6
Defense offsets: policy versus pragmatism

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Introduction

The purpose of this chapter is to evaluate the pragmatic aspects of defense offsets rather than policy ambitions. Are the actual development benefits of offsets real, or are they simply the hyperbole of politicians seeking to persuade skeptical public opinion of the wider economic benefits of purchasing expensive military equipment?

Offsetting market failure

The classical free markets approach of Adam Smith and David Ricardo provide the principal conditioning factors of the international economic system in the 21st century. It is a system dominated by the important, yet controversial, 148 member World Trade Organization, the WTO. Nepal and Cambodia are the two most recent recruits to the club with all member countries seeking growth through trade. Still more countries, including Russia and Saudi Arabia, line up to share the growth and development benefits of free trade.

Reality, however, does not always square with theory. While there is no doubting the positive impact of economic liberalization, it is an economic veil that hides myriad market imperfeetions. At the heart of the free market and open trading models, lie the critical assumptions of unfettered market access, homogenous goods, free information flows, immobility of capital between states, and fragmentation of the supply base. Such assumptions define the theoretical models of perfect competition and comparative advantage theory—respectively, the rationale of economic liberalization and the WTO. Yet the assumptions are far removed from the contemporary mechanics of global markets. Economic reality reflects market barriers, product differentiation, patents and the protection of intellectual property rights, high levels of capital mobility through foreign direct investment, technology transfer, and progressive industrial consolidation, leading to oligopolistic market structures at the national, and, increasingly, the international level.

Nowhere, moreover, is the disparity between theory and practice more evident than in the defense sector. Imperfections abound. The European Union's Article 223 of the Treaty of Rome, now superceded by Article 196 of the Treaty of Amsterdam, acts to constrain competition and protect member country defense markets. The US has its protectionist "Buy America" legislation, seeking to safeguard America's defense industrial capabilities by requiring that US purchases of offshore weapon systems be

produced under license in America. This also happens, more subtly, in Japan, where over 90 percent of arms are procured locally through licensed production of mostly US defense equipment. Additionally, Japan has put self-imposed policies in place, denying it the right to export defense equipment. China, conversely, suffers externally imposed embargos on its ability to import weapon systems. The list of politically motivated impediments to open trade is endless. Also, from an economic perspective, static classical economic models will likely impose dynamic cost competition. The reality is that open markets facilitate the search for profit, amplify first-mover advantage, and hence "incentivize" product development and the creation of technology gaps through raised levels of research and development expenditure. These costs constrain new entrants because the perverse effects of defense globalization are turning classical models upside down. The large scale and technological maturity of advanced country defense firms are such that new entrants are deterred.

The international defense market is complex, often lacking in transparency, and always hyped as operating on the "dark side," characterized by corruption, bribery, shady deals, and nepotism. Defense offsets, perhaps unfairly, have been categorized in this light, earning offsets the opprobrium of policymakers, particularly in the US. A consequence of such perceptions is the effort by numerous countries to re-badge offset policy as industrial participation, cooperation, or partnership. A deliberate advantage of such titles is that they connote long-termism, mutual benefit and, importantly, trust.

Notwithstanding the dubious non-market aspects of defense offsets, their re-emergence as a dominant theme in trading patterns has been influenced by market forces. This has driven the transformation of the international arms market from a seller's market in the early 1980s, characterized by an abundance of purchasing nations and limited defense contractors, to that of a buyer's market today. Now, by contrast, there are many sellers of weapon systems, but few purchasers. This reversal of fortunes affords buying nations substantial leverage in extracting concessions from offshore vendors. Not all countries, though, have sought to exploit their market position when purchasing "big-ticket" weapon packages from abroad. For instance, the constant threat of war with India has meant that for Pakistan urgency of supply has historically held a higher priority over offset-induced defense industrialization (Matthews, 1994). Even more extreme is Brunei's procurement posture. In this tiny, oil-rich state, policy is primarily directed toward off-the-shelf acquisition of British defense goods, with the government viewing offset requirements as unprincipled trading behavior. Brunei's defense treaty with Britain may provide the *quid pro quo* for buying British, helping to explain Brunei's unequivocal aversion to offset opportunities. Adoption of an agnostic approach toward exploiting the potential benefits of defense offsets is more the exception than the rule, however. In the main, governments do view offsets as a win-win situation. Hence, the purpose of this chapter is to evaluate the pragmatism of offsets rather than the policy ambitions. Are actual development benefits achieved? Or are claims to the effect simply the hyperbole of politicians seeking to persuade skeptical public opinion of the wider economic benefits of purchasing expensive military equipment?

Offset strategy

Development of less developed economies requires diversification away from reliance on cash crops toward the promotion of industrialization. In defiance of classical comparative advantage theory, developing countries are obliged to erect tariff barriers to protect the fledgling manufacturing sector. The WTO condones such import substitution protectionism, but solely with respect to the poorer members of the club. In pursuit of competitiveness, however, the barriers must eventually come down. History has shown that the import substitution model can work, and Japan's "techno-nationalism" model is testament to this fact (Chinworth and Matthews, 1996).[1] Development experiences of the latter 20th century suggest that import substitution can propagate the seeds of industrial and technological development, but cannot guarantee sustainable indigenous capability. Nowhere is this more evident than in the defense sector.

Since Britain's industrial revolution, defense production has been at the core of the manufacturing endeavor. It has driven innovation across the military-civil divide via technological cross-fertilization of blueprints, ideas, skills, processes, and products. Defense-development synergies favor the countries that possess substantive defense industrial bases. This has meant that, post-world war II, the technology gap between rich and poor countries has widened. Indeed, today this euphemistic "gap" is in reality a yawning chasm. The US defense budget, for instance is now around $400 billion, and rising, supporting a huge defense R&D expenditure in excess of $50 billion; this is over three times larger than that of the whole of Europe, and reportedly as much as 70–80 percent of the entire world's defense-related R&D (Kennedy, 2002). This huge US R&D sum reflects the high cost of developing sophisticated defense technologies required to realize the "transformational" warfare doctrine. While many of these technologies will bespeak the military "high-spec" battlefield context, many others will be sourced from the commercial sector. These latter technologies are associated with shorter product cycles, faster availability, and lower cost. Such interdependence between civil and military industrial bases is one of the principal distinguishing characteristics between advanced defense industrial bases and the rest. The struggle for viability, sustainability, and dynamism in defense industrial capability is not just the reserve of less developed countries, but an imperative taxing policymakers of all countries.

For the past two decades, defense offsets have been viewed as a partial solution to the paucity of indigenous industrial undertaking in developing countries. For these poorer countries, offsets have been conceptualized as the catalyst for "deeper" industrialization. By the same token, industrialized nations view offsets as a technology vehicle for avoiding both the high costs of "reinventing-the-wheel" and as a partnering mechanism for engaging in collaborative development of frontier technological systems. The question relevant to all states, however, is whether aspirations equate to achievements. All important in effecting technology transfer is

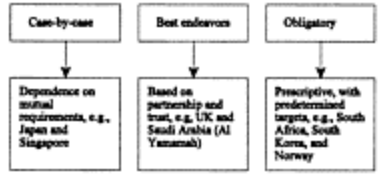

Figure 6.1: Spectrum of offset policy possibilities

the crafting of an appropriate and successful offset strategy. Figure 6.1 illustrates the spectrum of policy flexibility in this regard.

Many nations have seized the opportunity to formalize offset policy through the publication of prescriptive guidelines, but inflexibility in the negotiating position may not always be appropriate. Japan and Singapore, for example, are two countries which do not impose a standardized solution to fit all circumstances. Rather they adopt a case-by-case policy approach, seeking to maximize mutual benefit through negotiation and compromise. Importantly, this need not imply a reduction in the quantity and quality of technology transfer, as evidenced by Japan's and Singapore's successful track record in adapting, modifying, and improving second and third generation technologies derived from initial licensed production. Japan's defense industry offers a good example of this offset model, whereby near self-sufficiency in several sectors has been realized through the application of learning to promote indigenous defense industrialization.

On the path from unregulated flexibility to prescription, is the intermediate case of best endeavors. This is an approach favored by Britain's Ministry of Defense. The key ingredients here are partnership, trust, and vendor commitment. No penalties are imposed if the vendor fails to achieve the required 100 percent offset target across the stipulated delivery period. The sole penalty is that consideration of future bids by an offshore vendor will be influenced by its performance on earlier offset programs.

The final offset approach shown in figure 6.1 is founded on obligation, meaning precise adherence to regulations, including penalties for non-achievement of offset targets across the specified delivery period. This approach normally imposes offset multipliers on the vendor, thus providing incentives for investment, technology transfer, and work placement into the buyer's pre-determined strategic sectors of the local economy. Prescription imposes standardization and clarity, but as more countries have come to view defense purchases as a means of enjoying offset-induced development, so the demands for benefit have become more ambitious. Inevitably, this has led to policy stress and the non-fulfillment of vendor offset commitments.

Offset strategy goes deeper than legal compulsion to accomplish specified offset targets across a prescribed time period. It also encompasses industry and technology policy. The offset strategy matrix shown in figure 6.2 illustrates the mix of processes and objectives linked to the principal forms of offset strategy. The matrix matches the character of the primary contract to the sectoral destination of the associated offset programs, representing a study framework of civil-military strategic relations. The arrows within the matrix track the crude chronological development of offset strategy.

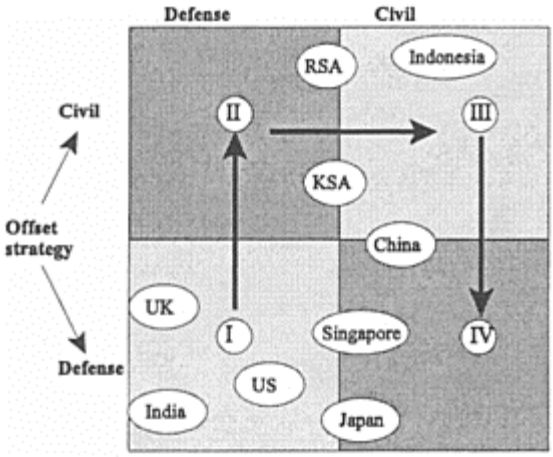

Figure 6.2: Offset strategy matrix

Quadrant I shows the traditional offset model, whereby a major weapon systems purchase from an offshore vendor is tied to a defense related offset program. For instance, South Korea's purchase of 120 F-16 fighters was tied to a 30 percent license agreement for in-country production of components and subassemblies of this aircraft. Equally, India's purchase of Russian SU-30 aircraft is tied to offsetting license agreements facilitating Indian defense industrialization. As already mentioned, the UK industrial participation policy pursues similar objectives. Here, however, the stipulated offset requirement is for the purposes of compensating UK defense contractors for the loss of work caused by MoD switching from sovereign "cradle-to-grave" development production to "off-the-shelf' purchase from an offshore vendor. Importantly, offsetting investment, technology transfer, and placement of work from the overseas prime contractor must be undertaken competitively. Thus, in the British model, offset credits accumulate due to competitive success through the granting of market access rather than by a defense equivalent to affirmative action. Moreover, while the normal causal flow is from the primary defense contract to offset license arrangements linked to the same contract, it is not an uncommon practice these days for offset programs to cross over into other local defense programs.

Figure 6.2 also shows the US policy position firmly embedded in quadrant I. Without doubt, the US "Buy America" legislation is an offset policy under a different guise, unequivocally aimed at strengthening US defense industrial base capability. Even with the onset of defense globalization, the clamor in Washington is for greater rather than less protection of US defense supply capability. This is symptomatic of the tensions over offset-driven defense globalization versus defense industrial sovereignty that are likely to intensify in the years ahead.

Quadrant II reflects that as the global defense industrial imbalance between the US and the rest of the world has heightened, the pursuit of defense industrialization has increasingly come to be questioned by numerous industrializing countries. There has been a growing recognition that the high costs of defense R&D and constrained production scales limit the economic benefits of defense-related offsets. As a result,

policy direction has begun to shift from defense to civil offset requirements. The thrust of Saudi offset policy (the Kingdom of Saudi Arabia, KS A), for instance, has focused away from defense objectives, as exemplified in the US Peace Shield program to commercial training and industrial objectives. Evidence of this re-focus is the ongoing Al Yamamah offset arrangement that has been instrumental in the establishment of a Tate and Lyle sugar processing complex, Glaxo pharmaceutical plant, and commercial computer training facilities (Matthews, 2002a). Other examples of a quadrant II offset strategy include Malaysia, which has sought to develop university competence through civil offsets linked to overseas defense contracts, Oman, seeking regional commercial training opportunities through the sponsorship of a local air traffic control college, and Kuwait, via the fostering of small and medium enterprise (SME) networks in the civil business environment.

Quadrant III illustrates that civil-civil primary contract and linked offset arrangements have become increasingly important in the global economy over recent years. These arrangements arise because big-ticket commercial contracts in sectors, such as aerospace, power generation, and telecommunications are so expensive that in a tight international market, the purchasing countries are in a position to play one bidder off against another and extract concessions. For instance, in a move likely to be followed by other Persian Gulf states, Kuwait's finance ministry has begun requiring 35 percent countertrade commitments from all foreign companies having civil sector contracts of more than KD10 million ($35 million) with the Kuwaiti government (*Financial Times*, 2002). Principal among these concessions is offsetting investment. Similarly, Indonesia's Garuda Airline, for instance, used its market leverage when purchasing airliners from Airbus and Boeing to obtain offset work in the fabrication of subassemblies for the aircraft purchased. This work played an important role in the preservation and "up-skilling" of local workers at Indonesia's PTIPTN Bandung aerospace manufacturing complex (Matthews, 1996). Indonesia's offset contracts with Boeing included the production of engine access doors, pylons, and other relatively low-technology work. These outputs were then shipped to Mitsubishi factories in Japan as part of a global network of offset operations. Indonesian manufacturing packages would be integrated into Japan's higher value-added sub-assembly production in Tokyo before onward shipment for final assembly at Boeing's Seattle factory. In China, similar civil-civil offset arrangements occur, with local production of vertical and horizontal tail fins in China's AVIC aircraft fabrication plants. Again, these offsets were linked to the purchases of Airbus and Boeing aircraft by the myriad operating airline companies in China (Matthews, 2002b). Saudi Arabia has also engaged in this civil-civil offset strategy, incorporating an additional novel dimension into its policy approach The Kingdom has exploited local manufacturing capacity created through the Peace Shield joint venture defense offset program. This includes civil offset work gained from, for instance, the $4 billion telephone switching equipment contract from ITT, a US company. Civil-civil offset arrangements are permitted by WTO regulations, but only for developing countries.

Quadrant IV captures a fourth offset strategy, the contemporary policy significance attached to dual-use industrialization. Civil-to-defense offset strategy emphasizes the role of technology spin-on. Here, local defense industrialization is underpinned by foreign technology transfer via licensed (or multinational) production of technologies in the

recipient country's civil economy; the labor skills and manufacturing outputs are, in turn, transferred domestically from the civil to the defense sector to foster development of sovereign defense industrial capacity. Japan provides an excellent example of this dual-use strategy, particularly since the preponderance of R&D occurs in civil industry. The innovative, high-tech dual-use avionic, microelectronic, telecommunication, and process machinery products of civil-military industrial conglomerates such as Mitsubishi, Kawasaki, Toshiba, Nissan, and Sony are then employed, as appropriate, to propel the technological development of Japan's defense industry. This strategy enjoys the benefits of cost reduction, technological synergy, and reduced time-to-market. Singapore's defense industrial strategy has also been characterized by its emphasis on dual-use technology cross-over opportunities (Matthews, 1999a, 1999b, 2002c). Emulating the Japanese and Singaporean strategies, China's defense industrialization strategy, since March 1986 and the implementation of the "863 plan," has been predicated on the promotion of local strategic industrialization. The "863 plan" prioritizes the infusion of foreign technology via the development of civil (dual-use) industries, the high technology outputs from which are then subsequently absorbed into the Chinese defense industrial base for sovereign development of critical technologies. This process will accelerate China's progress toward achieving transformational war-fighting capability (Frankenstein and Bates, 1996).

Development through offsets?

Given the particular offset strategy pursued, the question is: do offsets work? This is not an easy question to answer, not least because the subject's sensitivity means that empirical data are difficult to come by. By and large, the economic impact of offset policy remains shrouded in mystery. What is known is that there are two opposing standpoints: the recipient nations, seeking to extract maximum industrial benefit from offset-based inward technology transfer, and the vendors/contractors seeking, by contrast, to minimize obligations for outward technology flows. The negotiating trick is to satisfy both parties, accommodating the development of a long-term mutually beneficial trading relationship. Inevitably, for partnership to occur, the recipient country will require measurable progress on technological development; the sustainability of the development process is a particularly important metric in this respect. Rather than linked to the life of a specific offset project, the technology strategy needs to embrace productive opportunities across the broader economy. Offset policy thus needs to be framed accordingly.

Figure 6.3 provides a conceptual model of the key attributes for offset success. It highlights the key components of the offset cycle, from initial technology transfer to the long-term goal of sustainable indigenous technological development. Offset packages will be shaped by the institutional arrangements in place. What is best for one country with a particular industrial level and context, may not be best for another country. Although policies will differ, the important point is that in the 21st century there is limited excuse for countries not to have established a policy position. While a win-win end game to an offset arrangement can never be guaranteed, both the transferor and transferee need to identify and plan to ensure the realization of the benefits anticipated to accrue.

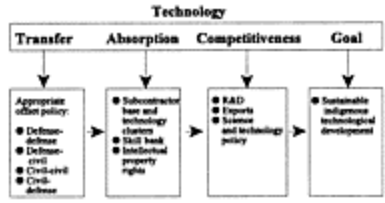

Figure 6.3: Development through offset technology

Once the work placement and/or technology transfer has been agreed, then for promotion of local capability to occur, it is fundamental that the technology is effectively absorbed into the local industrial base. At this second, absorption stage of the model, three critical success factors can be identified:

> possession of an educated and highly trained workforce; existence of a diversified and innovative subcontractor base, structured across clusters of horizontally and vertically integrated high technology companies; and the ability to dynamically evolve local technologies where intellectual property rights can be conferred.

The third stage of the conceptual model recognizes that in the absence of international competitiveness, long-term economic success will be illusory in spite of technology transfer and absorption through infusion of new skills and capacity. Hence, a national culture supportive of R&D is essential to ensure continuous re-investment into the national technology base. Moreover, the universal search for competitiveness will be aided by the reduction in cost structures achieved through export penetration, but this is not as straightforward as it appears. Given that most developing countries leverage new locally-designed technology systems by incorporating critical subassemblies and components from advanced country contractors, export opportunities are often constrained by the latter embargoing third-country sales. This is a danger that South Korea presently faces in its plans to export the T50/A50 Golden Eagle (Matthews, 2003).

The ultimate goal of indigenous sustainable technological development will be more realizable if the local economy has a robust and well-crafted Science and Technology Policy (STP) in place. A coherent and logical offset strategy should be coordinated with other facets of the STP framework. These will include policies such as education and training, the development of University Science Parks and government support for R&D, regional development, and appropriate technology strategies.

The fact is that few countries have effectively developed their technology base through offsets. Rather, it is the existing technology base that defines the parameters for successful absorption of technology offsets (Brauer, 1991; 2000). Taking stock of the importance of extant industrial and technological capabilities leads to a more informed judgement on the performance of offset programs and to the tempered prediction that offset performance will often struggle to meet the rhetoric of political and corporate commentators.

Reality versus rhetoric

Perhaps surprisingly, offsets are unknown to the broad sweep of the defense community, and in those cases where there is an awareness, there is likely to be misunderstanding. Such widespread ignorance suggests that offsets are relatively unimportant, but this does not square with reality. The subject has been fundamental to the practice of defense procurement for at least two decades, and over the last two or three years, the study of offsets has been pursued with fervor by defense economists across the globe. The catalyst for the heightened academic interest in compensatory trade was South Africa's 1999 controversial offset program. Even with intense academic, political, and media attention, it is remarkable that empirical evidence on offset deliverables remains sketchy. The reason of course is the subject's sensitivity. From the corporate standpoint, offsets represent possibly the principal marketing tool for gaining competitive edge over rivals; indeed, its significance appears to be growing, given the predilection of countries to elevate the offset package above price and product considerations.

Notwithstanding this lack of data, it is possible to offer general observations to inform policymakers and analysts involved in framing offset strategy. It is sensible to compartmentalize discussion into the short and long-run implications of offset performance. Quite clearly, tangible benefits do accrue to the purchasing country, though with the passage of time the case becomes more difficult to prove once the initial offset multiplier benefits dissipate. This can best be illustrated by reference to GKN Sankey's export to the Philippine Army of 150 Piranha (Simba) wheeled armored personnel carriers and ancillary equipment, worth around $ 100 million. The first eight of these vehicles were built in the UK and the remaining 142 were assembled in the Philippines. However, as soon as they were completed, the assembly line and the factory were closed (Villanon, 1998). GKN Sankey fulfilled its contractual obligation of 15 percent offsets and 100 percent countertrade, but save for a small amount of local job creation and skill-generation, there were only minimal offset benefits to the Philippines. In retrospect, it is evident that the British defense contractor *and* the Philippine planning authorities had focused on the short-term benefits of the contract at the cost of long-term sustainability.

In the short-run, vendor intent has to be driven by the imperative of making the sale. Offsets act as a powerful technological discriminator in this regard. Most defense contractors would admit that aside from the sale, there is little attraction for them to enter into offset agreements. Except for the possibility of fostering a growing network of efficient offset subcontractors and integrating them into an international supply chain, the stereotype of offsets is that it is a cost. More telling, the majority of arms vendors view offset cost as a pricing issue. The challenge of who pays for the offset lies at the heart of why nations escalate offset targets. The attempt is to minimize vendors' loading of offset costs into the primary defense contract price. It is for this reason, as well as the growing leverage of buyer nations, that offset targets during the 1990s have risen. The UK, Belgium, Denmark, Netherlands, Norway, Portugal, and Spain all have 100 percent offset requirements, most of them mandatory. Further afield, offset targets have inflated even more dramatically. For instance, South Africa's recent $4 billion purchase of frigates, submarines, helicopters, and fighter/trainer aircraft from the UK/Sweden, Germany, and Italy was linked to offset targets reportedly reaching up to 300–400 percent (*Financial Times*, 2002). Indeed, the Republic's $2.5 billion purchase of Gripen fighters and Hawk

trainer aircraft requires a total offset commitment, direct and indirect, of $8.7 billion, that is, an offset requirement of 348 percent (*Financial Times*, 2002). Moreover, an offset deal in excess of 400 percent was also reportedly negotiated between South Africa and Germany for the purchase of submarines (Interview, 2000). Offset targets will obviously cause difficulty if the strategic aspirations of the arms purchasers are not realistic, but reaching a common agreement on the valuation of offsets is a cause of tension in discussions. For instance, Eurofighter's efforts to establish an industrial offset strategy with Norway's defense ministry complicated the former's 1999 bid to sell 20 Eurofighter Typhoons to the Royal Norwegian Air Force. Difficulties were caused by the parties' differing valuations of Eurofighter's industrial cooperation (offset) plan. Eurofighter valued its offset package at Nkr 26.7 billion. Set against a 10-year time frame, and based on 23 percent direct, 26 percent indirect defense, and 51 percent dual-use and civilian high-technology contracts, Norwegian industry valued the plan at somewhat less, around Nkr 16 billion. Using its own calculating methods, Norway's defense ministry reached yet another valuation of just Nkr 4.5 billion (Berg, 1999).

Further immediate difficulties are caused by additionality clauses. The result of such clauses is to question whether an offset is actually an offset. The best example here was Britain's 1986 purchase of US AWACS aircraft. A 130 percent offset package to compensate Britain's defense industry for cancellation of the indigenous GEC Nimrod program was agreed with the US contractor, Boeing. Boeing estimated that its offset package would create the equivalent of 40,000 man-years of work for UK industry, over eight years. Bizarrely, up to mid-1989, Britain's Ministry of Defense had made no effort to assess the employment effects of the offset work. Worse still, some 60 percent of the value of follow-on work for contracts placed by Boeing with UK suppliers *before* the end of 1986 was counted as offset credits (Martin and Hartley, 1995).

If vendors are serious about entering into mutually beneficial partnerships with their global clients, then a serious commitment to the successful completion of offset agreements is essential. Longer-term strategies thus come to the fore. Most purchasing countries in any case increasingly stress long-term development plans. This is reinforced by the trend whereby countries allow vendor companies to bank offset credits, to be used to fulfill future offset obligations associated with anticipated defense sales in those same countries. It is estimated that such credit transfers already account for 7.5 percent of all offset transactions (Udis, 2000). Moreover, the banking of offsets against future seller commitments has increased the tendency to allow offset commitments to extend into the long-term, stretching over several projects rather than being tied to specific projects for bilateral clearing (Udis, 2000).

In the long-run, offsets have the potential to impact on a number of critical areas, such as technology transfer, competitiveness, economic efficiency, defense-industrial sovereignty, employment, and in the current pursuit of transformational warfare, coalition forces benefit from rationalization, standardization, and interoperability (RSI) of military equipment. However, as mentioned earlier, in order to exploit long-term gains from offsets, the recipient country must be able to effectively absorb overseas technology. For most countries, the technology transferred must be high technology, of an equivalent technical level as the defense equipment being sold. Yet, US evidence suggests that American offset-related technology in 85 percent of the cases was over 10 years old (Cahill, 2000). Unsurprisingly, this refers to first-tier tacit manufacturing knowledge, not

design know-how or proprietary in-house sophisticated manufacturing technologies (Watkins, 2000). Even if current technology is transferred, it will most likely be protected through legal retention of the intellectual property rights and physical barriers via "black boxes" (Martin and Hartley, 1995). Technology transfer is *the* critical issue in many respects, yet there is a prevailing sense that offsets fail to deliver on this count. Certainly, this is the case for most of the developing countries, and it might also possibly be generalized to apply to advanced countries. Martin and Hartley (1995) for instance argue that little offset-related transfer of significant technologies into the UK defense sector has occurred.

To counter this negative view, fragmentary evidence exists to suggest that licensed production offers opportunities for countries with a mature defense industrial capability to produce improved versions of the original weapon system. The RAF Apache, for example, is a Westland Longbow version of the US Army AH-64D. The RAF fleet of 67 aircraft benefits from the more powerful Rolls Royce RTM 322 engine. Although de-tuned, it provides a superior profile and greater growth potential as compared to the US T600 engine. British Apaches will also benefit from the High Intensity Defensive Aides Suite (HIDAS) that the US aircraft do not have. The WAH-64D helicopters additionally have a more modern radar and Mission Planning System enabling real-time updating of mission plans to accommodate rapidly evolving threats. Finally, the British Longbow variant helicopters enjoy more extensive corrosion protection than their US counterparts. Similar examples of host countries upgrading licensed equipment include that of the US, which through the stringent "Buy American" regulations requires that all major overseas equipment procurement be licensed-produced in the US. Thus, the AV-8B Harrier II is an improved version of the British original; the former incorporating the APG-65 radar common to the F/A-18 (the only UK Harrier equipped with radar is the Sea Harrier) and possessing greater capability through its ability to deliver GBU-12 and GBU-16 bombs with pinpoint accuracy. Also, the US Goshawk, more formally known as the T-45C trainer, is a substantially improved licensed production version, built around a new digital "glass cockpit" design, of the British Hawk trainer. The Goshawk is a "navalized" variant of the BAe Systems Hawk. Numerous modifications have been introduced, including the need to provide lower landing speeds for carrier-based operations. This has necessitated SMURFS (strakers) being fitted to the rear fuselage to prevent excessive turbulence around the tail plane, and more powerful engines have been developed to counter the resultant increased drag of the aircraft.

Employment generation is another long-term objective of offset strategy. For the less industrialized countries the creation of sustainable jobs is always likely to be challenging. Saudi Arabia's multiple offset programs have managed to create only a few hundred local jobs, and most of these unskilled (Matthews, 1996). Spain's 1980s licensed production of the US F/A-18 aircraft did generate substantial numbers of jobs in a broad array of local industrial sectors, but only at considerable cost to Spanish public funds which were used to effectively subsidize Spanish firms' output costs to ensure they were competitive with McDonnell Douglas' existing US supplier costs (Molas-Gallart, 1996). Industrialized countries are also impacted by offset-related employment considerations. Britain's Westland company claims that the Apache program has created up to 3,000 British jobs (Spear, 1997), but in the longer-term, the net impact of offsets in the UK as a whole may lead to a loss of jobs. Thus, while inward industrial participation work is anticipated to

reach £5.3 billion up to 2010, the value of outward bound offset packages is estimated to reach between £12–15 billion from global obligations, equating to the entire annual turnover of Britain's defense industry (*Financial Times,* 2002). Similarly, the US fears that its overseas defense industrial offset obligations will lead to the loss of 469,000 jobs over the next 20 years (Spears, 1997).

Conclusion

The purpose of this chapter has been to explore the theory and practice of defense offsets. It is a subject that nearly always attracts controversy, and conjecture. Increasingly, offsets have come to be viewed as a "third-way" to local industrial and technological development, but the evidence for this is slim. Offsets can work to support industrialization, but as the Japanese case indicates, governmental, organizational, and possibly cultural issues are instrumental in arriving at successful outcomes. Offsets will contribute to sustainable technological development only if recipient countries evolve appropriate offset policies, provide the conditions for effective technology absorption to occur, and foster a business environment conducive to promoting competitiveness. This is an ambitious agenda, and hanging on the presumption that offsets are here to stay. History has shown this not to be the case.

Note

1. But see Chinworth (2004) for an important updated assessment of the effect of offsets on Japan.

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