian Airlines (Saudia) – 10%	Manufacture and repair of advanced electronics equipment (e.g. military and telecommunication equipment, avionics, and electronic equipment & system) and technical services across a wide spectrum of the electronic field	Riyadh	US\$125 Million	Operational	10% (\$12.5 Million)
Alsalam Aircraft Co. Ltd.	BITG (50%), Saudia (25%), GIC (10%), NIC (10%), and Saudi Advanced Industries Co. (SAID) – 5%	Modification, manufacture, remanufacture assembly, repair, maintenance and overhaul of military, commercial and civil rotary and fixed hydraulics	Riyadh	US\$190 Million	Operational	50% (\$95 Million)
International Systems Engineering (ISE)	BITG and Hughes Aircraft Co. (50%); United Systems Engineering (50%) – consortium of 6 Saudi software companies, namely: (1) Advanced Systems Co., (2) Al Khaleej Computers, (3) Arabia Data Systems, (4) CAP Saudi Arabia, (5) Modern Electronics Systems, and (6) Saudi National Information Systems	Computing system projects in the military, government and commercial sectors	Riyadh	US\$20 Million	Operational	50% (\$10 Million)

Name of Project/ Venture Entity	Joint Venture Partners (Share In Equity)	Line of Business	Project Location	Project Cost	Status	Foreign Partner Share (%) and Investment
Middle East Propulsion Co. (MEPC)	Foreign Partners (50%) General Electric (GE), Pratt & Whitney and Rolls Royce (RR); Saudi Partners GIC, NIC, SAIC and Saudi	Maintenance, repair, and overhaul of gas turbine engines and their companies	Riyadh	US\$ 52 Million	Operational	50% (\$26 Million)
PEACE SHIELD-II OFFSET PROGRAM						
Middle East Battery Co.	Raytheon and General Motors (GM) – 49% and 6 Saudi companies HOLDING THE REMAINING 51%, NAMELY: (1) Abdulaziz & Mohammed Abdullah Al Jomaih Co., (2) Abdullatif Ali Al-Issa Est., (3) Al-Mutlaq Group, (4) H.A. Al-Zamil & Bros., (5) Omar A. Bulabaid Co., and (6) Saudi Automotive Services Co. (Sasco)	Automotive battery manufacturing	Dammam	US\$59 Million	Operational	49% (\$28.9 Million)
B. U.K. PROJECTS:						
AL-YAMAMAH OFFSET PROGRAM						
United Sugar Co. (USC)	Tate & Lyle (15%); Savola Co. (51%); and a consortium of 15 Saudi Imports Co. (SIC)	500,000 tpy sugar refinery plant	Jeddah	US\$150 Million	Operational	15% (\$22.5 Million)
Glaxo Saudi Arabia Ltd. (GSAL)	Glaxo Wellcome (UK) 30% and Saudi Imports Co. (SIC)	Manufacture of pharmaceutical products including Glaxo's best known products, (e.g., Zantac, Serevent and Zofran)	Jeddah	US\$26 Million	Operational	30% (\$7.8 Million)
Cyclar Project	Licensing agreement between Saudi Basic Industries Corp. (SABIC) and technology suppliers UOP and BP (25%)	Supply of technology for the Cyclar Plant at SABIC's and training packages	Yanbu	US\$365 Million	Operational	25% (\$91.25 Million)

Name of Project/ Venture Entity	Joint Venture Partners (Share In Equity)	Line of Business	Project Location	Project Cost	Status	Foreign Partner Share (%) and Investment
Cumene Manufacturing Project	Universal Petrochemical Co. Ltd. (Unichem), Phenochemie (Germany), and Herdilla (India) (50%)	Cumene manufacturing facility	Yanbu	US\$60 Million	Negotiation Stage	50% (\$30 Million)
Dhahran Harco Chemical Inds. Ltd.	Harlow Chemical Co. Ltd. (30%) (Harco) and Dhahran Chemical Industries Ltd. (DCI)	Manufacture of a range of dispersion products used in the paint and adhesive industries	Dammam	US\$2 Million	Operational	30% (\$0.600 Million)
Rezayat Flover Co. Ltd.	Flover Ltd. (50%) and Rezayat Trading Company	Repair or remanufacture of Instrumentation equipment across the range of Saudi industry	Eastern Province	US\$2 Million	Operational	50% (1 Million)
Saudi Development and Training Co.	BAe Systems (50%) Al Gosaibi	Development of local manpower, technical training	Riyadh	US\$3 Million	Operational	50% (\$1.5 Million)
Electronics Training Organization	BAe Systems (50%) Al Gosaibi	Advanced electronic training, aircraft engineers training	Riyadh	US\$28 Million	Operational	50% (14 Million)
Waste Oil Recycling	Enprotech (ME) Ltd. (30%), various Saudi investors (70%)	Waste oil recycling plant	Eastern Province	US\$53 Million	Operational	30% (\$15.9 Million)
Saudi Polyolephins Co. (SPC)	Basell (Shell/BASF) (25%) and National Petrochemical Industry Company (NPIC)	Polypropylene, 450,000 tonne p.a. propone dehydrogenation plant	Jubail	US\$530 Million	Under Construction	25% (\$132.5 Million)
Gulf Advanced Chemical Co.	Hunstman (USA), Davy Process Technology (UK) – 10% each, and Saudi International Petrochemical Co. (SPIC) GCC Investors	Maleic Anhydride and Butanediol production, 50,000 tonnes p.a. for export (Textile use Lycra)	Jubail	US\$220 Million	Under Construction	20% (\$44 Million)
C. FRENCH PROJECTS: SAWARI OFFSET PROGRAM						
Dhabab Co. Ltd.	Thomson CSF (49%) and Saudi Investors (51%)	110 tpy gold refinery	Jeddah	US\$53 Million	Operational	49% (\$25.6 Million)

Name of Project/ Venture Entity	Joint Venture Partners (Share In Equity)	Line of Business	Project Location	Project Cost	Status	Foreign Partner Share (%) and Investment
Al Bilad Catalysts Co. Ltd.	European Catalyst (Eurocat) (35%), Al Bilad Trading & Econ. Est. (20%), and National Contracting Co. (20%)	Regeneration of hydro-treating used in oil refineries and petrochemical units	Jubail	US\$10 Million	Operational	35% (\$3.5 Million)
Arabian Meter Co.	Market TradingCo. Schlumberger (30%)	Manufacture of electric Meters (90,000 units/year)	Dammam	US\$3.2 Million	Operational	30% (\$0.96 Million)
Saudi Saudi French Chemical Co.	Atiq of France (35%) and Sawa of Gassim	Chemical Products	Riyadh	US\$10.6 Million	Operational	35% (3.71 Million)
AT & T offset Program	AT & T (35%); AEC Saudi (65%)	Manufacture of PCBs for assembling 5ESS (R) – 2000 switch and transmission systems for the TEP – 6 Project	Riyadh	US\$252 Million	Operational	35% (\$88.2 Million)

Notes: BITG comprises of Boeing, Westinghouse, the Saudi Amoudi Group. ITT and United Support & Service (a joint venture of the US' Frank E Basil and Saudi Operations & Maintenance Co., Inc.) Investment by BAe and Rolls Royce in two Peace Shield Offset companies (i.e. AACC and MEPC respectively) are under the Al-Yamamah offset commitment.

Sources: Ministry of Defense, Riyadh. Economic Offset Secretariat. 2003
The Economic Bureau Riyadh, 1998

Analysis of the above projects reveals a wide diversity of objectives of the joint venture offset partners. Table 6 below summarizes the major emphasis of the offset projects whether operational or under construction, to assess whether they met the initial preferred objectives of the offset program.

Table 6: Saudi Offset Projects: Actual vs. Preferred Areas of Project Implementation

Preferred Offset Investment Areas	Actual Number of Projects Implemented/Under Construction	Size of Offset Projects (\$Million)	Foreign Share Ownership (\$Million)
1. Generating advanced technical training and high value employment for Saudis	1	3	1.5
2. Boosting foreign investment in productive services and activities	4	119.2	45.96
3. Import substitution as well as products for exports.	4	455.0	103.2
4. Development of local technical, professional and managerial expertise in high technology industries.	6	316.0	158.0
5. Transfer of technological know-how through research, development and manufacturing processes.	3	742.0	191.95
6. Making use of the Kingdom's raw materials	4	602.6	166.81
TOTALS	22	2,237.8	667.42

Source: Table-5

Having reviewed the Saudi Offset program, the section below analyses the non-offset investment that has taken place over the same period.

Section IV. Investment Structure of Non-Offset Programs

The necessity for economic diversification of the Saudi Arabian economy away from an overwhelming dependence on erratic oil revenues is now of paramount importance and repeatedly stressed in all official policy (Ministry of Planning, 2001). The role of the Saudi private sector to become the prominent contributor to economic growth and employment is

emphasized, as unemployment is now of the utmost urgency in a country with one of the highest population growth rates in the world at 3.5 - 3.7% per annum levels and with nearly 70% of the population under the age of 30 (SAMA, 2002).

Table 7 below offers a snap shot view of the progress of Saudi industry over the period 1982 – 2000 by setting out the number of operational industrial units by sectors. The major concentration has been in engineering machinery and equipment, chemicals and by products, construction and food beverages.

Table 7: Summary: FACTORIES UNDER PRODUCTION – 2000

<u>Industrial Sector and Code</u>	<u>Year</u> (Nos.)					
	1982	1985	1990	1995	1999	2000
Food and beverages	187	235	308	391	529	539
Textile, wearing apparel and leather industries	22	28	55	108	156	167
Wood and wood products, including furniture	38	53	81	109	155	174
Paper products, printing and publishing	86	109	131	163	205	211
Chemicals & petroleum, coal, rubber & plastic	150	220	311	463	670	693
Construction materials, chinaware, ceramic & glass	261	314	387	464	560	570
Basic metal industries	5	6	9	15	11	12
Manufacture of fabricated products, machinery and equipment	294	388	545	685	915	948
Other manufacturing industries	16	29	51	59	79	83
Transportation & storage	19	19	19	19	20	21
TOTAL	1,078	1,401	1,897	2,476	3,300	3,418

Source: Ministry of Industry & Electricity, Industrial Statistics Bulletin – (2001)

A feature of Saudi industrial development has been active participation of foreign companies in this process, with the number of joint ventures going up from 344 in 1995 to 475 in 2000 as seen from Table 8 below. These joint ventures exclude the offset related projects, and were undertaken through the joint initiatives of Saudi and foreign private sectors based on their own commercial criteria, a phenomena observed elsewhere in the world (Davies, 1977). The revision of the foreign investment regulations (especially the reduction in the top rate of taxation to 30% on foreign companies in 2003), along with other institutional reforms, is expected to contribute towards more such joint ventures.

**Table 8: SUMMARY OF INDUSTRIAL JOINT VENTURES
IN SAUDI ARABIA**

				(SR Million)
	1995		2000	
Admin. Area	No. of units	Investment	No. of units	Investment
Riyadh	116	4,388	168	6,718
Qassim	4	15	1	3
Makkah	95	14,448	139	17,023
Madinah	11	15,505	20	36,780
Eastern Region	116	54,452	144	71,777
Assir	2	2	2	2
Tabouk	-	-	1	175
TOTAL	344	88,810	475	132,478

Source: Ministry of Industry & Electricity, Industrial Statistics Bulletin – (2001)

According to Table 8, total investment in the joint ventures had risen to SR132.14 billion or \$35.3 billion in 2000 compared with \$23.7 billion in 1995, averaging a 6.6% growth per annum over the 5 year period 1995 – 2000. What is notable, was that the majority of investments were in the Eastern province of Saudi Arabia, attracted by its oil and petrochemical base, despite having a smaller population compared to the other regions. Comparison of the current Saudi offset and non-offset companies in terms of employment generation, investment per employee and other economic benchmarks are not within the scope of this paper and have been addressed elsewhere by the author (Ramady, 2003). Section V below analyses the components of technology transfer before comparing the effectiveness of such technology transfer to Saudi Arabia through the offset and non-offset joint venture partners.

Section V: Methodological Framework Analysis of Components of Technology Transfer.

Technology is transferred between countries through a variety of methods and channels, ranging from the relatively simple such as equipment purchase and direct recruitment of foreign experts, to the more complex process such as total project contracting or complete “packaging” of technology transfer.

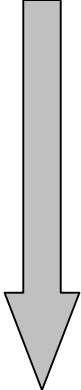
This notion of “comprehensiveness” refers to the totality of the transfer package including such elements as training, provision of equipment and plant services. It is thus possible to categorize the “packaging” of technology transfer into various levels according to the respective degree of “comprehensiveness” or totality of the transaction.

Various methods of technology transfer have been proposed. Patel (1974, p.5) expanded on eight types of channels through which transfers might be effected to developing countries ranging from flow of books to direct foreign investment and operation. Wilkins (1974, pp. 166-7) suggests two basic types of cross-border transfer of technology, namely export oriented channels and import oriented channels. The United Nations Conference on Trade

and Development (UNCTAD), presents another classification, (UNCTAD, 1978, p.6), whereby transactions involving international flows of technology are classified into three main types: (i) simple direct transactions (where the purchaser would attempt to buy each technology transfer element at best possible price and terms, and, in essence, resulting in “package-free” deals, (ii) process-package transactions (where supplying firms market “systems” along with managerial and technical skills), and (iii) project-package transactions (where the supplier undertakes to set up the complete project with the technology “embodied” in it).

From the above literature, it is possible to establish a classification of transfer methods for technology transfer and this is set out in Table 9 below.

Table 9 **Methods of Technology Transfer**

Complexity	Methods
<p>Most Complex</p>  <p>Least complex</p>	<ol style="list-style-type: none"> 1. Total Project Contracting 2. Total Process Contracting 3. Major Process contracting 4. Know-how Contracts 5. Patent Contracts 6. Trade mark agreements 7. Franchise Agreement 8. Engineering Services Contracts 9. Technical Consultancy Contracts 10. Machinery Supplies 11. Employment of experts 12. Technical publications 13. Personal Contacts

Adapted from Patel (1974), UNCTAD (1978).

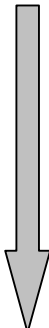
Table 9 sets out the methods ranging from the most complex to the least complex in their perceived order of respective level of “comprehensiveness”. (Shubber, 2003). The more an economy lags behind in terms of technical skills, diverse manufacturing and a scientific base, the more complex or “comprehensive” will be the method of technology transfer.

Based on the channels for technology transfer, it is now possible to define the degree of “packaging” of technology transfer. By packaging, we refer here to the degree of “comprehensiveness” in the provision of technology transfer by the principal technology supplier. When this level of comprehensiveness is broad, the associated degree of packaging can be regarded as “high” and vice-versa. On this basis, five main packaging levels can be identified (Shubber, 2003), along with associated transfer methods as follows:

- A. *Ultra-packaged Transfer*: This corresponds to ‘total project contracting’.
- B. *Highly-packaged Transfer*: This corresponds to ‘total process contracting’.
- C. *Medium-packaged Transfer*: This corresponds to the methods of ‘major process contracting’, ‘know-how and patent contracts’, and ‘know-how contracts’.
- D. *Low-packaged Transfer*: This corresponds to ‘patent-contracting’, ‘trade-mark contracts’, and ‘franchising’.
- E. *Package-free Transfer*: The methods here are ‘engineering services contracts’, ‘supplies of equipment’, ‘employment of experts’, ‘technical publication’, ‘technical consultancy’, ‘personal contacts’.

The five levels of packaging are summarized in **Table 10** below.

Table 10 **Component Of Technological Transfer:
“Packaging Levels”**

Component Element		Basic	Ancillary
		1. Industrial Property Rights (patents, trademarks) 2. Hardware 3. Software (Computer programs, blueprints, instruction manuals) 4. Training of personnel 5. Technological Services (Product design, engineering)	1. Building design/construction 2. Energy Provision 3. Maintenance and/or provision of spare parts 4. Supply of materials 5. Operational Management
Most Advanced Component			
	A.	All 5 basic elements present	<u>Plus:</u> At least 3 ancillary elements exist.
	B.	All 5 basic elements present	<u>Plus:</u> Up to 3 ancillary elements exist.
	C.	3 to 4 basic elements present	<u>Plus:</u> Up to 3 ancillary elements exist.
	D.	2 to 3 of basic elements present	<u>Plus:</u> 1 to 3 ancillary elements exist.
	E.	1 to 2 basic elements present	<u>Plus:</u> 1 to 2 ancillary elements exist.
Least Advanced Component			

Note: A = Ultra Packaged Transfer, B = Highly Packaged Transfer, C = Medium Packaged Transfer, D = Low Packaged Transfer, E = Package Free Transfer

How do the various Saudi economic offset projects fare in terms of the listed technology component transfer packaging levels? This is examined below.

Section VI: Offset versus Non-Offset Technology Transfer

As discussed earlier the total number of offset projects were 22. These were evaluated using publicly available information to assess the level of technology packaging applicable for each project. Supplemental management information was sought wherever possible. The assessment focused on major variables such as industrial sector, technological and managerial complexity, as well as patents and trademarks as set out in the previous table.

The results, summarized in Table 11 below, must be treated with a certain degree of caution due to the imprecise nature of “technological comprehensiveness” evaluation as well as to the sensitivity of some of the offset projects, especially those defense related.

Table 11 Saudi Arabia – Level of Technology “Packaging” for Economic Offset Companies

Industrial Sector	Level of Packaging				
	A	B	C	D	E
1. Advanced Electronics	4	2	1		
2. Oil, Petrochemicals			2		
3. Chemicals, Pharmaceuticals			4	1	
4. Consumer products – food			1		
5. Metal products/ mining			1		
6. Training/ Human Resources		1	1		
7. Manufacturing			2	2	

Note:

A = Ultra Packaged Transfer, B = Highly Packaged Transfer, C = Medium Packaged Transfer, D = Low Packaged Transfer, E = Package Free Transfer

Source: Table 5, plus management information.

The result for the offset companies in terms of transfer technology packaging was quite positive. Nineteen projects or 86% of the total fell in the “A – C” technology packaging category and only 3 projects or 14% were in the “D” – low technology packaged transfer-range. There were no offset companies in the “E” or “package free” transfer category. What was further encouraging was that 7 projects or 31% of the total, where in the “A/B” or ultra packaged/high technology packaged categories, which was one of the principal objectives of the original economic offset program. In terms of industry, the advanced electronic sector, as well as specialized technical training stood out as being in the ‘A’ or ultra packaged technological transfer category as they scored the highest level of pre and post operational technological complexity. The majority of the remaining offset projects fell into the ‘C’ or

medium packaged technology transfer and these included projects in the oil, petrochemicals and chemical industries.

The reason was self evident – Saudi Arabia had an already established track record in the oil, petrochemical and chemical industry sectors *prior* to the offset programs. Hence, the level of “packaging” was not significant. However, there were no advanced electronic industries or expertise in the Kingdom in these sectors prior to the offset projects. As such, the level of technology transfer packaging was significant in these “new industries”.

Table 12 below sets out the level of “technology packaging” for the private sector non-offset joint venture projects using the same packaging component schedule set out in Table 10. Fortunately there was more information available on the non-offset companies, but again the results should be treated with caution.

Table 12 Saudi Arabia – Level of Technology “Packaging” for Private Sector Non-Offset Joint Venture Companies (2000)

Industrial Sector	Level of Packaging				
	A	B	C	D	E
a. Chemicals, petroleum, rubber and plastics		4	32	63	34
b. Food & Beverages			6	14	17
c. Textiles and leather industry				5	14
d. Wood and wood products and furniture				2	17
e. Paper products, printing and publishing			4	6	10
f. Construction material, chinaware, ceramic and glass			1	19	38
g. Basic metal industries, fabricated metal products, machines and equipment			3	107	71
h. Other manufacturing industries, transport and storage				3	5

Note:

A = Ultra Packaged Transfer, B = Highly Packaged Transfer
 C = Medium Packaged Transfer, D = Low Packaged Transfer
 E = Package Free Transfer

Source: Adopted by Author from Industrial Statistics Bulletin – 2001. Ministry of Industry and Electricity, “Top 1000 Saudi Companies”, 6th Edition. 2000, IIT. Al-Khobar, Saudi Arabia, 2001.

The results of the survey of the 475 non-offset private sector joint venture companies set out in Table 12 seems to indicate that some ground exists for assuming that the level of transfer technology packaging for the non-offset projects was considerably less significant than those for the offset projects. Some 50 non-offset companies or 10% of the total, were in the “B – C” highly packaged/medium packaged range, with 219 projects or 47% in the “D” low

packaged range and remaining 206 projects (43%) in the “E”, or package free transfer range. Those that operated in the relatively more technology packaged ranges were similar to the offset projects by being in the chemical, petroleum, metal as well as the advanced food and beverages industries. The majority of non-offset joint venture projects seemed to operate on franchise agreement, engineering services contracts, technical consultancies, general machinery supplies and ad hoc employment of experts. Those operating in the more “technological comprehensive” packaging areas such as chemicals etc. did so using know-how contract, patent contract or on major process contracting basis with their foreign partners.

Section VII: Policy Assessment and Conclusions.

The Saudi economic offset program can be viewed as one special case of economic management in which certain policies were devised to overcome perceived internal constraints in the Saudi economy, specifically the lack of an advanced technology skills base. While the objective and strategy was laudable, the actual results to date have not been commensurate with either the size of investment made or the expected direction and sustained economic impact of the offset program into other industrial sectors to create a “virtuous cycle” of interdependencies. (AL-Ghamdi, 1999, Evans, 1996, Ramady, 2003). With the exception of a few key Saudi family owned industrial offset partnerships, the majority of Saudi businessmen who could benefit from participation in the offset program are either unfamiliar or unaware of the programs’ existence. The fact that the Economic Offset Office operates as part of the Saudi Ministry of Defense seems to create a psychological barrier to potential investors and the Ministry could well consider locating some of its operational advisory functions to a more “civilian” friendly environment. The shortcomings to date of the offset program are more due to institutional, human and marketing constraints rather than physical or technological, as evidenced by the growth of non-defense related offset ventures pursued by the UK offset program which has opted for that route. The Saudi Chambers of Commerce and Industry need to be more involved than to date in identifying absorptive capacity for new as well as existing offset projects. One visible success of the current offset program has been the provision of advanced electronic and technological skills to Saudis. This could be the pattern for the future expansion of the current offset program, rather than in identifying new projects which, as we have noted, the private sector can successfully do outside the offset framework.

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