

Defence Industrial Policy Approaches and Instruments

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Executive Summary

This study is an economic analysis of a sample of countries’ defence industrial policies. The eight countries studied are Australia, Germany, Holland, Israel, Korea, Spain, Sweden and the UK. The study takes countries’ various defence industrial policy documents at face value and, by deconstructing their approaches, examines the structures and the incentives they generate. Since such documents do not estimate the administrative costs of implementation, the study is silent on such costs. However, market distortion costs, the cost of public funds, and incentive costs that arise from policy implementation are explicitly indicated.

The study generates the concept of defence industrial policy approach that integrates the modes of procurement with defence’s and defence industry’s strategic objectives which may not always align smoothly.⁴ The theoretical table below lists the essential modes of procurement (and their properties) that may well be combined by a particular approach in order to satisfy the two strategic objectives. For instance, Canadian defence industrial policy approach doesn’t rule out any of the modes.⁵ Interestingly, the

Procurement mode ⁶	R&D capability	Production capability	Export potential	Industrial policy	Technology transfer	Skill development
Domestic	Essential	Essential	Essential	Yes	No	Yes
Offshore	No	No	No	No	Maybe	Maybe
Licensed	No	Essential	Important	No	Yes	Yes
Joint venture	Maybe	Maybe	Maybe	Important	Maybe	Maybe

Table 1: Comparison of properties of procurement modes (Adapted from R.B. Byers [1985], “Canadian Defence and Defence Procurement: Implications for Economic Policy”, in D. Stairs & G.R. Winham (eds.), Selected Problems in Formulating Foreign Economic Policy, Univ. of Toronto Press, 1985)

offshore acquisition of a certain platform (e.g. CF-18 in Canada) may be combined with In-Service Support (ISS) by a domestic company that would benefit from technology transfer as well as skill development. The concept of approach thus captures the subtle combination of modes to attain a set of policy objectives.

A policy approach is a comprehensive set of policy instruments unified by an underlying principle. In the case of defence industrial policy, the most common approaches are import substitution, export promotion, or a combination of these two policies. The primary goals of such policies are to develop domestic production capabilities while establishing an industrial infrastructure and generating employment in the home country that does not rely solely on domestic government purchases.

⁴ For example, prime contractors or Original Equipment Manufacturers (OEMs) will factor offset obligations into their bids. This means defence funds being used for defence industry policy.

⁵ Naval ships and munitions are acquired domestically; some aircraft have been bought offshore (and off the shelf); some army platforms have been produced under license; and the F-35 project is a joint venture.

⁶ Procurement mode or approach must be considered in conjunction with industrial policy.

To facilitate import substitution, the strongest tool at the government's disposal is procurement, a demand pull instrument. The government can purchase military equipment directly from domestic firms, or use offset agreements to require domestic co-production or licensed domestic production when purchasing from foreign companies. Increased coordination between the government and domestic firms would also facilitate import substitution, as domestic firms can make long-term adjustments to gear their output potential to the needs of the domestic government.

Export promotion is most often achieved through supply push policies. These policies are designed to allow domestic firms to access foreign markets more easily, or give them a competitive edge when competing for contracts. Typical instruments include information dissemination, coordination, and the development and retention of technical skills. Many governments provide special assistance to small and medium enterprises who would normally find it difficult to enter the global supply chain. Governments can promote specific firms internationally, or simply provide a forum where these small firms can coordinate with prime contractors. The government can also use procurement to aid in export development. Boosting the scale of production of a domestic firm, and thus lowering its average costs, the firm may become internationally competitive.

Many government policies will often lead to both import substitution and export promotion. For example, increased funding in research and development encourages foreign firms to locate branch plants in the domestic country to take advantage of that country's intellectual property. Domestic firms may also be able to increase exports as they may now offer more technologically advanced products. Offset agreements are designed to promote import substitution. However, it is sometimes the case that domestic firms need these protections in the short term to overcome the large costs of breaking into the international market. The ultimate goal of offset agreements is often to enable domestic firms to develop into exporters.

Lately a sophisticated approach to defence industrial policy has been adopted by Australia and Britain⁷. They moved away from the traditional and inefficient approach exemplified by offsets⁸ where the government, by assuming the function of picking winners, exposes itself to industry pressures. Australia and Britain defined the key industries to be supported by using a combination of defence and industry strategic criteria. However, instead of supporting particular firms, their new approach develops instruments for technology and skill development as well as domestic market coordination and export market promotion. This uniquely Australian approach identifies key defence industries to preserve domestically from a defence policy perspective, exposes the rest to international competition but develops industrial policy instruments to support them for competition in global supply chains.⁹ This approach provides two critical policy innovations. First, by being neutral relative to firms in a particular sector, it alleviates pressures from vested interests. Then, it enhances competition in a key sector by indirectly supporting all firms in the industry and making it attractive to compete in the sector rather than moving away in the product spectrum. This enhancement of competition is known to induce innovation by forcing firms to differentiate their products vertically in quality. Of course, this upward push in quality is an input critical to firms' participation in the global supply chains.

The Australian approach proves particularly relevant for Canadian aerospace industry that exports about 82% of its output. The appropriate policy approach would be to strengthen the industry's R&D base and

⁷ Their latest defence industrial policy documents are referenced below in this report.

⁸ Industrial and Regional Benefits in Canada.

⁹ Thus firms are not protected but supported by an industrial environment conducive to exports.

boost innovations by making sure competition in the industry is supported by making it attractive to new players, especially to SMEs.

One of the study's main findings is that Australia and the UK have moved away from offsets, Netherlands is reconsidering its use of offsets, and some other countries are still inefficiently using the (mostly direct) offsets as defence industrial policy instrument to develop their defence industrial capabilities.¹⁰ Australia's wide range of defence industrial policy instruments aim at elevating Australian defence companies to join the global supply chain with a very competitive approach, value for money for defence, resisting the use of inefficient instruments. Australia seems to have designed instruments that are not generating friction between defence and defence industry strategic objectives. Moreover, the instruments do not empower the government to pick winners while supporting Small and Medium Enterprises (SMEs). In the Australian approach, defence procurement is leveraged to persuade primes and OEMs to consider domestic suppliers. This approach significantly differs from Canada's in that procurement does not impose offsets that generate inefficient suppliers in the short run but, rather, aims to generate efficient suppliers in the long run.

Netherlands, with its current defence industrial policy, is an eclectic case. Possessing many internationally competitive defence industry products and with a national champion shipbuilder that can export, Dutch still use offsets primarily to transfer technology. The Dutch co-production of F-16s, due to offsets, enabled them to develop their aerospace industry and landed them some JSF contracts with their Tier 2 status in the JSF program. Netherlands is a member of European Defence Agency and also participates in OCCAR, the European organization for collective procurement. These are two mechanisms aiming at developing a European defence industrial base with a level playing field conducive to international competition.

The UK has identified many ways in which the government can create a business environment that would encourage contractors to use UK firms, just like in the Australian approach. This objective is not to be achieved through direct subsidies or forced offsets but, rather, through investing in science and engineering training and creating a stable macroeconomic environment. Recognizing that they can no longer support the full array of defence industries with only domestic purchases, the UK has identified industries they wish to keep for strategic and defensive reasons. These industries are also those in which the UK holds a comparative advantage in the world market. The UK hopes that by actively supporting these specific industries combined with an increased commitment to R&D spending, that it will be able to maintain a substantial share of the global defence market.

Spain, by contrast, still relies on the use of offsets to encourage the inward transfer of technology. However, Spaniards are very specific in the type of offsets they want (direct) and often direct contractors to which Spanish firms they should use, an approach consistent with picking winners policies and the related interest group activities. This rigid approach to offsets can be costly as it prevents contractors from optimizing their supply chain. A flexibility afforded by the Spanish approach is that, although offsets typically amount to 100% of the value of the contract, allowances are made if substantial technological transfers are expected to occur.

Israel's approach to defence industrial policy is largely shaped by its precarious geopolitical environment. Given its relatively small manpower endowment, industrial policy has focused on R&D and domestic production capabilities in an effort to continue to provide a qualitative advantage to its defence forces. Whenever possible, domestic firms are favoured in defence procurement initiatives,

¹⁰ It is to be noted that offsets are a version of import substitution policy.

quite the opposite of the Australian policy where domestic firms have to provide value for money to be selected. International firms are however often sourced to provide advanced defence systems beyond the scope of Israel's domestic production capabilities. In such arrangements, Israeli policy calls for the use of offsets, requiring a minimum of 50% of the contract value to be spent on various domestic business activities including co-production, technology transfers and investments in infrastructure. By relying on relatively large government expenditures on R&D, Israel aims to broaden opportunities for export while maintaining the technological advantage it currently enjoys with respect to its regional adversaries.

Korea has recently followed a similar path to Israel. With a political desire to decrease overall numbers of military personnel, focus has shifted towards modernization, with an overall goal of achieving greater effectiveness in terms of deterrence capabilities. The Defence Acquisition Procurement Administration (DAPA) cites as a major policy goal the implementation of measures aimed at technology and research, particularly through the use of offset obligations in procurement, while simultaneously increasing exports of military products. Establishing itself as a top-10 defence systems exporter would put the country in an elite group of worldwide exporters¹¹, and would perhaps justify extensive long-run expenditures in R&D and infrastructure. Since the dual approach of continuing with an offsets policy as well as aiming at larger volumes of systems exports is contradictory, one may expect policy changes in the near future.

Sweden's aerospace industry – and the Gripen program in particular – has acted as the country's main driver in defence systems development and innovation. This particular program has always relied on the smart and cooperative procurement approach with a long-term partnership in mind where the purchaser participates in development. Accordingly, Swedish defence industrial policy is geared towards supporting domestic developers through the use of subsidies to SMEs and offset policies with elements of technology transfers and cooperation in R&D. With an eye towards maintaining a comprehensive defence industrial base, Sweden aims to remain an international player in aerospace, its key area of comparative advantage.

¹¹ Korea is a worldwide competitor in building ships and, also, exports naval ships.

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Introduction

The approaches to defence industrial policy are as varied as the number of countries in the world. This is not surprising since every country is faced with a unique strategic environment and since every country weighs the importance of maintaining domestic defence industrial capabilities differently.

In this report we analyze the approaches that seven developed countries take in developing their defence industries. These countries are Australia, Israel, the Netherlands, South Korea, Spain, Sweden, and the United Kingdom. Three of these countries, Australia, Israel, and South Korea, are located in more volatile regions than the rest, and this fact is reflected in their approach to their defence industrial policies. Although all these countries are rich, our largest country (the UK) has an economy ten times the size of the smallest (Israel). This diversity sheds light on how countries must deal with a varying degree of resources.

We focus our attention on the overall approaches taken by country. Specifically, we examine the two major approaches of import substitution and export development. Import Substitution is the goal of developing domestic industries that the government can make purchases from, instead of importing foreign produced goods. Import substitution is often a prerequisite for export development. The goal of that approach is to develop the domestic industries to such an extent that they are large and efficient enough to compete in the global market. The countries we examine have all developed to the point that their industries are exporting to the global market.

Within these two approaches we have identified six general policy areas that governments use to carry out their approach. These areas are:

- Policies that improve coordination between government and the defence industry;
- Policies that encourage and support research;
- Policies targeted to support SMEs;
- Policies that help firms access global supply chains;
- Policies that create a Pro-Competitive Environment;
- Offset policies.

Some countries have programs that focus on all six of these areas, whereas others have policies that focus on only one or two of these areas. Some countries such as the UK and Australia are found to be more willing to allow market forces to determine which firms succeed and which fail. Although these countries do have a number of policies for industrial development, they are designed to create an environment for firms to succeed. Other countries, such as Spain, prefer that the government plays a larger role in determining how the defence industrial sector develops.

The paper is organized as follows. The next sections examine each country's policies in turn. We focus on describing the policies as presented by the various governments, and analyze the incentives that

result from these approaches. We comment on the possible effects, intended and unintended, that may arise. Following this we examine each of the six policy areas and note the different approaches that each country takes. This allows us to comment on which individual policies may provide better results.

Case Study: Australia

Preamble to Key Principles

Australian defence industrial policy has recently modified its approach away from import-substitution¹² towards export-promotion. While an import-substitution approach relaxes competitive pressures on domestic industry, export-promotion imposes competitive discipline. Perhaps the main implication is that domestic producers are compelled to innovate vertically, i.e. a combination of cost, quality and technology improvements rather than innovating horizontally towards differentiated products. Consequently, vertical innovation facilitates access to global supply chains.

The Australian defence industrial policy document (BDC [2010]) is categorical about the approach adopted:

“... Protectionist measures such as offsets and local content quotas are costly and counterproductive. They have no place in the Government’s defence industry policy. Defence industry policy will encourage local enterprises to identify opportunities and enhance their productivity, skilling and innovation. It is these strengths, rather than guarantees of work with little or no competition, which will assure industry’s future.” (p.16)

“[Government procurement policy ...] has moved away from offsets programs towards competitive procurement based on value for money criteria that encourages Australian industry to be internationally competitive and globally integrated.” (p.24)

This change in approach towards procurement relates to an overall Australian industry policy of joining global supply chains. Since such success depends on international competitiveness, Australia does let markets rather than government pick the winners.

“The only way to ensure a viable and resilient industry base is to allow market forces to determine which companies will be successful¹³, innovative and able to survive. Past efforts to prop up companies that were not commercially viable failed, but only after both Defence and industry had wasted a lot of money.” (p.39)

This move away from offsets may not be novel as it is also observed in the UK, in Germany and expected to be adopted in the Netherlands.

¹² Mandated offsets requirements have been rule rather than exception in most countries’ defence industrial policy arsenal.

¹³ The arbiter is no longer government picking the winner but rather the invisible hand.

Then what?

Australian defence industrial philosophy takes their international and defence policies as the starting point with a clear emphasis on their strategic environment.

This crystallizes in the identification of Priority Industry Capabilities (PICs) that would enable the Australian Defence Force to be operationally effective for a period of time identified by defence planners. Defence industry policy measures are then geared to sustain PICs strategically and only then leverage it for economic objectives. However, consistent with the export promotion approach, domestic procurement is competitive. Since value for money is the overarching principle in all sourcing, “the Government does not guarantee future work or funding for particular companies.” (p.43)

A second layer of broader industry capabilities, Strategic Industry Capabilities (SICs), identified as potentially becoming PICs, are continuously monitored. SICs provide “enhanced defence self-reliance, ADF operational capability, or longer term procurement certainty.” (p.41) Monitoring is achieved by tender responses, their performance if under contract, company ScoreCards, and through industry associations and Business Access Offices.

Understanding Australian Defence Industrial Policy

Four simple principles guide Australian defence industrial policy.

1. Clear investment priorities (10 year sliding plans);
2. Stronger Defence-Industry relationship;
3. Opportunities for defence industrial growth;
4. Building skills, innovation and productivity.

As will be seen below, one detects a fundamental concern about the coordination of various government and industry initiatives in the full spectrum of defence procurement as well as Australian defence industries. This coordination spans demand as well as supply aspects with an eye to innovation through public-private partnerships extensively exploited in the United States with a myriad of such organizational links (Maurer & Scotchmer [2004]). Since “picking winners” is left to market forces, the defence industrial policy must respect an even playing field but support the field by complementing the marketplace where it has gaps. Overall, as will be indicated throughout this study, government’s role is confined to a few interventions:

- i. the provision of information to players;
- ii. their coordination;

- iii. the reduction of transactions costs;
- iv. the competitive financing of emerging technologies and innovation;
- v. measures regarding skill development and its preservation where market players may have disincentives to invest for lack of property rights.

These interventions seem to derive from a textbook microeconomic analysis where markets are expected to underperform. Moreover, in this approach, none of the interventions seems to be about subsidizing products directly, whether by first-buyer or preferred buyer policies.

Analysis of various instruments

A. Clear investment priorities

- **Defence Capability Plan (DCP)** is Government's signal to industry about its defence capability needs and intentions for future major capital acquisitions (p.40, BDC [2010]). Industry must expect that the plan is to be adjusted over time due to:
 - a. changing strategic priorities;
 - b. prevailing economic circumstances,
 - c. maturing projects;
 - d. evolving technology for options under consideration; and
 - e. accumulating operational experience. (p.35, BDC [2010])

This long list of factors affecting future procurement clearly delineates the conditions that would trigger DCP evolution and provides the industry long-run guidance for investment. In fact, released first in 2009, the plan has now been updated in 2010 and the most recent in 2011 (DCP [2011]). It is primarily an intertemporal coordination device which supplies PICs (Priority Industry Capabilities) the sole-buyer's acquisition intentions provided, of course, industry perceives the plan as credible. This credibility is enhanced if the plan evolves in response to changes in the above factors in predictable ways, thus confirming the plan's coordination function. (See pp.37-38, BDC [2010] for details.) The coordination enabled by a credible DCP is expected to reduce industry adjustment costs and increases their responsiveness. From DMO (Defence Material Organization) perspective, these advantages would translate into lower costs and shorter delays in acquisitions.

- PICs are industry capabilities identified as essential strategic domestic industries that would enable ADF (Australian Defence Force) self-reliance and operational capability. The selection of the current twelve PICs is rooted in credible strategic contingencies rather than in any industrial or regional benefit considerations. In fact, they were first identified in 2008 for the 2009

Defence White Paper. PICs are industrial capabilities enabling defence readiness. Upon closer inspection of these twelve capabilities, none is a platform producer.

A notable capability amongst PICs is “systems integration”. The strategic motivation to select this capability becomes evident when the objective is stated as “to enable the ADF to decouple from specific allies’ products and take selective advantage of world best military capability developments.” (p.86, BDC [2010]) Considered as part of the whole set of PICs, this capability is quite consistent with BDC’s competitive procurement, SME development and long-term industry success aims, this latter predicated on becoming part of the global supply chain. Interestingly enough, the systems integration capability is also a signal and incentive to industry to provide competitive products by sustaining the capability to integrate them into existing platforms. Moreover, it also serves as intertemporal coordinator by clearing industry’s path towards developing products that can be integrated to ADF platforms. Finally, systems integration is an essential ingredient supporting ADF’s network centric warfare capability.

Since systems integration is typically the prerogative of major prime contractors, this ambitious PIC seems yet to be developed or what is meant is the Australian subsidiary of a major prime. However, this latter may run counter to the objective of sovereign operational effectiveness.

- **PIC Innovation Program** directly supports companies’ innovative and “unusual” proposals related to PICs. The proposed activity must be one that they would not normally have undertaken. This modestly-funded program is especially directed towards SMEs.

The program lends funds matching a company’s own investment into capital equipment for new capabilities or into the development of new processes, all to be related to one or more PICs. Arguably the most interesting incentive is the criterion used to measure maturing of the infant industry: If the SME succeeds to sell to non-Defence customers and/or to export, the subsidies are repayable. This is risk-sharing by the taxpayer in the highly uncertain technology sector in that, if successful, the company can pay the “loan” back and still remain a winner whereas in case of project failure the cost is spread. This venture capital function provides an incentive for SMEs to concentrate on PICs. We further note that the gain to taxpayer upon company’s success is twofold. First, in terms of defence capabilities, a PIC is successfully supported. Second, potentially, the company becomes part of the global supply chain.

PIC Innovation Program is intimately related to Skilling Australia’s Defence Industry (SADI), Defence Industry Innovation Centre (DIIC), Defence Export Unit (DEU), Global Supply Chain (GSC)

B. Stronger Defence-Industry relationship

- **Capability Development Advisory Forum (CDAF):** This is a coordination program that allows industry to get in the process early (see Canadian Project ACCORD below in Appendix B) and

input into Defence decision making via a forum where ideas are exchanged. The forum includes the Chief of Capability Development and the CEO of DMO from Defence side and ten members from industry, namely four from each of large contractors and SMEs and two industry associations. The presence of high-ranking Defence procurement officials renders this forum particularly crucial in avoiding late failures in procurement that could have been avoided early. For instance, a failure at the request for proposals stage is highly costly in terms of resources committed by either side. If the forum raises a red flag early on, economies will be significant. The forum's consultative nature and its high level staffing generate a swifter process and strengthen the industry-Defence coordination in procurement.

- **Defence+Industry ePortal:** Another coordinating device that boosts access to defence's acquisition and sustainment program information by all companies but, in particular, SMEs. Also helps Australian Industry Capability (AIC) Program (see below) by matching primes and OEMs with potential Australian suppliers and subcontractors.¹⁴ Beyond the broad DCP (discussed above), detailed future requests for tender are posted in the portal.

The portal exhibits the following properties.

- a. The service is layered to allow seriously interested parties to register and gain access to more detailed information about potential partners.
- b. It is a continuation of DCP in that maturing plans that have reached the stage for request for proposals will be posted to the portal as well changes to DCP.
- c. Potential suppliers, both foreign primes as well as Australian companies, register their interest and indicate their capabilities.
- d. The portal allows industry to provide feedback on Defence programs (see the 360⁰ View ScoreCard Program below).

The portal plays the first contact role in the overall picture of the Australian procurement market. Rather than investing resources in real-time sampling of potential partners, it allows all companies to narrow down the list of potential partners. The take-up evidence for this market-maker seems to be strong, with 4,000 users from Defence and industry and 1,300 companies exhibiting their capabilities.

- **DMO Business Access Offices:** This network of offices serves a series of functions. First, it lowers the cost of interfacing for companies, especially SMEs that might find it costly to communicate with Defence. Second, it is a coordination device with state and local governments. The local Office personnel provide continuous interaction with companies that have declared ready to join the Defence supply chains. Various functions they perform include guidance, training and briefings for companies into Defence business opportunities. Finally, they manage the Unsolicited Promotional Product Offer (UPPO) and the Defence Recognized Supplier Scheme

¹⁴ In Canada, a private consultancy industry has sprung up filling this vacuum.

(DRSS). In these capacities, they act as business intelligence units in that they detect emerging industry capabilities that might be of relevance to Defence and certify them as such.

The Defence Recognized Supplier Scheme program allows companies access to Defence+Industry ePortal. Thus there exists a complementarity between the two programs. Moreover, this program contributes to the maintenance and enrichment of PICs, the PIC Innovation Program (see above) and the continuity of SICs. By lowering the cost to potential PICs and SICs, UPPO and DRSS are supplier development and recruitment devices.

C. Opportunities for defence industrial growth

- **Australian Industry Capability (AIC) Program:** This is Canadian Industrial and Regional Benefits (IRBs) program without percentage mandates but with facilitation and, perhaps, moral suasion. Effectively, the program aims at leveraging major Defence acquisitions to create, not impose, opportunities for Australian companies to join the global supply chain.

The crucial distinction between AIC and Canada's IRBs can perhaps be best captured by the Joint Strike Fighter (JSF) program where no contract is guaranteed but participation generates access to bidding. Contracts thus obtained by competing internationally enable companies to join the Global Supply Chain. For, winners' products must be at the frontiers of technology and have been produced at the frontiers of technology. One might even go so far as saying the AIC Program mimics the JSF program by replacing the "JSF project participant" criterion by "Australian Defence project bidder". The JSF partner nations' companies acquired the right to bid for JSF contracts whereas Australian companies have been required to bid for Australian Defence contracts. However, their exposure to primes and OEMs are facilitated by various typically firm-blind instruments of Australia's defence industrial policy. Thus, Australian AIC Program doesn't pick winners. Rather, it lets markets to pick winners.

Traditional offsets (or IRBs in the Canadian context) impose local industry participation (direct or indirect). This costly imposition undermines cost-effectiveness of defence acquisitions as primes will factor the premia into bids. The JSF-type participation is efficient because it doesn't impose local industry participation but allows it upon competition.

Australian companies chosen on the basis of "value-for-money", i.e. internationally competitive, by prime contractors or Original Equipment Manufacturers (OEMs) bestow them a winning edge. Primes and OEMs entering bids must submit a binding AIC plan. This program must be seen in conjunction with GSC (see below) because Australian companies that team up with primes and OEMs may have proven their international competitiveness. A word of caution is in order in that bidding primes and OEMs have a strong incentive to team up with Australian companies to acquire an edge and they would be prepared to enter AIC plans where they could inflate Australian companies' competitiveness.

Another objective of the AIC Program is to facilitate technology transfer by making it attractive to OEMs. An opportunity is provided to primes and OEMs to submit their long-term technology investments in Australia.

- **Global Supply Chain (GSC) Program:** Industry Capability Branch works with multinational primes, OEMs and their suppliers to connect them to Australian suppliers. This program is especially intended to facilitate SMEs entry to the global supply chain as resources required to explore global markets and attract the attention of global primes might exceed SMEs' organizational and financial capabilities. Moreover, consistent with the overall policy, the program facilitates access to global supply chain without championing specific SMEs.

The program has already established agreements with such major contractors as Boeing, Raytheon, Thales, BAE Systems, Lockheed Martin, Eurocopter, and Northrop Grumman. The first three have already developed branches specializing in evaluating Australian suppliers participating in the program.

SMEs registering in the program through the ePortal may expect such services as an evaluation of their suitability, information on capabilities sought by international primes via AIC (Australian Industry Capability) Program, on such licensing impediments to free trade as ITAR (International Traffic in Arms Regulations)¹⁵, on future opportunities and other support available such as on export potential through DEU (Defence Export Unit), and on skills, productivity and competitiveness information through DIIC (Defence Industry Innovation Centre).

- **Defence Export Unit (DEU):** International marketing, market intelligence for Australian companies, coordination with potential foreign purchasers, identification of foreign market restrictions, and promotion of Australian access to markets are tasks mandated to DEU. This program obviously exhibits strong synergies with the Global Supply Chain (GSC) and the Australian Industry Capability (AIC) Programs.

An interesting task undertaken by DEU is to promote Australian SMEs' products by leveraging access to Australian Defence Force (ADF) assets for demonstrational purposes. This is not part of a first-buyer policy but, rather, a demonstration of performance of such products. Since access to other defence forces' assets may be difficult for the intended purpose, this demonstrative task requires close coordination between DEU and ADF.

- **New Air Combat Capability Industry Support (NACCIS) Program:** The program promotes new or improved industrial capabilities that might win JSF contracts. The international JSF project introduced a new offsets concept where there is neither a mandate nor a workshare plan but just a potential access to the global supply chain via international competition for JSF system components. Operationalizing this program is the forum Australian Joint Strike Fighter Industry

¹⁵ Given the above list of primes where only BAE Systems and Thales are non-American, a thorough knowledge of American regulations governing exports and imports in weapons or weapon components is critical to any SME hoping to join the global supply chain.

Group (AJIG) which replaced the JSF Industry Advisory Council (JIAC) in late 2009 as JSF Program was entering the production phase. AJIG is chaired by the Program Manager, New Air Combat Capability (NACC).

Perhaps the single specific purpose is the identification of new opportunities for SMEs in the sustainment and follow-on development of the aircraft. This is a product-specific forum, similar to the Capability Development Advisory Forum (CDAF) with Government and industry participation. However, beyond the CDAF mandate but within the JSF framework, it incorporates GSC and DEU mandates of interfacing Australian SMEs with Lockheed Martin and other OEMs within the JSF Program.

The program provides information updates on JSF such as the production rate and new opportunities, fosters coordination between SMEs, assesses the existing JSF-related SICs and suggests new SICs towards supporting the JSF and its follow-on development to ensure the Australian Defence Force achieves operational sovereignty, and helps Australian SMEs navigate through US defence export licensing process, and its management by US companies, and other US regulations such as Title 10.

As we have seen over and over, this program targets potential market failures within a specific program. It aims to foster coordination and to provide information to all SMEs, whether they are already under JSF contracts or potentially interested in further development or sustainment related to JSF.

D. Building skills, innovation and productivity

a. Skills

- **Skilling Australia's Defence Industry (SADI):** The SADI grants program¹⁶ commenced in 2005 in order to up-skill existing employees in the defence industry, improve the quality and quantity of skills training in the defence industry, and generate additional skilled positions. Since its inception, around 150 defence companies and organisations have been provided with funding support for training and/or skilling activities in professional, technical and trade skill areas. SADI funding priority has been given to skilling activities in PICs or SICs. SADI complements the Industry Skilling Program Enhancement (ISPE), Defence Industry Skills Taskforce (DIST) and Defence Industry Innovation Centre (DIIC), all examined below. We note that, given the portability of such skills, individual SMEs would not have a strong

¹⁶ SADI is a reimbursement program. Approved expenses are reimbursed upon completion of the eligible training activity.

incentive to support employees' up-skilling if employee turnover is perceived to be high. However, from the country's perspective, the turnover would be significantly lower and, hence, the federal government's support to generate such skills. This program amounts to an internalization of positive externalities emanating from skill generation.

- **Industry Skilling Program Enhancement (ISPE):** This multi-dimensional program is one of partnership with all levels of government as well as with industry and universities. More than a dozen programs include:
 - i. school pathways programs that, jointly with regional development agencies, expose young people to work in PICs and SICs;
 - ii. various scholarships at programs related to PICs and SICs, including placement at SMEs;
 - iii. Defence Materiel Organization courses offered to PICs and SICs;
 - iv. sponsorship for systems integration, support related graduate degrees;
 - v. a defence industry downturn response strategy to prevent skill loss at PICs and SICs.

In conjunction with DIST, SADI and DIIC, ISPE concentrates on skill development as well as preservation.¹⁷ It differs from SADI by a more centralized approach via setting up and supporting cooperative programs in education and training as well as addressing the dynamic coordination problem of deskilling over the downturns in business cycles.

- **Defence Industry Skills Taskforce (DIST):** This is a standing taskforce, composed of members from government, industry and unions. Its mandate is to monitor the skills profile available to ADF, PICs and SICs and then provide, on a continuing basis, analysis and policy options. The taskforce works in collaboration with stakeholders, including all levels of government as well as education and training suppliers, to ensure the supply of a skilled workforce.

b. Innovation and productivity

- **Defence Industry Innovation Board (DIIB):** This is another coordinating mechanism. It helps coordinate innovation programs that are available to industry. Moreover, the board oversees the PIC Innovation Program studied above. A senior defence industry executive will chair the Board, which will include members from primes, small to medium enterprises, defence, the Department of Innovation, Industry, Science and Research, industry associations, and unions. It also includes representation from innovation communities, in

¹⁷ Deskilling caused by the boom and bust cycles in Canadian shipbuilding is one of the problems targeted by ISPE.

particular Defence Materiel Organization (DMO) and Defence Science and Technology Organization¹⁸ (DSTO).

- **Defence Industry Innovation Centre (DIIC):** The Centre provides, at no charge and in major cities, specialist Defence Industry Business Advisers to SMEs. These advisors work with SMEs to improve their international competitiveness. Specific grants to implement advisor recommendations reinforce innovation efforts.

Another specific grant allows researchers from universities and public research agencies placement with SMEs with the objective of developing new ideas with commercial potential. Of course such placements enhance networking and hence cross-fertilization of ideas.

Other services by the Centre include group innovation and business development projects, technical advice to business advisers and firms, advice and business intelligence to SMEs on new technologies, products and processes, access to prototyping and testing facilities to turn innovative ideas into new products or to test products for new markets, and promotion of industry-wide networks and relationships by undertaking events and awareness seminars.

This program is related to Skilling Australia's Defence SADI and ISPE.

- **Capability and Technology Demonstrator (CTD) Program¹⁹:** This program enables defence companies to demonstrate their products with advanced technologies may enhance ADF capabilities. Competitive funds are available for SMEs to demonstrate how their novel technologies might enhance defence capabilities. These funds break down into three categories:
 - i. Seed funding for developing CTDs;
 - ii. Project viability funding (e.g. to retain staff and infrastructure) to support CTD proposals prior to funding;
 - iii. Concept definition funding for the development of CTD proposals.

This program is reinforced by CTDE below that funds further development of ideas selected in the CTD program. Moreover, CTD is related to Skilling Australia's Defence Industry (SADI) and Industry Skilling Program Enhancement (ISPE).

¹⁸ Defence Research and Development Canada (DRDC) is the counterpart in Canada.

¹⁹ Defence Research and Development Canada has the similar Technology Demonstration Program (TDP) whose main objective is to consider emerging concepts and technologies relevant to future defence capabilities. The TDP sponsors approximately 40 defence research and development projects with an average funding value of \$6 million. Typically, six new projects are selected from a pool of proposals each year. TDP projects are collaborative in nature and usually require some form of meaningful investment by all stakeholders. TDP seems to merge Australia's CTD and CTDE programs by expanding demonstration to all industry.

- **Capability and Technology Demonstrator Extension (CTDE) Program:** This program bridges the gap from selection of a CTD to its commercialization while its suitability for ADF is under consideration. Evaluation of technical risks associated with the project is critical in this process.
- **Rapid Prototyping, Development and Evaluation (RPDE):** This small program revolves around speed in developing solutions for ADF capabilities and current operations. It brings together, swiftly, small teams of experts from defence, industry and academia. Ongoing relationships with a wide range of experts facilitate the speedy formation of teams when a problem emerges. It engages the team at an early stage in the process.²⁰
- **Defence Future Capability Technology Centre (DFCTC) Program:** This program is similar to RPDE above yet with a longer horizon. The Defence Materials Technology Centre is the first major initiative and it conducts research in air and marine platforms, armour applications, high-tech materials and propulsion systems. These research projects cover areas beyond PICs and SICs while they may input into many capabilities identified under PICs and SICs. The program also provides education and training in the areas covered.
- **Company ScoreCard Program:** This program evaluates DMO contractors' and subcontractors' performances on an ongoing basis. The evaluations are multidimensional, including all aspects of work. Evaluations can be challenged by contractors and reinforce dialogue with industry. The program's critical role is the facilitation of future source selection by reducing transactions costs.
- **360° View ScoreCard Program:** This program aims at improving DMO's performance in contract implementation. Feedback is obtained in such areas as ability to honour agreed schedules, understanding cost drivers, effectiveness in implementing AIC requirements, and contract and intellectual property management.

Consistency of policy instruments

- Australian government invests in areas where individual companies might not as their investments may not yield proprietary outcomes. Overall underinvestment would result otherwise.
- For instance, investments in skills, in certain R&D areas, in coordination, in information transmission, and in access to markets are examples. Interventions take place in markets where either public goods or heavy externalities without proprietary benefits for investing companies.
- Moreover, common agency problems (e.g. underinvestment, low levels of monitoring) would have arisen if a "common marketing agency" type organization was set up by companies. Instead, GSC, DEU, and NACCIS are such common agencies run by Australian government.

²⁰ The Canadian Project ACCORD shares the same structure and objectives. See Appendix B for details.

- Interesting: 360⁰ View ScoreCard Program is about Monitoring the DMO!

Appendix A

PICs (NB No platform production and they derive from credible strategic contingencies!)

1. Acoustic technologies and systems;
2. Anti-tampering capabilities;
3. Combat uniform and personal equipment;
4. Electronic warfare;
5. “High end” system and “system of systems” integration;
6. High frequency and phased-array radars;
7. Infantry weapons and remote weapons stations;
8. In-service support of Collins Class submarine combat system;
9. Selected ballistic munitions and explosives;
10. Ship dry docking facilities and common user facilities;
11. Signature management;
12. Through-life and real time support of mission critical and safety critical software.

SICs (Str. Industry Capabilities with potential to become PICs)

1. Composite and exotic materials;
2. Elements of national infrastructure (such as supply and storage of aviation fuel; provision of terrestrial and space communication systems; elements of logistic infrastructure);
3. Geospatial information and systems;
4. Guided weapons;
5. Naval shipbuilding;
6. Protection of networks, computers and communications;
7. Repair and maintenance of specialist airborne early warning and control systems;

8. Repair, maintenance and upgrading of armoured vehicles;
9. Repair, maintenance and upgrading of aircraft (incl. helicopters);
10. Secure test facilities and test ranges;
11. Systems assurance;
12. System life-cycle management.

Instruments established since 2007

- Identification of PICs
- 2009 Defence Capability Plan (DCP) and enhancements
- Defence + Industry ePortal
- Australian Industry Capability (AIC) program
- Global Supply Chain (GSC) program
- Industry Skilling Program (ISP)
- Defence Industry Innovation Centre (DIIC)
- Defence Industry School Pathways Programs
- Defence Technical Scholarships Program
- Engineering Scholarship Program
- ReEngineering Australia (REA)
- Defence Materiel Organization (DMO) Institute
- Masters of Military Systems Integration programs
- Masters of Systems Support Engineering
- Professional Doctorate in Systems Engineering
- Industry Downturn Response Strategy
- Defence Industry Sector Branding Strategy
- Company ScoreCard Program

- New Air Combat Capability Industry Support Program
- Defence Materials Technology Centre Program
- Defence Export Unit
- Defence Industry Innovation Board
- Capability Development Advisory Forum (CDAF)

Appendix B: Project ACCORD

The Project ACCORD is included because it consolidates some of Australia’s myriad of defence industrial policy programs into one in Canada. It stands out as one directed towards the coordination between the purchaser (DND) and sellers. It is similar to Australia’s Capability Development Advisory Forum (CDAF) but also incorporates some functions assigned to Australian programs such as Defence+Industry ePortal, Rapid Prototyping, Development and Evaluation (RPDE) and Defence Future Capability Technology Centre (DFCTC) Program.

The Project

Project ACCORD is a DND initiative that will enable key players within the broad defence industry, academic and government realms to directly feed into the conception, development and analysis of future military capabilities for the CF.

Using the brightest minds and the best ideas from the public and private sectors in Canada and worldwide, this new mechanism will ensure that critical and unbiased input is integrated into procurement processes from the outset. This mechanism will operate in a fair, open and transparent environment – a key priority in the Government of Canada’s Procurement Reform agenda – and will streamline defence procurement process for maximum effectiveness and impact as identified in the Canada First Defence Strategy.

Project ACCORD is a multiyear project that is expected to roll-out in three phases:

- Phase 1 – Options Analysis Study of possible Canadian concept options.
- Phase 2 – Definition (Pilot Project) Initial concept option testing in a two year pilot project.
- Phase 3 – Implementation (Final Operational Capability) Implementation of a Canadian independent body and process.

The Concept

The concept proposed by Project ACCORD is designed to ensure that industry and academia are engaged early and to streamline and influence the DND decision making process from capability planning to

implementation. This mechanism will provide DND with vital, valued and validated advice. It will also provide industry and academia with early insight into defence challenges now and in the future.

The new Canadian independent and cooperative mechanism proposed by Project ACCORD will contribute to the Department current procurement processes in the following way:

Step 1 – Identify the Need

The Department, as part of its capability management process, would identify themes for which industry and academia can contribute in addressing the capability challenges.

Step 2 – Input to ACCORD Mechanism

Based on these themes, the new mechanism proposed by Project ACCORD would make a decision to proceed, or not, based on anticipated benefits to both DND and Canadian industry and academia.

Step 3 – Output from ACCORD Mechanism

The mechanism would analyze the theme and provide unbiased, industry-wide, and validated advice to DND.

Step 4 – Output Exploitation

DND would take into consideration this advice in determining its way ahead.

Case Study: Israel

Introduction

Israel's approach to defence industrial policy is largely shaped by its precarious geopolitical environment. Due to its relatively small manpower, an ongoing policy aim of providing a qualitative advantage in terms of effectiveness and technological modernization to its defence forces has been pursued. To help satisfy these goals, Israel ranks among the world leaders in military expenditures per capita, spending an average of above \$15 billion (U.S. Dollars) over the past 5 years, representing, as of 2010, 6.5% of gross domestic product. Of this, approximately 28% is devoted to research and development-related projects; considering that Canada spends only roughly 4% of its total defence budget on R&D, this is a relatively large number. Israel has the benefit however of being able to finance these expenditures through the long-term military assistance it receives from the United States, with a baseline of \$2.55 billion in aid in 2009 set to increase to \$3.1 billion by 2018.

This focus on technology and modernization is further reinforced through the use of offsets in international procurement agreements; Israel requires 50% of the value of all contracts with international partners to be subject to offset obligations, and gives priority to co-production activities and investments in domestic research and development.

In adopting these policies, Israel aims to maintain the technological advantage it currently enjoys with respect to its regional adversaries, while providing further opportunities for growth and export to its domestic producers.

Understanding Israeli Defence Industrial Policy

The principles of Israeli Defence Industrial Policy can be explained as:

1. Policies enacted through offset obligations:
 - Domestic co-production / subcontracting
 - Development of long-term relationships and providing future business opportunities
 - Foreign funding of Israeli R&D
 - Investments in domestic firms
 - Offering incentives for contracts with firms in “development” regions or industrial clusters
2. Subsidization / Funding of domestic R&D
3. Preference of Israel-based producers in procurement initiatives

4. Participation in joint R&D projects
5. Export-market assistance for domestic firms, especially SMEs

Analysis of Various Policy Instruments

1. Policies enacted through offset obligations

Offset agreements, under the joint supervision of the Industrial Cooperation Administration (specifically for co-production activities) and the Ministry of Industry, Trade and Labour, is one of the main tools by which Israeli defence industrial policy is carried out. Consistent with the Ministry of Defence's principal objective to keep the Israeli Defence Force (IDF) at the forefront of technological progress, offset measures cover a large spectrum - from direct technology transfers via co-production to indirect investment in domestic R&D.

Offset program highlights:

Managing body:	<ul style="list-style-type: none"> ⤴ Industrial Cooperation Administration (ICA), Ministry of Industry, Trade and Labour
Dollar value threshold:	<ul style="list-style-type: none"> ⤴ \$5M (U.S. Dollars)
Minimum offset requirement:	<ul style="list-style-type: none"> ⤴ 50% of the total contract value for military procurements
Offset preferences:	<ul style="list-style-type: none"> ⤴ Direct and Indirect, with a focus on technology and industrial co-operation (i.e. co-production agreements)
Penalties for offset agreement violation:	<ul style="list-style-type: none"> ⤴ Companies that fail to fulfill their offset obligations may be prevented from competing for future contracts; this will last no longer than 5 years
Completion of offset requirements:	<ul style="list-style-type: none"> ⤴ 5 years; offset-banking practice used

Offset instruments:

- ⤴ **Domestic co-production / subcontracting**

Israeli policy focuses heavily on providing opportunities for domestic firms to produce intermediate inputs into the final products being acquired in procurement. Such components of offset agreements are considered *most preferred* by the ICA; when deciding between competing offers in procurement negotiations, a “preference” factor is assigned according to the relative level of domestic subcontracting included in the proposal. Generally, a minimum of 20% of the offset requirement should be accounted for via subcontracting.

⚡ **Development of Long-Term Relationships and Providing Future Business Opportunities**

By creating partnerships with foreign firms through the co-production mechanisms in offset agreements, the ICA hopes to forge long-term relationships and open new markets for domestically-produced competitive defence systems, while creating a framework for long-term bilateral or multilateral industrial and trade cooperation.

⚡ **Foreign funding of Israeli R&D**

In satisfying offset obligations, foreign partners have the option of investing in domestic Israeli R&D firms. Israel has a great preference for such activities, and, as a means to incentivize foreign firms into opting for this measure, will credit 150% of the total amount invested against offset obligations.

⚡ **Investments in Domestic Firms**

A partner company may also satisfy offset obligations via the investment of domestic non-R&D firms. In cases of foreign investment, a controlling share of the firm in question must remain in Israeli hands, so partner firms may not purchase more than 49% of total shares in any given firm.

⚡ **Offering incentives for contracts with firms in “development” regions**

Incentives are provided for firms willing to do business with industry located in regions selected for “employment and regeneration”.

In focusing so heavily on co-production activities, the potential for spillovers in terms of technology and industrial benefits are rather marked. Being one of the key drivers of Israel's economy, industrial development and employment is significantly affected through such offset activities. The costs associated with these measures, however, include an inherent lack of efficiency in production, at least in the short run; presumably, domestic production does not often constitute the least-cost alternative, as these inputs could likely be produced more cheaply elsewhere. The focus of the cost-benefit analysis, then, is between the gains to industry and development in terms of potentially improving the long-run competitiveness and efficiency of firms versus the inherent inefficiencies in mandatory domestic production activities.

While only 20% of the total offset obligation is generally required in procurement agreements, this number is sometimes exceeded by a wide margin. A particularly striking example is the procurement of the F-35 (Joint Strike Fighter); in agreeing to obtain a minimum of 20 of these aircraft, Israel has secured approximately 180% of the total value of the contract in co-production activities, a revelation that was met with sharp criticism from American observers (Liveleak, 2010), especially given the regular aid Israel receives from the United States. Considering that Canada's offset ratio as a tier-3 participant in the JSF program is only 75%, this seems especially contentious, even if Israeli firms are efficient producers of intermediate inputs in the F-35.

2. Domestic subsidization of R&D

Israel spends up to 28% of its defence budget in research and development, and is widely considered to be an efficient innovator, often favouring “risky” research projects that offer the chance for substantial advancement over more “blue chip” type projects. An additional advantage to research and development stems from the fact that many of the technicians and engineers employed have prior service in the IDF, granting them a clear perspective of military needs. Close cooperation by Israeli defence firms with the IDF is also cited as a source of efficiency, an arrangement that is employed regardless of whether the IDF has committed to purchasing the defence system in question.

Given the issue of a relative disadvantage in terms of economies of scale when compared to major defence system producing nations, these approaches have, by all accounts, served Israel well in the past. Examples of successful research projects include the development of the *Ofeq* satellites, the *Arrow* missile system, and the *Python 5* short-range air-to-air missile (Kagan et. al., 2004).

3. Preference of Israel-based producers in procurement initiatives

Israeli law requires procurement initiatives treat all potential bidders equally, with the exception of the potential bids from domestic firms, which are assigned a greater weight in the evaluation process. Since Israeli producers tend to be efficient and cost-effective, this policy measure is not usually a great source of distortion in the procurement process, especially when taking into account the allure of offset agreements that are applied in contracts with international firms.

Despite this, there exist inherent inefficiencies with any such 'buy-local' policies, as inferior domestic producers may have the potential to land contracts they would otherwise not be privy to based on their own merit.

4. Participation in joint R&D projects

Israel seeks to participate in multinational joint research and development projects, as in the case of the *F35 Joint Strike Fighter* and the *Arrow* (in conjunction with the United States) missile system programs. The rationale to participate in these types of programs is primarily one of economies of scale and comparative advantage. Clearly, there are benefits associated with such agreements; one partner may be relatively well-endowed and efficient in a particular area of expertise, while another provides similar benefits to other areas. In combining their efforts, there are, in theory, efficiency gains for all participants. The associated costs include the sharing of technological advances, potential search costs in finding partners in research, costs associated with nations' research support organizations (such as DRDC in Canada) and issues related to coordination of efforts between companies.

5. Marketing assistance for domestic firms, especially SMEs

One of the ICA's primary functions is to aid domestic firms in finding international business partners for the purposes of obtaining export contracts and otherwise provide opportunities for future partnerships. Israeli SMEs often lack the resources necessary to market their products on the world stage, and such efforts enable these firms to level the playing field with respect to their international competitors.

Israel's thriving domestic defence industry currently exports a majority of its total product, which is indicative of success in domestic research and development and the ICA's marketing efforts.

Case study: The Netherlands

The Dutch defence industrial policy is eclectic: Export promotion and import substitution coexist, the latter in the form of offset requirements.²¹ The current defence industrial policy dates back to 2007.

“The Ministries of Defence and Economic Affairs, Agriculture and Innovation have to find a balance between on the one hand taking action for an open market and international co-operation, and on the other hand the choice of policy instruments to position the Netherlands industry during the time when this open market system has not yet been achieved. In this respect the operational needs of the Ministry of Defence are leading.”²²

Even the competitive sounding part of the industrial strategy statement refers to international co-operation that includes the Tier 2 Dutch participation in the JSF program and the Dutch participation in the European OCCAR program²³, two organizationally different programs. Whereas the JSF program contracts are awarded competitively and, hence, differ from traditional offset requirements, OCCAR distorts competitive allocations by using work quotas.²⁴ As for the statement on the primacy of defence needs, it appears weaker than the Australian defence industry policy that states in no uncertain terms that the Australian Defence Force operational effectiveness drives the industrial policy. This difference is understandable as the two countries’ strategic environments are significantly different.

Dutch defence industrial policy environment

Dutch defence industrial policy is implemented by the Ministries of Economic Affairs, Agriculture and Innovation and of Defence where, respectively, the Commissariat for Military Production is responsible for the defence industrial policy and the Defence Materiel Organization²⁵ for procurement. This functional distribution is very similar to Canada’s as Industry Canada and Department of National Defence (DND) carry the same mandates. We note, however, that the Dutch Defence Materiel Organization (DMO) manages its own procurement contracts, unlike in Canada where Public Works and Government Services Canada (PWGSC) is the government-wide contracting authority. A clear

²¹ The policy is under major review as of 2012.

²² The quote is from the Dutch Defence Industry Strategy (DIS), <http://www.government.nl/issues/commissariat-for-military-production/defence-industry-strategy-dis>.

²³ OCCAR, “What do we do?”, <http://www.occar-ea.org/186>. See Appendix A for further details.

²⁴ Using the principle of *juste retour*, although OCCAR initially allocated work according to participating country’s financial contribution to a particular program, a serious allocative inefficiency, the workshare mechanism has been allocatively improved to balance countries’ shares over several programs and years.

²⁵ Established recently in 2006.

implication of this organizational structure is that defence procurement will be smoother with an in-house contracting agency rather than being handled by a common agent.

The Netherlands participates, through European Defence Agency (EDA)²⁶ and OCCAR, in the development of a competitive European defence technology and industrial base (DTIB), which is also seen as a conduit to global supply chains for defence systems. Another aspect of this vision is that the Dutch defence industry has to prepare for the future globalized defence markets and for the inevitable consolidations in the European defence industry. This realization will undoubtedly affect the 2012 review of Dutch defence industrial policy review.

Key principles of Dutch defence industrial policy

The Dutch approach combines import substitution in the form of offsets, export promotion in the form of R&D investments, skill development, market access instruments and by supporting through procurement and R&D support a national champion in shipbuilding²⁷. Thus it is difficult to pinpoint the Netherlands close to an extreme along the defence industrial policy scale.

DIS technology orientation reflects the Government's view that while the Dutch industry may lack the range and depth of industrial resources necessary to develop and produce major weapons systems other than naval ships, it possesses the requisite skills and expertise to be a strong participant in a wide variety of international programs from their development to their life-cycle maintenance. In some cases this includes final assembly and testing of major weapons systems that it procures. An example is the F-16 co-production program where Fokker did the final assembly and testing of the F-16 A/B and sub-assemblies and components and produced the centre section of the F 16 C/D for shipment to the U.S.

The 2007 DIS requested integration between the technological policy of the Ministry of Defence and the innovation policy of the Ministry of Economic Affairs. The cooperation between the two ministries holds the key to the success of Dutch defence industrial policy.

Analysis of policy instruments

1. Offsets

The Dutch offsets policy is fairly standard by comparison to similar countries implementing offsets. Perhaps, the two notable instruments are the negative incentives (or penalties) arising in response to contractor failure to fulfill obligations and the responsibility of obligors to submit twice-yearly reports. These tight leash conditions force better contractor fulfillment of offset obligations.

²⁶ See Appendix B for further details.

²⁷ Royal Schelde builds almost all Dutch navy ships and exports successfully.

CMP catalogues Dutch defence contractors and supplies the information to foreign firms with offset obligations, governments searching for potential suppliers, national operating industries exploring new markets, and international programmes. This information dissemination and coordination role is performed by a program in Australia.

Offset program highlights:

Managing body:
✦ Commissariat for Military Production, Ministry of Economic Affairs, Agriculture and Innovation
Dollar value threshold:
✦ €5M (Euros)
Minimum offset requirement:
✦ 100% of the total contract value for military procurements with further conditions assuring investment into SMEs and R&D
Offset preferences:
✦ Though both direct and indirect offsets acceptable, preference for direct offsets; multipliers heavily favour technology transfer and R&D investments in defence and in venture capital
Penalties for offset agreement violation:
✦ Failure to fulfill obligations by mid-point in contract induces 15% increase in obligations whereas failure at the end results in 30% increase
Completion of offset requirements:
✦ 10 years; obligors have to submit twice-yearly reports on fulfilling offset requirements; offset-banking restricted to 3 years

CMP is mandated to develop and manage the offset requirements policy.²⁸ Unlike Australian voluntary offsets, the Dutch offset requirement is mandatory and, as seen in the box above, highly sophisticated. The prominent use of multipliers aims to concentrate offset obligations towards technology transfer and R&D for defence sector and investments in venture capital funds.

²⁸ See footnote 1 above.

2. Domestic defence industrial base

Similar to the defence industrial policies of the U.K. and Australia, DIS recognizes the importance of a capable domestic defence industry. The DIS assigns responsibility to the two-lead Ministries to work in a coordinated manner to position the Dutch defence industry, given that an outstanding national industry is an important base for both the MoD as a smart buyer, smart user and smart maintainer of equipment and for an innovative national economy.

DIS was developed with direct industry input. It recognizes that to achieve and maintain a position in the international defence market is primarily the industry's own responsibility but it underscores that the Government will play an active role in shaping its future. It is predicated on the assumption that its defence industry can only be successful if companies form part of international networks focussing on the development, production and maintenance of equipment – supply chains.

DIS seeks to harness international opportunities and to promote synergy between the needs of the Dutch Armed Forces and those in the civil market due to the relatively small size of the Dutch defence industry. DIS considers that the Dutch industry has the capability to excel and consolidate its position in the global (primarily European) defence market in a few areas. The six priority technology areas²⁹ are:

- i. C4I (command, control, communications, computers and intelligence);
- ii. Sensor systems;
- iii. Integrated platform design, development and production;
- iv. Electronics and 'mechatronics';
- v. Advanced Materials;
- vi. Simulation, training and synthetic environments.

DIS confirms the intent of the Dutch Government to support these fields of technology: "Research and technology fall outside the scope of the EDA (European Defence Agency) code of conduct. This means that, in principle, financial instruments for the promotion of innovation can be used to reinforce national positions. If the government subsequently places an order for production, this can be viewed in certain cases as a 'follow-up contract'".

The most important financial instrument is the National Technology Project (NTP) under which proposals can be submitted by one or more research institutes, by industry, or by both. In principle, the NTP covers 100% of the cost incurred to carry out the technology development. DIS also accords the MoD an important role in acting as 'lead customer' for specific new technologies. In doing so, it

²⁹ The Dutch priority industries differ from Australian PICs in that they are not geared to operational effectiveness but, rather, to industrial comparative advantages.

recognizes the need for it to take part in multinational development and production programs from their earliest start phase as is the case of participation in the Joint Strike Fighter Program.

Further investments in defence R&D-related projects are carried out by the National Defence Research Organization and its three laboratories: (i) Physics and Electronics laboratory specializes in operations research, information technology, radar and communications and acoustic; (ii) the Prins Maurits Laboratory specializes in technology research such as propulsion, ammunition functioning and explosives; (iii) Institute for Perception conducts research in vision/thermal physiological, hearing and speech, experimental psychology and human engineering. Moreover, The Dutch Navy has established the Marine Elektronisch en Optisch Bedrijf to keep abreast of the high technology necessary for modern navies. Research activities range from repair and maintenance, to design, development, and production of special equipment. They are heavily involved in optical and underwater acoustics, as well as magnetic measurement and structural/vibration analysis. In 2007, the Ministry of Economic Affairs announced a research, development and innovation subsidy for the shipbuilding sector – allocating 20M EUR annually over 3-years.

3. Export promotion

CMP implements the policy of participation in global supply chains by using the following instruments.

- In international materiel co-operation under the principle of “cost share = work share” under OCCAR³⁰, CMP strives to optimise the Netherlands work share in terms of volume and technological content. This instrument does, in fact, depend on CMP’s bargaining strength in work share negotiations with OCCAR partners.
- Supporting the Netherlands industry and research institutes in the acquisition of orders in the framework of the JSF Programme. This activity has been developed together with the Ministry of Defence/Royal Air Force, the Netherlands Institute for Aircraft Development and Aerospace (NIVR) and the Netherlands Industrial Fighter Aircraft Replacement Platform (NIFARP).
- Actively supporting initiatives within the framework of export promotion of the Netherlands defence related industries. CMP has a co-ordinating task between the foreign governments, the various Netherlands ministries and industries.
- Supporting the Netherlands contribution at international defence exhibitions/trade fairs, in close consultation with the NIDV (Netherlands Industry Association for Defence and Security), the Ministry of Defence and the uniformed services;
- Furthermore CMP participates in international consultations on European defence materiel matters and it targets exclusively the herewith connected industrial and market aspects. Consultation occurs within the framework of the EU, the EDA (European Defence Agency) and NATO. CMP aims to promote international materiel cooperation and to create suitable conditions for a competitive

³⁰ See footnote 4 above.

mobilisation of the Netherlands defence-related industry on international defence market, a market which remains closed. The ultimate goal is to achieve the liberalisation of the European defence market.

In the Netherlands, CMP participates in the consultation rounds with all relevant ministries (Foreign Affairs, Defence and Economic Affairs) and the Netherlands Industry Association for Defence and Security (NIDV). The NIDV aims at an optimal mobilisation of the Netherlands industry in connection with defence materiel orders.

4. R&D and competitiveness

Joint Strike Fighter (JSF) programme

After the Fokker bankruptcy in 1996 the Netherlands government devoted itself to saving the knowledge and skills of the aviation cluster of the Netherlands' aviation sector. A hefty part formed a substantial investment in a programme to position the Netherlands industry in the JSF project. In 2002 this resulted in an expansion of the investment up to \$ 800 million in the development phase of the JSF Programme and the Netherlands became one of the two Tier 2 partners with Italy.

Dutch companies have already secured substantial contracts. With these contracts the Netherlands became a serious and innovative contender in the international aviation cluster. If Dutch companies in the JSF programme make profits, a percentage has to be reimbursed to the State. All this is recorded in an agreement between the government and the aviation cluster: the Co-financing Agreement JSF. At the moment 83 companies and institutions participate in this Agreement.³¹ The program enables Dutch companies to obtain contracts in the future phases of the JSF Programme and CMP signed separate agreements with the main contractors of JSF (Lockheed Martin, Pratt & Whitney, General Electric and Rolls Royce) about potential contracts for Dutch companies.

Export promotion

CMP aims to promote the participation of the defence related industry and services not only nationally through offset policy but also abroad via export promotion. CMP supports the Dutch companies in their export endeavours when foreign governmental delegations are on mission in the Netherlands, as well as supporting governmental delegations on trade missions abroad and when visiting international defence exhibitions. Several of these governmental delegations are joint efforts of the Ministry of Defence and CMP, supported by the NIDV.

CMP is also mandated to facilitate the direct involvement of Dutch industries in procurement by the Netherlands Ministry of Defence, e.g. by discerning of possibilities early enough and setting up a network of necessary contacts. For example, CMP aims to maximise the industrial benefits of the F-16

³¹ This is similar to an Australian conditional technology loans program where successful companies would either reimburse the government or sell to the government at a discount.

Replacement Project (the JSF Program) for the Dutch economy by supporting Dutch industry and institutes in winning JSF contracts.

Competitiveness

The United Kingdom and the Netherlands have often selected U.S. products over European products, while France has only purchased major U.S. defence items when a comparable French or European option was not available. The United States is the largest supplier of defence imports to both the Netherlands and the United Kingdom. Both of these countries have stated open competition policies that seek the best defence equipment for the best value. For example, in the sale of the U.S. Apache helicopter to the Netherlands and the United Kingdom, there was no competing domestically developed national option, the product was technically sophisticated, and significant industrial participation was offered to domestic defence companies.

5. Coordination, information dissemination and transparency

Private mechanisms for coordination and information dissemination

Several manufacturers' organizations are directly and indirectly involved in defence related activities. For example, the Contactgroep van Werkgevers in de Metaalindustrie (Contact Group of the Employers in the Metallurgical Industry) represents the interests of the metallurgical, electro-technical, and optical industries in The Netherlands. Another player in the industrial cooperation arena is The Industrial Marketing Association of The Netherlands for the Procurement of Defence Orders (NIID). This independent group is financed by Dutch industry and aims at promoting optimal participation of Dutch industry in the field of defence production for both national and foreign forces. NIID operates in close liaison with the Ministeries van Defensie en Economische Zaken (Ministries of Defence-MOD, and Economic Affairs-MEA). They also assist foreign companies with offset obligations in finding potential partners in The Netherlands.³² NIID also assists small and medium sized Dutch firms in obtaining defence orders, especially as subcontractors.

The aviation and space interests of Dutch industry are represented by The Netherlands Aerospace Group which is composed of small and medium sized companies who generally operate in the subcontractor mode. Closely associated with the Aerospace Group is the Vereniging Gas Turbine (Dutch Association Gas Turbine). This highly specialized group develops and coordinates activities to stimulate the technical and economic interests of the Dutch gas turbine industry and its related companies. These activities include coordination of research and development, discussion with Government of agencies and customers, and promotion of top level quality within the industry.

Government-Industry interface in R&D

³² A similar offsets (IRBs) coordination sector exists in Canada.

The close link between Dutch industry and government is also apparent in research institutes and laboratories. To a large degree, intellectual support for these agencies is provided by the excellent technical universities at Delft and Leiden. These institutes and laboratories are supported directly and indirectly by the Government of The Netherlands, by the Dutch industries and industrial associations, and by revenues from contract research and development efforts. For example, the National Aerospace Laboratory (NLR) conducts contract research for both military and civilian organizations on an increasingly international scale.

6. National champions

In December 2007, the Netherlands' Defence Materiel Organisation (DMO) and Schelde Naval Shipbuilding signed a contract for the supply of four Patrol Vessels. The contract has a value of 240 million EUR. The four Patrol Vessels will be built for the Royal Netherlands Navy, and are to be delivered in a time-frame between November 2010 and November 2012. The first two vessels will be built at Schelde's premises in Vlissingen, whereas the construction of the third and fourth vessel will largely take place at Damen Shipyard at Galati (Romania) under supervision of Schelde Naval Shipbuilding. The contract marks the ongoing, intensive relation between the Royal Netherlands Navy and Schelde Naval Shipbuilding over many decades. It positions Schelde Naval Shipbuilding in the export market for naval patrol vessels, fast-attack craft and corvettes. Schelde built naval ships have been exported worldwide.

Appendix A: OCCAR

<http://www.occar-ea.org/186>

OCCAR-EA's mission is to facilitate and manage collaborative European Armament Programmes and Technology Demonstrator Programmes through their life cycle to the satisfaction of our customers.

Through Life Management (TLM) means managing a programme throughout its whole life cycle, in a use-centric way. TLM is achieved by applying and integrating best practice management techniques in a coherent manner across all system aspects in order to deliver, sustain and dispose the required cost-effective defence system.

The use-centric representation of this approach is replacing the step-by-step approach and linear representation which is mainly focused on fulfilling goals in a given phase.

At every decision point and for every aspect within the life cycle of the defence system there are two questions, which have to be answered positively before the choice of a possible solution is found by rigorous application of Life Cycle Cost (LCC) Analysis in support of a value for money decision:

- Will the design of the defence system fill the capability gap through its in service life?

- Will the defence system be operationally available whenever the commander on operations needs it?

To implement this TLM approach, OCCAR-EA created a coherent set of rules which have a through life and use-centric focus. The official [OCCAR Programme Management Procedures](#) (OMP) are adopted by the Board of Supervisors and are mandatory for all OCCAR managed programmes.

In order to apply this set of OMPs in a coordinated way into daily practice, all OCCAR Programme Divisions and Central Office are working within the [OCCAR Integrated Management System](#).

Appendix B: European Defence Agency (EDA)

(<http://www.eda.europa.eu/Aboutus/Whatwedo/Missionandfunctions>)

EDA was established in 2004, "to support the Member States and the Council in their effort to improve European defence capabilities in the field of crisis management and to sustain the European Security and Defence Policy as it stands now and develops in the future". It acts as a catalyst, promotes collaborations, launches new initiatives and introduces solutions to improve defence capabilities. But it can only succeed when its shareholders – the participating Member States – deliver these capabilities.

EDA is ascribed four functions, covering:

- developing defence capabilities;
- promoting Defence Research and Technology (R&T);
- promoting armaments co-operation;
- creating a competitive European Defence Equipment Market and strengthening the European Defence, Technological and Industrial Base.

These four functions form the chain for capability development, from defining requirements via research and armaments cooperation to industrial supply. This integrated approach will contribute to coherent capability development, where demand and supply are optimally connected in order to save time and costs for governments. More collaboration will, in turn, provide opportunities for industrial restructuring and progress towards the continental-scale demand and market, which industry needs.

Case Study: South Korea

Preamble to Key Principles

“... (Korea's national defence R&D) is rapidly changing due to changes in the domestic security environment, radical changes in science and technology, and improvements in national R&D capabilities. The Defence Acquisition Program Administration plans to continually expand national defence research and development along with core technology development to ensure our armed forces are highly developed elite forces (while) building independent defence power.”

- *DAPA on the prioritization of R&D in defence technology*

“Through the abolition of specialization (and) systematization in (the) defence acquisition program, monopoly and oligopoly system, DAPA has revitalized the entry of new companies to the market and has prevented the existing defence companies (from) sitting back.”

- *DAPA on the introduction of competition mechanisms into the defence industry*

Introduction

Since the 1970s, South Korea has been pursuing the modernization of its defence capabilities on multiple fronts. With the introduction of the *Agency for Defence Development* (ADD) around this time, efforts were focused on developing domestic capabilities in terms of production and weapons systems innovation. Initially producing small arms, artillery and other equipment not considered technologically-intensive, the country soon moved on to the development and production of more advanced defence products, from the manufacture of K-1 tanks and K200-KIFV mechanized infantry vehicles in the mid-1980s to modern submarines and trainer aircraft in recent years (Lee, 2010).

This emphasis on domestic production and development capability has continued to be a major policy goal. Despite a current political desire to decrease overall defence spending and reduce personnel numbers in the Korean army (Ref: 2011 Budget analysis) – South Korea currently ranks very highly in terms of military spending per capita – the percentage of the defence budget devoted to research and development has followed a slight upward trend over the last decade (Lee, 2010) and, according to the 'Defence Reform Plan 2020' proposal as elucidated in the 2008 ROK White Papers, this trend will continue at least for the foreseeable future. To this end, the Defence Acquisition Procurement Administration (DAPA) cites as a major policy goal the implementation of measures aimed at technology and research, particularly through the use of offset obligations in procurement, while simultaneously increasing exports of military products. Establishing itself as a top-10 defence systems exporter would put the country in an elite group of worldwide exporters, and would perhaps justify extensive long-run expenditures in R&D and infrastructure.

Understanding South Korean Defence Industrial Policy

The principles of South Korean defence industrial policy can be summarized as follows:

- Policies objectives through offset obligations:
 - Technology transfer
 - Domestic co-production / production of intermediate inputs
 - Domestic R&D support
 - Providing opportunities for participation in joint R&D programs
 - Domestic industry support via indirect investment
 - Indirect offsets via export of commercial, non-defence products
- Export development via marketing support and assistance
- Increasing competitiveness in the domestic defence industry
- Enhancing transparency and coordination in defence procurement projects

Analysis of Various Policy Instruments

1. Policies enacted through offset obligations

Offset obligations play a critical role in Korean defence industrial policy; the United States alone imported over \$1 billion in defence products from South Korea over the course of 2011, accounting for roughly \$500 million in offset obligations for American firms. As will be detailed below, Korean offset guidelines are consistent with governmental policy objectives involving technological advancement and domestic capabilities as detailed in the 2020 Defence Reform Plan.

Offset program highlights:

Managing body:

- ▲ Defence Acquisition Procurement Administration

Dollar value threshold:

- ▲ All contracts valued at \$10M (U.S. Dollars) or more are subject to offset obligations. Eligibility for contracts under this amount is left to the discretion of DAPA.

Minimum offset requirement:

- ▲ 50% of the total value of the procurement contract.

Offset preferences:

- ⤴ 60% of the total obligation must be devoted to 'direct', technology and domestic production related elements. Of the remaining 40%, indirect offsets, such as investment in new or already-existing local companies are permitted.

Penalties for offset agreement violation:

- ⤴ 10% of contract value; potential disbarment from participating in future projects

Completion of offset requirements:

- ⤴ Required within 5 years

Offset instruments:

- ⤴ **Technology transfer**
Contracts involving transfers of technology are given priority in the evaluation of bids.
- ⤴ **Domestic co-production**
Contractors assist in setting up industry elements in order to allow for the production of intermediate inputs; the amount counted against the total offset is a combination of the costs of setting up the industry elements as well as the value of the inputs produced.
- ⤴ **Domestic research & development support**
Offset agreements may include elements involving the provision of technical training related to the development of defence technologies. Further, as part of the “indirect” component of offset agreements, contractors may provide third-party investment for the purposes of research, development and testing.
- ⤴ **Participation in joint R&D programs**
Opportunities for international cooperation in research and development programs may be counted monetarily against the direct / high technology portion of offset agreements.
- ⤴ **Domestic industry support via investment**
Indirect offsets may include foreign investment in Korean industry for, among other things, the establishment of infrastructure and facilities for the defence industry.
- ⤴ **Indirect offsets via export of commercial, non-defence products**
Non-defence products are strictly considered to be components of the indirect portion of any offset agreement, and thus must account for less than 40% of total obligations.

South Korean offset policy is clearly aimed at increasing domestic capabilities in terms of both production and R&D. While a lower overall offset obligation percentage is adopted (50%), the majority of the total obligation – at least 60% - must be fulfilled through 'direct' offsets, largely involving technology transfers, domestic co-production, infrastructure development, and R&D assistance in the form of technical training. The remaining 40% of the obligation may consist of a variety of investments into industry, as well as exports of commercial products.

In evaluating this group of instruments, a few observations made. First, in terms of potential 'technology'

components of offset obligations, determining an accurate and fair value for the technology being acquired is a relatively uncertain endeavour; it is difficult to fully ascertain the long-run benefits of technology acquisition, as the possibility for spillovers might vary significantly between different technologies.

Second, since such a large portion of the total offset agreement consists of 'direct' offsets, it is highly likely that potential partners would seek inherently less-efficient means of fulfilling these obligations. For example, in co-production projects, the partner firm may choose to have Korean industry produce a larger number of relatively basic inputs, instead of offering the opportunity for production of more advanced components. This would limit the long-run positive impacts of such agreements, especially in the area of spillovers and future business arrangements.

2. Export Development via Marketing Support and Assistance

Recently, Korea's GESCA (Gyeongnam Export Support Corps for Aero-Parts) has been commissioned to make efforts to market the production capabilities of South Korea's southern Gyeongnam province. While one firm in particular, KAI, figures as being very prominent in this province, other smaller firms are having trouble marketing themselves internationally. GESCA's ongoing role will be to help match foreign airframers with smaller South Korean suppliers.

Given the competitiveness of global defence industries, it is often difficult for these smaller firms to successfully market their products, even if they produce superior components and equipment efficiently. The issue is one of economies of scale. Large international firms have adequate budgets for the marketing of their products, and actively seek opportunities for profit from export agreements. They also tend to reside in larger countries such as the United States and other European nations, who make use of their political leverage to secure deals for their firms. Thus, relatively smaller countries, as in the case of South Korea, are essentially incur high marketing costs in order to assure domestic firms a fair chance in winning contracts.

As alluded to earlier, South Korea has seen an increase in defence-related exports over the past two decades, and especially over the past few years, when exports increased from slightly over \$1 billion (U.S. Dollars) in 2008 to \$2.4 billion in 2011. While much of this can be attributed to increases in competitiveness, assistance in marketing is likely a major reason behind such a marked increase.

3. Increasing competitiveness in the domestic defence industry

While DAPA claims to have ceased all practice of infant industry support and protectionism, there are also programs in effect that allow the government to subsidize SMEs for the purposes of "increasing competitiveness" and giving them the capacity to survive a highly competitive market in the early-going, eventually allowing them to flourish in the long run.³³

A recent paper by Aghion et al. (2012) states that government subsidy to industry can be beneficial if carried out properly. In essence, if subsidy is targeted in a manner that increases competitiveness of firms, especially if it causes them to innovate vertically (to newer and better technologies, i.e. developing products that are strictly better than what they are producing currently) instead of horizontally (developing products that are not technologically superior, but are differentiated from other products in some possibly trivial way) then these subsidies can have very positive impacts in the long run. Given the

33 This may be a critical moment in Korean development in terms of the transition from import substitution to export promotion.

new stage in Korea's development of its defence industry, this policy's effects are yet to be observed. The hypothesis that the reason the current Korean high-technology industries are highly advanced is due to infant industry support in past decades. In the 1960s, South Korea had a GDP per capita well below that of even many underdeveloped African nations. If the government had not gone about instituting policies that could be qualified as “picking winners” or “protectionist”, some claim, it is unlikely the country would have become such a relevant fixture in high-technology industries today.

4. Enhancing transparency and coordination in defence procurement projects

Among the list of policy goals cited by DAPA is the establishment of increased controls, oversight and coordination in defence procurement projects. To accomplish this, the DAPA has implemented a set of policies:

- ⌘ Increasing project oversight and dealing with past issues in system testing and evaluation
 - Establishing an 'Integrated Project Team', meant to oversee and coordinate procurement initiatives and provide efficiency enhancements from a perspective of project planning, budgeting and quality assurance
 - Strengthening test and evaluation procedures for each acquisition project

Taking into account the failures and inefficiencies of the past, these goals largely refer to the management aspects of DAPA projects, and address such items as forming a dedicated team-system for project monitoring, setting up checks and balances to ensure quality and transparency, and creating clear guidelines and standards in evaluating offset projects.

- ⌘ Ensuring personnel are adequately qualified and trained to meet the competencies of their assigned position; provide opportunities for professional advancement

This initiative deals primarily with organizational and staff issues, i.e. ensuring adequately qualified personnel and establishing an educational and professional advancement program. This seems to be geared towards an approach of meritocracy, allowing better skilled workers the chance to advance in their field.

- ⌘ Improvement of the integrated defence program information management system

This policy aims to improve efficiency by, among other things, eliminating redundancies in investment. A component of the system involves information sharing, which should cause efficiency enhancements as potential contractors will then have a leveled playing field in terms of coordination between government and industry.

Case Study: Spain

The goal of Spain's industrial policy for the past 30 years has been to acquire as much technological knowledge for Spanish firms as possible. Spain's defence industry in the post-Franco era faced a very strong disadvantage compared to the rest of Europe, due to the neglect in research and development. The past 30 years has seen Spain using an unwritten rule of offsets to make up for its technological shortcomings.

Spain's industrial policy is entitled Industrial Cooperation, and its 3 objectives as stated by the Ministry of Defence are:

1. The attainment of the necessary self-sufficiency to support the systems acquired during its life cycle, both in the Armed Forces and in the industry.
2. The development and consolidation of strategic industrial sectors.
3. The creation of an industrial and technological base of defence which is effective and competitive that contributes to its consolidation at European level.

The two sectors which Spain seems most focused on are the aerospace sector and shipbuilding sector. These two sectors have had the most success at selling their products in the global market.

It also adheres to the Code of Conduct drawn up by the European Defence Agency which Spain believes has allowed it to acquire a large number of technology transfers and new management techniques. The ministry also states that,

“Priority is given at all times to those transfers that affect the sensitive technologies of the acquired systems or that affect other advanced technologies of military interest, as well as to staff training and the establishment of excellence centres that may carry out national developments from the transferred knowledge, in order to ensure the National Defence's supply and future needs.”

Offset Program Highlights:

Managing Body:

- Ministry of Defence (Industrial Cooperation Directorate)

Dollar value threshold:

- All contracts over approximately 1.22 million US dollars

Minimum offset requirements:

- 100% of contracts. Allowances are made if significant technological transfers to Spain occur.

Offset preferences:

- Direct offsets (generally about 60%) especially ones with new technologies. Spain will often direct contractors to specific firms.

Penalties for offset agreement violation:

- A grace period is offered before penalties are imposed.

Completion of offset requirements:

- Undefined. 10 years plus 3 years grace period for the purchase of F-18s.

The effective policy is to require offsets on all contracts of 1 million Euros or more. The general requirement is for 100% offsets, but this can be, and is occasionally, negotiated lower if it is shown that significant technology transfers will occur. The focus is on direct offsets, which are purchases by the contractor directly from Spanish defence firms. This requirement was a hard learned lesson from Spain's F-18 acquisition.

That contract was for \$1.8 billion in offsets which was designed to jump start the Spanish defence industry. However, McDonnell Douglas found it difficult to meet this requirement, as Spanish firms did not have the technology capacity to act as a supplier. The result was mainly indirect offsets with only two firms receiving significant technology transfers. Nowadays, the Spanish government will often provide direction to foreign contractors as to which firms it should make purchases from. This allows Spain to direct the flow of technology into their industrial base. Some firms report that the government will encourage that the offsets to be spread around different regions of the country.

Though this may seem like a natural reaction to the problems faced with the F-18 acquisition, it presents new problems associated with government's trying to pick winners. History has often shown that the governments do not have a good track record with identifying firms that will succeed. Normally firms rely on markets to provide signals regarding their performance. Government intervention disrupts these signals and leads to inefficiencies.

Spain's industrial policy also included the selling off of government-owned firms to foreign-owned firms with the expectation that this would provide a transfer of technology into Spanish factories from their new parent companies. However, this policy is accompanied by a fear that the foreign-owned firms will close some of the Spanish factories during this process. As such, Spain sold the firm ENSB to General Dynamics only when it stated that it would keep all 5 plants in Spain operating. Spain, in return promised GD that it would provide it with a sufficient number of contracts to justify their continued operation. This sale occurred in 2000, and although Spain has not made as many purchases as GD expected, it has still maintained operations at all 5 sites.

Spain has a clear policy goal with their offset program. They wish to modernize Spanish industries so that they can compete on the international level. They have attempted to do this by requiring that foreign firms provide 100% offsets, and often that they do so with firms chosen by the government.

Economically, this approach presents some risks. By making the contract very rigid, the Spanish government limits the ability of firms to minimize their costs. In order to ensure that they receive a satisfactory level of profit, they may have to take other cost cutting measures, or charge a higher price than might otherwise be the case. The end result for Spain may be the purchase of equipment that is more expensive and potentially of lower quality.

The practice of offsets allows Spanish firms to survive, even if they cannot compete in the market place. This leads to the trap that the firm may never become efficient, and may always rely on the government for business. Allowing foreign companies to purchase government owned firms will help these firms to become more efficient and to compete in the international market place. Although it is tempting to restrict the ability of these firms to close plants, it is important to recognize that large firms have become large because they understand how to be efficient and compete on in international markets. Allowing foreign firms to bring this knowledge to Spanish firms is the ultimate goal.

One of the strategic sectors which Spain targets is shipbuilding. Navantia is a publicly owned shipbuilding company that describes itself as "the strategic industrial base of the Spanish Navy." It is a company that is championed by the Spanish government. Since Spain makes most of its naval purchases through Navantia, that has provided the company with the resources and support necessary for it to be competitive on the world stage. It ranks as the fifth largest shipbuilder in Europe, and ninth largest in the world. This has allowed it to become a successful supplier to a number of foreign countries including Australia, Norway, Malaysia, Chile, Venezuela, India, Thailand, and Egypt. 48% of Navantia's output is for the export market.

The company also serves a conduit for a large amount of R&D for the Spanish military. It devotes 7% of its revenues to R&D and employs a large number of highly skilled researchers and technicians (over 1000 staff members devoted to research). Another method of procuring technology is through Navantia's technology agreements with industry giants such as Lockheed Martin, Indra, and Thales.

Since Spain's major goal is the acquisition of improved technology, it should attempt to make itself more attractive for international investors. Spain has strong cultural links to many South American countries, and may be more able to compete there than other countries. To attract firms, it must invest in an educated workforce and create an environment where fair and open competition can occur. Investors will recognize the benefits of investing in Spain if they create a safe and rewarding economic climate.

This decentralized approach could also lead to the technology transfers that Spain craves, without the costly government overhead.

Case Study: Sweden

Introduction

Over the past two decades, Swedish defence industrial policy has transitioned from a standpoint of self-reliance to one that acknowledges current realities in which international cooperation is essential for smaller countries to remain competitive, both technologically and from a capability standpoint. The country's advanced aerospace sector, led by Saab's Gripen program, has responded to a shrinking domestic market by increasing efforts to secure export contracts, an endeavour that has had generally favourable results. In order to ensure long-run viability of the aerospace industry, Swedish policy has aimed at providing support to domestic suppliers, particularly via the expansion of export opportunities. In other areas where it lacks comparative advantage, an approach of international cooperation has been adopted, especially with the United States and European signatories of the 'Letter of Intent', focusing on joint research and development projects. International procurement is also an important tool in providing its military with a full array of defence systems, and offset agreements are used to provide Swedish industry with opportunities for co-production and technology spillovers. Sweden participates in OCCAR³⁴ and, as a European country, is a member of the European Defence Agency that coordinates European countries' defence capability collaboration.

Understanding Sweden's Defence Industrial Policy

The principles of Swedish Defence Industrial Policy can be explained as:

- Policies implemented through offset obligations:
 - Domestic co-production / subcontracting
 - Technology transfer
 - Building future business opportunities for domestic industry
- Participation in joint research and development projects
- Movement towards a market-based approach to innovation
- Increasing government coordination and enhancing competitiveness of domestic firms
- A long-term focus on domestic research and development in areas of relative comparative advantage and promotion of related exports

34 OCCAR, "What do we do?", <http://www.occar-ea.org/186>. See Appendix A for further details.

Analysis of Various Policy Instruments

1. Policies implemented through offset obligations

In stark contrast to other nations under study, Sweden lacks a clearly-defined policy on offset obligations. Historically, Sweden has been in favour of free-trade, and was said to view such practices as anti-competitive. However, in recent years, Sweden has come to view the use of offsets as a “necessary evil”, and has increasingly begun to employ them in procurement agreements. Interestingly, Sweden has a standing policy of omitting offset requirements, so long as the country of the firm participating in the procurement contract does not employ them in return. Given that nearly every country capable of producing weapons systems makes use of offsets, however, it remains to be seen whether such a policy has any real-world applicability.

Offset program highlights:

Managing body:

- ✦ Defence Material Administration (FMV) at the Ministry of Defence

Dollar value threshold:

- ✦ Approximately \$14M in U.S. Dollars

Minimum offset requirement:

- ✦ Generally 100%, but offsets are decided on a case-by-case basis

Offset preferences:

- ✦ Usually 'Direct' offsets, aimed at strengthening domestic defence industry through co-production and technology transfer

Penalties for offset agreement violation:

- ✦ Not specified

Completion of offset requirements:

- ✦ Within contract period

- ✦ **Domestic co-production / subcontracting**

Sweden's offset agreements require a significant portion be devoted to co-production activities. It is a primary policy goal in offsets that domestic industry benefit from defence procurement contracts, specifically from the standpoint of development of domestic production capabilities.

- ✦ **Technology transfer**

In evaluating offset proposals, Sweden ascribes a significant value to technology transfers due to their potential long-run benefits to domestic industrial development.

- ✦ **Building future business opportunities for domestic industry**

In conjunction with co-production and technology transfers as being preferred elements of offset

agreements, the aim of creating future opportunities for export is an important consideration. By creating partnerships with foreign firms through co-production, it is possible that joint ventures in foreign procurement contracts could be entered into, with domestic firms taking part as efficient producers of intermediate inputs.

Lacking any preference for 'indirect' offset measures as a means for partner firms to fulfill obligations, it is likely that potential partners in procurement are dissuaded from bidding on contracts due to relatively rigid offset practices. As is the case with technology-heavy offset practices employed by other countries such as Israel and South Korea, there are issues in terms of valuation of technological transfers, and inherent inefficiencies in co-production agreements (for instance, relatively costly domestic production of inputs when compared to efficient offshore producers). To counteract these issues, development of domestic industry would have to outweigh short-run costs with long-run gains in terms of business opportunities and public goods derived from technological advances.

2. Participation in joint R&D projects

As alluded to earlier, with Swedish industrial policy moving away from domestic production of a full array of defence systems has come an increased reliance on international cooperation in development, particularly in the area of joint research and development projects. To this end, Sweden has entered into cooperation agreements with other nations through the European Defence Agency and OCCAR. Of course, this approach brings with it the usual efficiency enhancements and inherent costs discussed previously³⁵.

3. Movement towards a market-based approach to innovation

In the past, Swedish defence industry firms had been working closely with the National Defence Ministry in research and development endeavours; projects were often commissioned directly and financed. In recent years, however, the approach has gradually moved towards a more market-oriented system, wherein firms have to compete for contracts. This has had the effect of forcing firms to innovate more quickly and become efficient in order to remain competitive in the market (Borjesson et. al., 2008).

4. Increasing government coordination and enhancing competitiveness of domestic firms

In 2004, a working group was commissioned by the Swedish government in order to develop a strategy for the long term growth and sustainability of the Swedish aerospace industry³⁶ (Kane, 2009). As a result, a set of measures were adopted, several of which addressed market failures, coordination issues, and aimed at establishing a clearer structure from which defence industrial policy can be evaluated. These include:

- ⌘ Developing a nationally integrated approach to the aerospace (defence) sector
- ⌘ Development of an action plan to increase domestic participation in aerospace and defence research within the EU³⁷

35 These issues are discussed extensively in the context of the Netherlands.

36 Similarly, the Dutch defence industrial policy supports the internationally competitive shipbuilding industry in the Netherlands.

37 Following Kane, 2009

- ⤴ Developing international cooperation and creating a competitive domestic environment (through domestic subsidy)

These measures represent the beginnings of a credible framework from which incentives between government and industry can be aligned in a more efficient manner. These should also have the result of reducing inefficiencies and market failures inherent in a *laissez-faire* approach to defence industrial policy, particularly through the mechanism of subsidizing domestic SMEs with the aim of enhancing their international competitiveness.

5. Long-term focus on R&D in areas of (relative) comparative advantage and promotion of related exports

Some of the other measures adopted were aimed at addressing research and development and increasing the potential for domestic firms to increase their exports. These include:

- ⤴ Increasing funding for domestic research and development efforts
- ⤴ Aiding in export promotion activities for domestic firms

Evaluating these measures comes down to a few key considerations. From the perspective of increasing R&D funding, long-term gains in industrial capability and technological advancement would have to outweigh the significant short-term costs in order to justify the program. In aiding export promotion activities for domestic firms, the benefits are more clear-cut. Domestic firms, particularly SMEs, would have much to gain from these policies as they generally lack the resources necessary to market their products internationally, but otherwise may be efficient producers of defence system components.

Case Study: The United Kingdom

The United Kingdom is one of the world's largest military exporters. This allows it to maintain a defence industrial base much larger than it could if using only domestic purchases. The UK's industrial policy is laid out in the 2005 White paper "Defence Industrial Strategy" (DIS). Three objectives transpire:

- 1) Promoting an attractive business environment for defence companies and investors.
- 2) Identify key industrial capabilities which the UK wishes to maintain domestically.
- 3) Increase transparency in the decision and planning process.

Business environment

The end of the Cold War has seen a great deal of consolidation within the global defence industry. The UK government recognizes that BAE Systems maintains considerable market power within the UK defence industrial base. While the UK has always championed the benefits of a competitive environment to ensure efficiencies and lower prices, the DIS indicates it is now willing to tolerate a less competitive environment in certain areas. Competition is perceived as a benefit as it forces firms to innovate and to become more efficient. It also has the effect of lowering prices as firms compete with one another. A reduction in competition removes the inefficiency of having a large number of firms producing at a small scale. In that case each firm's fixed costs are spread over a smaller quantity of sales, thus raising the overall price. Consolidation of the industry into fewer firms can reduce this duplication.

Within this new paradigm, the government sees 5 roles it can play to create an attractive business environment.

1) Government as Investor

The UK military demands relatively high technology outputs. The UK defence industrial base has found a niche in the global market by selling these advanced weapons to foreign countries. The high quality and associated high cost of the weapons has meant that UK firms have priced themselves out of the markets of certain developing nations. The UK plans to increase funding in R&D to 2.5% of GDP, from its current rate of 1.9% to maintain its niche position.

It also plans to increase the output of students with engineering and science backgrounds, two areas which the UK faces labour shortages. Australia is also pursuing a similar policy with their Skilling Australia's Defence Industry program and their Industry Skilling Program Enhancement policy. The

increased funding in R&D is to be targeted in areas where there is both a policy need and a lucrative global market. The uncertain nature of research however may lead to difficulties in identifying the areas which offer the largest reward.

2) Government as Supporter

The second role the UK government can play is ensuring a stable economic environment in which to invest. This would include a stable rate of inflation and a stable government budget. A well educated workforce would also make investment in the UK more attractive. The DIS also states the need to keep entry costs low. This may prove difficult in light of the decrease in competition in the defence market. The firms that remain may be able to erect barriers to prevent further entry.

The government also plans to commit itself to supporting defence industries through fiscal incentives, such as tax breaks for R&D, and through export support. They are clear in their policy in that they do not believe that protectionism is a viable strategy, nor trying to compete directly with low wage countries. This is similar to Australia's policy. Both countries do not wish to champion particular firms, but rather aid in the marketing of all domestic firms in the international market. It also plans to ensure a stable political environment, by trying to minimize direct government intervention in the industry. They recognize the fact that investors require a higher return when there is increased government interference.

These steps will certainly make it more attractive to invest in the UK, however many of these policies seem to favour earlier stages of production, such as the research or design phase. It will still be difficult for firms to compete against the low cost of production found in overseas factories. It is also difficult for a government to credibly commit to non-interference. In times of transition or crisis, the government may see no alternative to direct intervention.

3) Government as Regulator

As the economic regulator, the government believes it has a role to maintain competitiveness in UK markets. Their strategy is to limit mergers and acquisitions that would hurt the competitiveness of the economy. Unfortunately, BAE is already so large that it exhibits some monopolistic attributes. Its main competitors at the level of Principal contractor are mostly foreign firms, though there are several relatively smaller domestic competitors such as Rolls-Royce, Babcock and QinetiQ which provide a degree of competition. If there are still efficiencies to gain from more post-Cold War consolidation, then the government must walk a fine line between ensuring domestic competition, while still allowing UK firms to be able to compete globally.

4) Government as Customer

The government of the UK has identified two important ways it can aid industry with its role as a customer. First, the goods that the UK demands should be based on common international standards. In this way, the output of UK firms will be more appealing to foreign governments. If the UK military begins demanding weapon systems that are not built to the same standard as most foreign built weapon

systems, then UK firms will find it more difficult to find a market for their goods. Purchasing products from domestic firms also increases the scale at which these firms can operate. This may provide them the opportunity to lower their costs and break into the global export market.

Second, when signing a contract with a firm, the contract should not only be for the initial acquisition, but should also include through life support for the project. In this way, UK firms will have a constant stream of revenue with which to maintain employment levels. These life cycle contracts are becoming very popular with governments. There are many areas where private firms can directly contribute to military affairs. Typically, the complete nature of markets makes these firms more efficient at completing tasks when compared to having the military itself complete the task. The steady stream of revenues will allow for less volatile employment markets.

5) Government as Planner

The DIS has a strong focus on increased cooperation between the government and industry. If the government is able to make its long term acquisition plans known to industry, then industry will have greater time to adapt to these demands. This will put UK firms in a better position to bid on contracts when they come up. However, they must be careful that this does not go too far. Giving such an advantage to current suppliers will make it difficult for new suppliers to enter the market.

This is an approach used also by Australia. Their Defence Capability Plan and their Capability Development Advisory Forum both aim to inform the domestic industrial sector of the plans and needs of the military.

In an attempt to ensure easier access to defence contracts, the government of the UK wishes to pre-qualify some bidders. This is expected to lower the cost of making bids by having a list of qualified firms in place. Of course, this policy may lead to a reduction in competition.

Identifying key industries

The UK recognizes that it is unable to maintain a presence in all sectors of the defence industry. Although the UK military does purchase a lot of equipment and UK firms are able to export a large amount, it still must make decisions on which industries it wishes to keep domestically. To do this, it has compiled a list of four criteria.

1) Strategic Assurance

It is essential for the military of the UK to have access to working equipment that it is able to maintain without foreign help. There are also key technologies which the UK wishes to preserve in the country. Industries that satisfy these criteria will be maintained domestically.

2) Defence Capability

During a conflict, the military will require a steady stream of supplies such as munitions. The government has deemed it necessary to have priority access to these materials. They are also unwilling to rely on a monopolistic overseas supplier.

3) Strategic Influence

There are certain technologies which dictate how a conflict is fought. There are certain equipment standards which all NATO countries must adhere to. The larger the UK defence industrial base, the larger the influence the UK will have in these matters.

4) Technological spillovers

Industries which produce a lot of technological spillovers into the private sector are ones which the UK wishes to maintain. According to the DIS, they have not found any industry which is worth keeping solely for this reason.

Using these criteria, the UK plans to use its policies to maintain domestic production of submarines, warships, small arms ammunition, cryptography, and support services for fixed wing aircraft, helicopters, and AFVs. The government plans to negotiate partnered agreements to protect and guarantee business for firms in these industries. This is similar to the agreements between Netherlands and its domestic shipyards as well as Spain and its shipyards. The relationship between Saab and the Swedish government is also similar. It will no longer actively support domestic production of larger aircraft, trainer aircraft, helicopters, missiles, torpedoes, and new fighter aircraft.

There is an obvious comparison to be made between this approach and Australia's policy of identify its key industries, which they term Priority Industry Capabilities (PICs) and Strategic Industry Capabilities (SICs). However, these are chosen based solely on the second criteria listed above. Also, where the UK wishes to maintain the ability to create certain weapon platforms, Australia wishes only to retain certain components of these platforms.

Historically, it has always been difficult for governments to pick winners in industries. If the UK wishes to maintain a firm that fits the above criteria, but is not economically feasible, this will ultimately be very costly for the government and tax payers. Even if the UK does manage to maintain these industries in the domestic market, the supply chains of these firms are hard to trace. There is no guarantee that the suppliers of these firms are not located overseas. Until the supply chains of firms are revealed, it is not possible to ensure the independence that these criteria are designed to achieve.

The UK has made it clear that it values research very highly. The DIS states that most R&D should be conducted domestically to ensure that the intellectual property (IP) is maintained in the UK. They state that although they value advances in technology, they cannot pursue advancements as an end in itself. Despite this, the UK government admits that it is beginning to relinquish the lead it once maintained. Thanks to the investment it made in the 1980s, the UK claims that it maintains a 12 year lead in technology advancement, second only to the USA which maintains a 17 year lead at 10 times the cost.

Thanks to a reduction in R&D funds in the UK, countries such as China are beginning to narrow the lead that the UK once enjoyed.

The UK's comparative advantage appears to be in R&D. It makes sense for them to invest heavily in this sector, as it can trade their advances for inexpensive final production overseas. This is a standard result from international trade theory. To maximize global welfare, countries should focus on producing the goods with which they hold a comparative advantage.

Increased Transparency

The DIS is a first step in increased transparency by the government in the defence market. It has revealed the industries which the government desires to maintain domestically and the tools which it will use to do so. The reduction in competition has created the need, the government believes, to increase transparency in government industry relations.

The DIS states that there are limits to open competition, and that it often produces unrealistic timelines as firms attempt to outbid one another. Now that there are fewer firms, the government wishes to share information such as capability requirements, timelines, and budget assumptions. These will allow for firms and government to react to one another's needs, and ensure both sides obtain what they desire.

Again, we can see a parallel with Australia's Capability Development Advisory Forum, where industry and the government meet to discuss plans and capabilities.

Although the government admits that it must avoid paying a high premium for a domestically made product, this type of relationship is troublesome. By allowing such cosy relationships between industry and government, it makes competition from new entrants increasingly difficult. This can lead to higher prices, inefficiencies, less innovation, and monopoly profits.

Since the UK previously championed open competition, the government bureaucracy has become skilled in dealing with the fixed price contracts that resulted. Now, there will be a shift to target cost incentive fee contracts, which are less well known to the government. There will be a required learning period which will lead to higher costs in the short run.

The incentive for firms to share information with the government will be less if they maintain a large export division or civilian division. The government may find that firms are unwilling to share the information that the government requires to write contracts. The lack of competition puts firms in a better bargaining position due to the information asymmetry that is created. Competition would normally provide a reasonable indication of the costs firms expect to face. Without this competition, it is unclear how much the government should pay firms for their products.

Summary

The UK's new DIS marks a change from its previous policy of Industrial Participation. Under that policy, offsets from foreign firms were not required, but were often seen in practice. Now, the government's policy is to consider all bids, but will work hard to advocate that foreign firms use UK firms as suppliers of intermediate goods. This new policy fits well with new EU guidelines regarding defence acquisitions.

This new UK policy is rooted in a desire to maintain strong intellectual property rights in the UK. It is designed to make foreign investment in the UK more desirable. The tools the government uses are not as direct as the offsets which it previously used. The key to the success of this new policy will be to ensure that there still exists room for new entrants into the market, and a successful two way sharing of information between the government and firms, something that may be very difficult to achieve.

Policy Tools

In order to implement a particular approach to defence industrial policy, governments use a variety of policies. Although every country is unique in their approach, there are certain policies which are used in multiple countries. It is possible to classify these policies into six broad categories. They are:

Policies that improve coordination between government and the defence industry;

Policies that encourage and support research;

Policies targeted to support SMEs;

Policies that help firms access global supply chains;

Policies that create a Pro-Competitive Environment;

Offset policies.

We will consider these six categories in turn, classify and compare the seven countries' policies.

Policies that improve coordination between government and the defence industry

The market for military equipment is atypical, as there are both a limited number of customers as well as a limited number of suppliers. As such, governments may find it difficult to acquire the equipment they need in a timely manner if there are no firms in a position to satisfy the demand. Firms, on the other hand, may find it difficult to manage its employees and capital in an efficient manner as the demand for military equipment is not constant, but rather exhibits sporadic demand.

Policies that increase coordination between the government and industry can help relieve these pressures and ensure a more stable defence industrial sector. These policies can help with the import substitution approach, as it makes purchasing from domestic firms more appealing, as they may now be better situated to satisfy the government's demand. Some examples of these policies include:

- Australia has identified Priority Industry Capabilities and Strategic Industry Capabilities as areas that the government wishes to keep domestic production, the former designated as "key". The UK has also listed the industries that it will actively support in order to maintain domestic

production³⁸. By making these lists public, government disseminates demand information and, hence, firms are better able to predict the level of demand they will face for their products.

- Australia's Capabilities Development Advisory Forum allows for direct communication between the defence industry and the Australian Defence Force. This coordination forum ensures that industry will be able to respond to the future demands of the military. In turn, industry can inform the military of emerging technologies and the limits of production capabilities.
- Coordination between Israeli government and domestic industry largely takes place in the context of research and development. In particular, the Israeli Defence Force has a history of working closely with R&D firms, regardless of whether or not it is required to purchase the defence system upon completion of the project. As such, there are efficiency gains with lowered redundancy of projects, and coordination between government and industry objectives.
- In the Netherlands, CMP coordinates with relevant ministries (Foreign Affairs, Defence and Economic Affairs), the Industry through Netherlands Industry Association for Defence and Security (NIDV), European governments participating in OCCAR and the European Defence Agency. Interestingly, the Industrial Marketing Association of The Netherlands for the Procurement of Defence Orders (NIID), financed by Dutch industry, aims at promoting industry participation in defence production at national and foreign markets. NIID operates in close liaison with the Ministries of Defence and Economic Affairs, assists foreign companies with offset obligations in finding potential partners and matches SMEs with primes and OEMs.
- South Korea has established an 'Integrated Project Team' system, meant to oversee and coordinate procurement initiatives and provide efficiency enhancements from a perspective of project planning, budgeting and quality assurance.
- Though lacking a formal policy on defence industrial policy, Sweden has worked towards implementing a nationally integrated approach to the aerospace industry³⁹; this involves greater coordination and communication among government entities and industry players.
- In order to ensure they receive a quality product, the UK government has begun pre-qualifying some firms for future bids. In this way, the government signals that firms have a better chance of receiving future government contracts if pre-qualified. The Australian Scorecard program is one formal instrument in this regard.

38 Australian and British approaches diverge in that the former aims to preserve for military strategic reasons only whereas the latter also for industrial strategic reasons.

39 Sweden's Saab is at the frontier of aerospace technologies and, similar to Dutch and Spanish shipbuilders, is able to export Gripen aircraft it produces. Coordination is facilitated by the fact that such national champions are large firms.

Policies that encourage and support research

It is often perceived that many technological advances result from investment in the defence industrial sector of the economy. Moreover, techniques and technology developed in the defence sector tend to spill over to other sectors of the economy, thus improving their efficiency. A country that invests heavily into firms which develop new technologies can expect to penetrate global markets and place its firms in global supply chains. There is a large demand for high tech goods, and a country which maintains an edge in technology can sustain a strong export sector. Investment in frontier technologies can also allow for import substitution. If domestic firms do not have the technological know-how to create advanced weapons, a government may have no option but to import these advanced weapons from other countries. In this way, investment in research and development can be used to further both the export promotion and import substitution approaches. Some examples of these policies include:

- Australia has developed the PIC Innovation program, which provides funding to “unusual” proposals from SMEs that otherwise might not get funded due to the risky nature of research.
- Recent reports suggest a relatively high 28% of the vast defence budget of the Israeli government is devoted to R&D-related initiatives. Aside from this large amount of funding, Israeli offset policy encourages foreign firms to invest in domestic R&D as part of fulfilling offset obligations.
- Dutch defence industrial policy supports six key high-technology areas. In terms of defence systems, Netherlands competitively produces navy ships. These are seven areas with high R&D investments but which produce high technology products. Netherlands also exhibits a web of research centres that interface with industry and supported by public funds.
- Relying largely on offset policies for co-production agreements and technology transfers, South Korea aims to develop domestic production capabilities through procurement of advanced systems in areas where it lacks comparative advantage.
- Sweden has also adopted a technology-first approach to its offset agreements, though this is supplemented by expenditures in research and development and an increased long-term focus on support of its aerospace industry.
- Spain will reduce the required offsets from foreign firms if it is clear that these firms are providing new technology to domestic firms.
- The UK has increased funding in research in development to 2.5% of GDP. Heavy investments in R&D in the 1980s allowed the UK to become the second largest exporter of military equipment in the 2000s as they were one of only a few suppliers of advanced weapon systems and components.

Policies targeted to support SMEs

The end of the Cold War and the subsequent reduction in military budgets has precipitated a great deal of consolidation in the defence industry. There are now only a handful of firms which are able to act as prime contractors. Lack of competition and larger market shares makes it possible for firms to restrict

entry into the defence sector. Recognizing this problem, governments have begun providing targeted support to small and medium enterprises (SMEs).

Providing specific aid to these firms can help with both export promotion and import substitution. It is difficult for small firms to get noticed by large contractors and thus difficult to break into the global supply chain. Providing short-run assistance to SMEs can help turn them into exporters in the long run. As they become more efficient with lower costs higher technology, they can become suppliers not only to the domestic government but also to global supply chains. Specific policies include:

- In Australia, the Defence Industry Innovation Centre provides advisors to SMEs on how to enter the global supply chain.
- Australia's Capability and Technology Demonstrator Program allows SMEs to exhibit their new technologies to larger firms and foreign governments.
- Australia's Defence+Industry ePortal and the DMO Business Access Offices help match contractors with suppliers and suppliers with the ADF to reduce transaction costs of SMEs.
- Israel's defence industry is largely made up of a handful of relatively large firms, with few market entrants. Subsidies are largely limited to research and development, as well as international marketing aid for potential exporters.
- In the Netherlands, CMP catalogues Dutch defence contractors and supplies the information to foreign firms with offset obligations, governments searching for potential suppliers, national industries exploring new markets or international programs. CMP also coordinates SMEs capabilities with the Dutch defence force demands, European cooperative programs and other international programs like JSF.
- South Korea has recently moved away from "protectionist" policies that had unfairly favoured potentially inefficient firms; today, the primary goal of government subsidies is to allow smaller firms to enter the defence industry with the long-term goal of becoming internationally competitive in their respective markets.

Policies that help firms access global supply chains

As mentioned above, it can be difficult for a small firm to become a global supplier. By definition, small firms lack the marketing resources of larger firms. Large firms may also find it difficult to sell their goods internationally without the support of their domestic government while foreign suppliers being supported by their own governments.

It is clear that policies that provide assistance to firms will aid in the export promotion approach to defence industrial policy. Specific policies include:

- Australia has a Global Supply Chain Program, which helps SMEs enter the global supply chain by providing information, without promoting specific firms.
- Australia's Defence Export Unit helps Australian firms sell to foreign markets. They accomplish this in part by allowing access to ADF equipment to showcase the effectiveness of the product.

- Despite being a relatively small country, nearly all major Israeli defence firms are exporters, with approximately 70% of all systems produced being destined for export. This is made possible in part due to efforts by the Israeli government to assist in the marketing of their products internationally.
- Dutch government's co-production offset requirement with the F-16 program and its Tier 2 participation in the JSF Program have been policies that facilitated access to global supply chains by Dutch SMEs. CMP's foreign market access activities as well as government's participation in OCCAR are further policies in this regard.
- Spain will often provide foreign contractors with a list of firms it can use to fulfill its offset commitments. Doing so makes these domestic suppliers known to the international prime contractors and OEMs.
- Similarly, South Korea and Sweden each have standing policies of assisting domestic firms with the international marketing of domestically-produced defence systems and components.
- The UK has targeted specific industries which it wishes to maintain domestic production. The government there has targeted research funds to firms in these sectors which allow them to develop more advanced products. These products are easier to sell globally due to their advanced technology and since the UK government implicitly affirms the quality of the goods by purchasing them themselves.

Policies that help create a Pro-Competitive Environment

An important part of pursuing an import substitution approach is to ensure that the domestic economy is an environment where firms will wish to invest. Defence industries are often very technical, and as such require a technically-skilled labour force. A country that wishes to develop a domestic defence industry must be willing to invest in an educated workforce.

Barriers to entering the market must also be low. Having to deal with a large amount of regulations and unfair competitive practices of other firms will surely drive potential investors away. Some policies that governments have used to create a positive environment include:

- Australia has two programs targeted to increasing the skills needed in the defence industry. Skilling Australia's Defence Industry provides grants to learn skills needed in the PICs. Industry Skilling Program Enhancement is a larger program that coordinates schools and industries to provide incentives for students to focus in specific areas.
- The Israeli policy approach to foreign investment in domestic defence firms, in contrast, partly involves built-in incentives in offset agreements. Partner firms are allowed to purchase up to a 49% share of selected Israeli firms; the funds expended then count towards total offset obligations. This policy facilitates technology transfers.
- The Dutch pro-competitive measures, beyond supporting SMEs, include open competition in procurement. Similar to Australian and UK pro-competitive procurement, Dutch government

implements the best-value-for-money principle in purchasing equipment and services for the Dutch defence force. This policy incentivizes Dutch firms to be internationally competitive.

- While South Korea employs a similar offset-driven foreign investment policy, strides have been made in recent years in terms of funds aimed at investing in R&D and human capital for the purpose of defence systems development. The long-run consequences of such policies may be to attract further foreign investment into defence industries.
- Sweden has adopted, in recent years, a more market-driven approach to innovation and product development, abandoning the government-centric approach of years past that focused on direct involvement with domestic firms in financing and project selection.
- UK's 2005 White Paper discussed the need for further skill development and to focus on educating more engineers and scientists. Furthermore, the Paper called for a stable macroeconomic climate and a vigilant oversight of the defence industry to ensure unimpeded market entry.

Offset policies

Offset policies are the traditional tool used by governments to promote import substitution. While some countries use offsets partially for employment creation and balance of payments purposes, most countries perceive an opportunity for technology transfers. Offsets can be both direct and indirect. Direct offsets are the purchase of equipment and materials that will be used in the final product being supplied. Indirect offsets are purchases that are not defence related. Some governments require offsets for all contracts above a certain threshold, typically as a fraction of the procurement contract value. Other countries encourage such purchases as in direct offsets, but do not require them.

- Australia's Australian Industry Capability Program encourages contractors to use Australian firms as suppliers, but does not force them to do so. Though, firms that do acquire a competitive edge in contract awards.
- Israel requires 50% of the total amount of procurement contracts to be subject to offset obligations, preferring industrial co-operation agreements and foreign investment in domestic firms.
- What differentiates the Dutch offset policy from other countries in our sample are the strict implementation measures such as negative incentives (or penalties) arising in response to contractor failure to fulfil obligations and the responsibility of obligors to submit twice-yearly reports. Moreover, a set sophisticated multipliers heavily favour technology transfer and R&D investments in defence and in venture capital.
- South Korean offset policy, meanwhile, requires 50% of the total contract amount to be subject to offsets. However, they further require 60% of this amount to be strictly devoted to technology-driven measures such as co-production, technology transfer, R&D investment and skill development.

- Sweden's approach involves a rather rigid 100% of contract value be devoted to “direct”, technology-intensive offsets, consisting mainly of co-production elements; “indirect” offsets such as investments in domestic industry or non-defence counter-trade are ineligible.
- Spain requires offsets amounting to 100% of the contract value for all contracts worth over 1 million Euros. It requires that most of the offsets are direct, and special allowances are made if new technology is transferred. Spain follows a top down approach to choosing offsets and will often direct companies to specific firms in specific regions of the country.
- The UK does not require offsets, although it does encourage firms to use UK suppliers where possible.

Comparison of Government Policies (by country)

Policies	Countries			
	Australia	Israel	Netherlands	South Korea
Government & Industry Coordination	<ul style="list-style-type: none"> - Identification of PICs, SICs - Capabilities Development Advisory Forum 	<ul style="list-style-type: none"> - IDF works closely with R&D firms 	<ul style="list-style-type: none"> - CMP (gov't) and NIID (private) coordinate domestically as well as internationally 	<ul style="list-style-type: none"> - Integrated Project Team system
R&D Support	<ul style="list-style-type: none"> - PIC Innovation program 	<ul style="list-style-type: none"> - Heavy funding - Support through offsets 	<ul style="list-style-type: none"> - CMP programs into six key industries plus shipbuilding; gov't research centres 	<ul style="list-style-type: none"> - Relies on offset policies - Procurement of advanced systems
SME Support	<ul style="list-style-type: none"> - Defence Industry Innovation Centre - Capability and Technology Demonstrator Program - Defence+Industry ePortal 	<ul style="list-style-type: none"> - Aid mostly limited to R&D and international marketing efforts 	<ul style="list-style-type: none"> - CMP informs primes and OEMs about SMEs - CMP works with EDA and OCCAR to promote SMEs 	<ul style="list-style-type: none"> - Use of targeted subsidies to increase competitiveness of domestic firms and allowing SMEs to become efficient
Export Marketing Support	<ul style="list-style-type: none"> - Global Supply Chain program - Defence Export Unit 	<ul style="list-style-type: none"> - Assists domestic firms in finding international partners for export 	<ul style="list-style-type: none"> - CMP promotes foreign market access - Joint programs like F-16 and JSF 	<ul style="list-style-type: none"> - Assists domestic firms in finding international partners for export
Pro-Competitive Environment	<ul style="list-style-type: none"> - Skilling Australia's Defence Industry program - Industry Skilling Program Enhancement 	<ul style="list-style-type: none"> - Encouragement of foreign investment in domestic defence firms via offset incentives 	<ul style="list-style-type: none"> - Dutch gov't open competition or best-value-for-money in procurement 	<ul style="list-style-type: none"> - Encouragement of foreign investment - Investments in domestic training programs
Offsets	<ul style="list-style-type: none"> - Decreased reliance / use of offsets in procurement - Encouragement of contracts with domestic developers 	<ul style="list-style-type: none"> - 50% of total contract value subject to obligations - Co-production preferred 	<ul style="list-style-type: none"> - 100% of total contract value - Strict monitoring of obligors - Sophisticated multipliers for R&D and technology transfers 	<ul style="list-style-type: none"> - 50% of total contract value subject to obligations - Co-production, technology transfer preferred

	Countries		
Policies	Spain	Sweden	United Kingdom
Government & Industry Coordination	<ul style="list-style-type: none"> - No official policy, but many defence firms are partly government owned 	<ul style="list-style-type: none"> -Focus on aerospace industry necessitates communication between government and industry 	<ul style="list-style-type: none"> - Identifies list of industries it intends to support - Pre-qualifying trusted bidders
R&D Support	<ul style="list-style-type: none"> - Government owned Navantia devotes 7% of revenues to R&D - Support through offsets 	<ul style="list-style-type: none"> -Focus on aerospace research -Relies on offset policies 	<ul style="list-style-type: none"> - Increasing R&D spending to 2.5% of GDP
SME Support	<ul style="list-style-type: none"> - No specific support, but the government will direct buyers to particular Spanish firms 	<ul style="list-style-type: none"> -Aid mostly limited to R&D and international marketing efforts 	<ul style="list-style-type: none"> - Ensure that there are few barriers to entering the market - Additional aid if the firm is in one of the industries the government has committed to support
Export Marketing Support	<ul style="list-style-type: none"> - Assists domestic firms in finding international partners for export - Consistent orders to Navantia provide it with the scale to become internationally competitive 	<ul style="list-style-type: none"> -Assists domestic firms in finding international partners for export 	<ul style="list-style-type: none"> - Assists domestic firms in finding international partners for export - Does not champion particular firms
Pro-Competitive Environment	<ul style="list-style-type: none"> - Strives to maintain a qualified workforce 	<ul style="list-style-type: none"> -Movement towards market-driven approach to product development 	<ul style="list-style-type: none"> - Increased funding to train engineers and scientists - Maintain low barriers to entry and a trained workforce in order to attract foreign firms
Offset Policies	<ul style="list-style-type: none"> - 100% of total contract value subject to obligations - Co-production, technology transfer 	<ul style="list-style-type: none"> -100% of total contract value subject to obligations -Co-production, technology transfer <i>only</i> 	<ul style="list-style-type: none"> - No official policy, but will encourage foreign firms to use UK firms as suppliers

	preferred		
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